DRAFT
Environmental Impact Statement for the Wright Area Coal Lease Applications

Volume 2 of 2
Chapters 4 - 8 and Appendices

West Loadout Facilities
Black Thunder Mine, Wyoming

Elk on Reclaimed Rangeland
Jacobs Ranch Mine, Wyoming

Elk on Reclaimed Rangeland
Black Thunder Mine, Wyoming

Loadout Facilities in Porcupine Creek Valley
North Antelope Rochelle Mine, Wyoming

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NATIONAL SYSTEM OF PUBLIC LANDS

June 2009

The BLM manages more land – 258 million acres – than any other Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 Western States, including Alaska. The Bureau, with a budget of about $1 billion, also administers 700 million acres of sub-surface mineral estate throughout the nation. The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

BLM/WY/PL-09/026+1320

4.0 CUMULATIVE ENVIRONMENTAL CONSEQUENCES

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section summarizes the cumulative impacts that are occurring as a result of existing development in the Powder River Basin (PRB[1]) and considers how those impacts would change if other projected development in the area occurs and if the six LBA tracts in the general Wright analysis area are leased and mined.

BLM completed three regional Environmental Impact Statements (EISs) evaluating the potential cumulative impacts of surface coal development in the 1970s and early 1980s (BLM 1974, 1979, and 1981). A draft document for a fourth regional EIS was prepared and released in 1984 (BLM 1984). Since those regional EISs were prepared, BLM has prepared a number of NEPA (National Environmental Policy Act of 1969) analyses evaluating coal leasing actions and oil and gas development in the PRB. Each of these NEPA analyses includes an analysis of cumulative impacts in the Wyoming PRB.

Currently, the BLM is completing a regional technical study, called the PRB Coal Review, to help evaluate the cumulative impacts of coal and other mineral development in the PRB. The PRB Coal Review consists of three tasks:

- Task 1 identifies existing resource conditions in the PRB for the baseline year (2003) and, for applicable resources, updates the BLM's 1996 status check for coal development in the PRB.

- Task 2 defines the past and present development activities in the PRB and their associated development levels as of 2003 and develops a forecast of reasonably foreseeable development in the PRB through 2020. The reasonably foreseeable activities fall into three broad categories: coal development (coal mine and coal-related), oil and gas development (conventional oil and gas, coal bed natural gas, and major transportation pipelines), and other development, which includes development that is not energy-related as well as other energy-related development.

- Task 3 predicts the cumulative impacts that could be expected to occur to air, water, socioeconomic, and other resources if the development occurs as projected in the forecast developed under Task 2.

A series of reports have been prepared to present the results of the PRB Coal Review task studies. The Task 1, 2, and 3 reports represent components of a technical study of cumulative development in the PRB; they do not evaluate

[1] Refer to page xxvi for a list of abbreviations and acronyms used in this document.

specific proposed projects, but they provide information that BLM is using to evaluate the cumulative impacts that would be expected to occur if specific projects or applications, such as the six LBA tracts in the general Wright analysis area, are approved. The Task 1 reports, which include air quality conditions, water resources conditions, social/economic conditions, and other resource conditions, and the Task 2 Report have been completed. The Task 3 reports for air quality conditions, social/economic conditions, and other resource conditions have been completed. The Task 3A Cumulative Air Quality Effects has been updated and the new data and analysis have been included in this document to project air quality effects for 2015. The Task 3 evaluation of water resource conditions is in progress, with the surface water effects complete and available. The information in these reports is summarized later in this chapter, and the completed reports are available for viewing at the BLM offices in Casper and Cheyenne and on the Wyoming BLM website at http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html.

The PRB includes portions of northeastern Wyoming and southeastern Montana. The Wyoming portion of the PRB is the primary focus of the PRB Coal Review reports. The Montana portion of the PRB is included in the Task 2 Report and in the Task 1 and 3 air resources studies. For the majority of resources in the Task 1 reports and for the Task 2 Report, the Wyoming portion of the PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson counties outside of the Bighorn National Forest, and the northern portion of Converse County (Figure 4-1). For some components of the Task 2 Report and for the Task 1 and 3 air resource studies, the Montana PRB Coal Review study area includes portions of Big Horn, Custer, Powder River, Rosebud, and Treasure counties. For several resources, the Task 1 and Task 3 study areas include only potentially affected portions of the Wyoming PRB Coal Review study area; for other resources, the study area extends outside of Wyoming and Montana because the impacts would extend beyond the PRB. For example, the groundwater drawdown is evaluated in the area surrounding and extending west of the mines, because that is the area where surface coal mining operations would impact groundwater resources; but air quality impacts are evaluated over a multi-state area because they would be expected to extend beyond the PRB.

Section 4.1 summarizes the information presented in the PRB Coal Review Task 1 and Task 2 reports. Section 4.2 summarizes the predicted cumulative impacts to air, water, socioeconomic, and other resources presented in the PRB Coal Review Task 3 reports.

4.1 Past, Present, and Reasonably Foreseeable Development

Past, present, and reasonably foreseeable development in the Wyoming PRB are considered in the Task 1 and Task 2 reports for the PRB Coal Review. The Task 1 reports describe the existing situation as of the end of 2003, which reflects the past and present levels of development. The Task 2 Report defines the past and present development activities in the PRB as of the end of 2003 and projects

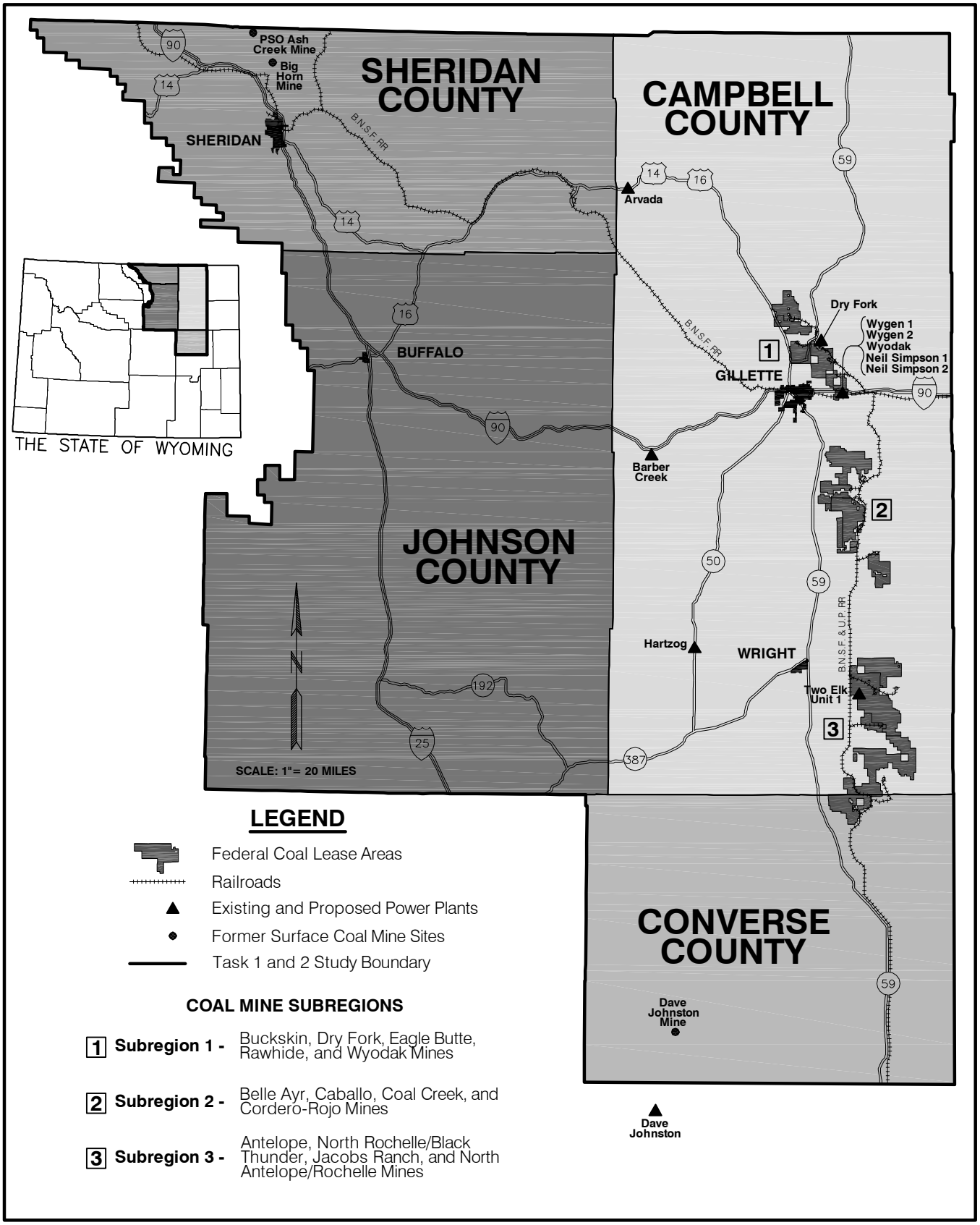


Figure 4-1. Wyoming Study Area for PRB Coal Review Studies Evaluating Current and Projected Levels of Development.

reasonably foreseeable development in the Wyoming PRB through 2020. The PRB Coal Review will be updated when more current development information is available.

4.1.1 Coal Development

4.1.1.1 Coal Mine Development

The Powder River Federal Coal Region was decertified as a federal coal production region by the Powder River Regional Coal Team (PRRCT) in 1990. Decertification of the region allows leasing to take place on an application basis, as discussed in the regulations at 43 CFR 3425.1-5. Between 1990 and January 2009, the BLM's Wyoming State Office held 25 competitive coal lease sales and issued 20 new federal coal leases containing almost 5.8 billion tons of coal using the LBA process. The lease sales are listed in Table 1-1, and the leased tracts are shown in Figure 1-1. This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals (IBLA) and one audit by the General Accounting Office (GAO). As can be seen in Figure 4-2, leasing activity has generally paralleled production since decertification. This is consistent with the PRRCT's objective at the time of decertification, which was to use the LBA process to lease tracts of federal coal to maintain production at existing mines.

The pending applications in the Wyoming PRB are shown in Table 1-2.

BLM has also completed three exchanges involving federal coal resources in the Wyoming PRB since decertification:

- Belco Exchange – an exchange of lease rights for a portion of the former Hay Creek federal coal tract for lease rights to coal near Buffalo, Wyoming, which became unmineable when Interstate 90 was constructed. This exchange was authorized by Public Law 95-554 and completed in 2000.

- Pittsburg and Midway Coal Mining Company (P&M) Exchange – an exchange of federal coal in Sheridan County, Wyoming, for land and mineral rights in Lincoln, Carbon, and Sheridan counties, Wyoming, completed in 2004.

  Powder River Coal Company AVF Exchange – an exchange of lease rights underlying an AVF at the Caballo Mine, which cannot be mined, for lease rights of equal value adjacent to existing federal leases at Powder River Coal Company's North Antelope Rochelle Mine, completed in 2006.

Table 4-1 provides information about the status, ownership and production levels for the existing surface coal mines in the Wyoming PRB in 2003 and their status as of 2007. In 2003, which was the baseline year for the PRB Coal Review Task 1 and Task 2 studies, there were 12 active surface coal mines and one inactive mine. Since 2003, the inactive mine (Coal Creek) has resumed

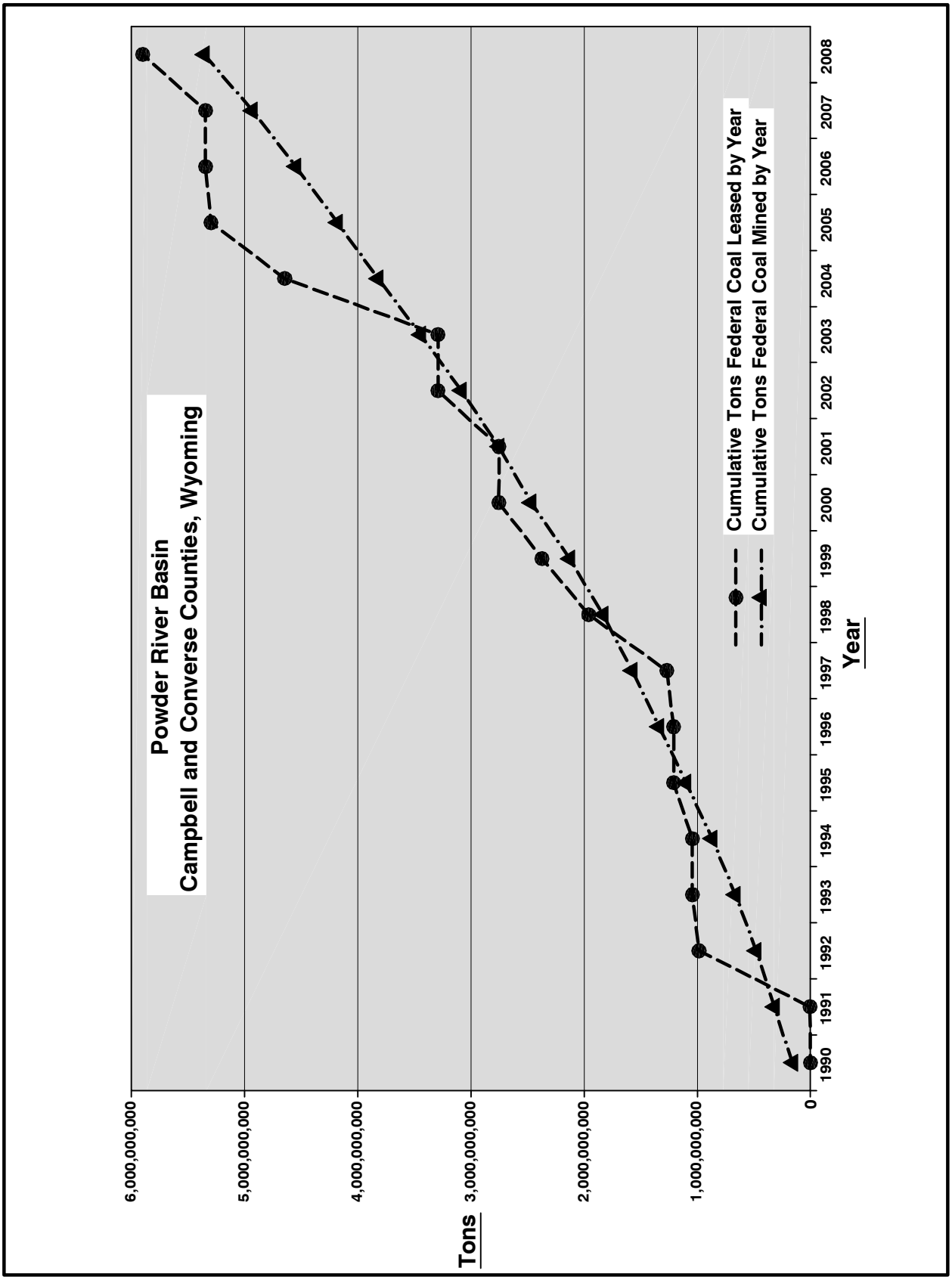


Figure 4-2. Tons of Federal Coal Leased Versus Tons of Federal Coal Mined Since 1990.

Table 4-1. Status and Ownership of Wyoming PRB Coal Mines for 2003, the PRB Coal Review Baseline Year, and for 2007.

2003 Mine	1994 Mine Owner	2007 Mine Owner	2007 Coal Production (mm Tons)[1]	Permitted Production Level (mm Tons)[2]	Status and Additional Comments
SUBREGION 1 (North Gillette)					
Buckskin	SMC (Zeigler)	Kiewit Mining Properties	25.3	42.0	Active
Dry Fork	Phillips/WFA & Fort Union Ltd	WFA	5.3	15.0	Active (includes former Fort Union Mine)
Eagle Butte	Cyprus-Amax	Foundation Coal West	25.0	35.0	Active
Rawhide	Carter (Exxon)	Peabody Holding Co.	17.1	24.0	Active
Wyodak	Wyodak Resources	Wyodak Resources	5.0	12.0	Active (includes former Clovis Point Mine)
Total			**77.7**	**128.0**	
SUBREGION 2 (South Gillette)					
Belle Ayr	Cyprus-Amax	Foundation Coal West	26.6	45.0	Active
Caballo	Carter (Exxon) & Western Energy	Peabody Holding Co.	31.2	50.0	Active (includes Rocky Butte and West Rocky Butte leases)
Cordero Rojo	Kennecott & Drummond	Rio Tinto Energy America[3]	40.5	65.0	Active (consolidation of former Cordero and Caballo Rojo Mines)
Coal Creek	ARCO	Arch Coal Inc.	10.2	25.0	Inactive in 2003, operations resumed in 2006
Total			**108.5**	**185.0**	
SUBREGION 3 (Wright)					
Antelope	Kennecott	Rio Tinto Energy America[3]	34.5	36.0	Active
Black Thunder	ARCO	Arch Coal Inc.	65.3	100.0	Active
Jacobs Ranch	Kerr-McGee	Rio Tinto Energy America[3]	38.1	55.0	Active
N. Antelope Rochelle	Peabody	Peabody Holding Co.	91.5	99.0	Active (consolidation of former North Antelope and Rochelle Mines)
N. Rochelle	SMC (Zeigler)	Arch Coal Inc.	20.9	35.0	Inactive since 2005, leases split between Black Thunder and North Antelope Rochelle Mines
Total			**250.3**	**325.0**	
TOTAL FOR 3 MINE GROUPS			**436.5**	**638.0**	

1 Wyoming State Inspector of Mines (2007a) and Shamley (2008)
2 WDEQ 2007 permitting levels (Shamley 2008).
3 Kennecott Energy Company changed its name to Rio Tinto Energy America in 2006.

operations and the North Rochelle Mine has been incorporated into the Black Thunder Mine following its purchase by the operator of the Black Thunder Mine. The North Rochelle Mine leases were divided between Black Thunder and North Antelope Rochelle Mine in 2006. Peabody has deferred startup of their new mine, the School Creek Mine, which is located between the Black Thunder and North Antelope Rochelle mines, until 2009 or later. These mines are all located in Campbell and Converse counties, just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth (Figure 1-1). As indicated in Table 4-1, there have been numerous changes in mine ownership since decertification, which have resulted in mine consolidations and mine closings within the PRB.

Two recently active surface coal mines in Sheridan County (the Big Horn Coal Mine) and southern Converse County (the Dave Johnston Mine) have ended mining operations, relinquished their federal coal leases, and are reclaiming areas of disturbance.

The lands within the Dave Johnston Mine permit boundary are owned by PacifiCorp. PacifiCorp requested a change in post mining land use from livestock/wildlife grazing to Industrial for the areas that would be affected by a wind project right-of-way. Some of the area was on full reclamation bond release and some area included was on pre-law lands. LQD approved this change of land use in three stages between September of 2007 and May of 2008. The Glenrock Wind Energy Project development is underway and slatted to go on line in 2009. There are existing permits for other surface coal mining-related operations in the PRB. These include the Ash Creek and Welch Mine permits in Sheridan County and the Izita Mine permit in Campbell County. Operations at these sites are completed and the disturbed areas have been reclaimed, but monitoring of the reclaimed areas is no longer ongoing. The KFx Mine, located north of Gillette on privately owned coal, has stopped mining coal for processing at the KFx coal enhancement plant, which is discussed in Section 4.1.1.2.4. The Fort Union plant was idled down in March 2008, until further notice.

The active mines in the Wyoming PRB are geographically grouped into three subregions (Figure 4-1). For purposes of this cumulative impact discussion, these subregions are called the North Gillette, South Gillette, and Wright subregions. Table 4-1 lists the mines included in each subregion.

A fourth subregion includes former and proposed mines in Sheridan County, Wyoming, and existing mines just north of Sheridan County, in Montana. There are currently no active mines in the Wyoming portion of the fourth subregion. However, the PRB Coal Review Task 2 Report projected that a new mine would be developed by P&M near Sheridan by 2010. In April, 2007, P&M and CONSOL Energy Inc. announced that they have formed a new company, Youngs Creek Mining Company, LLC, and entered into a joint agreement to develop a new mine in Wyoming north of Sheridan (Reuters 2007). According to the announcement, engineering, environmental and permitting work are in progress, but actual mine construction will not start until the joint venture has enough coal sales

under contract to justify the investment. The coal reserves included in this project are all privately owned.

The surface coal mines listed in Table 4-1 currently produce over 96 percent of the coal produced in Wyoming each year. Since 1989, coal production in the PRB has increased by an average of six percent per year. The increasing production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with the Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales. In 2003 (the baseline year for the PRB Coal Review), more than 35 percent of the coal mined in the United States came from the Wyoming PRB. By 2007, about 38 percent of the coal mined in the United States came from the Wyoming PRB (USDOE 2008a).

BLM estimates that the surface coal mines listed in Table 4-1 currently have about 125,180 acres of federal coal leased in Campbell and Converse counties. This represents approximately 4.1 percent of Campbell County, where the majority of the leases are located.

Task 2 of the PRB Coal Review projected coal development into the future for the years 2010, 2015, and 2020. Due to the variables associated with future coal production, two projected coal production scenarios (representing an upper and a lower production level) were developed to bracket the most likely foreseeable regional coal production level. The basis for the projected production levels included:

1) an analysis of historic PRB production levels in comparison to the gross domestic product and national coal demand;

2) an analysis of PRB coal market forecasts that model the impact of gross domestic product growth, potential regulatory changes affecting coal-fired power plants, and mining and transportation costs on PRB coal demand;

3) the availability, projected production cost, and quality of future mine-specific coal reserves within the PRB region; and

4) the availability of adequate infrastructure for coal transportation.

The projected upper and lower production levels subsequently were allocated to the Wyoming PRB subregions, discussed above, and to individual mines based on past market shares. Individual mine production levels were reviewed relative to potential future production constraints (e.g., loadout capacities), permitted production levels, mining costs, and coal quality. Then the projected future production was aggregated on a subregion basis. The actual 2003 and 2005 production levels and the two projected coal production scenarios for those years are shown on Figure 4-3. The two projected production levels for 2010, 2015, and 2020 are shown on Figure 4-3 and in Tables 4-2 and 4-3. The actual 2007 production level is also shown on Figure 4-3 as a reference.

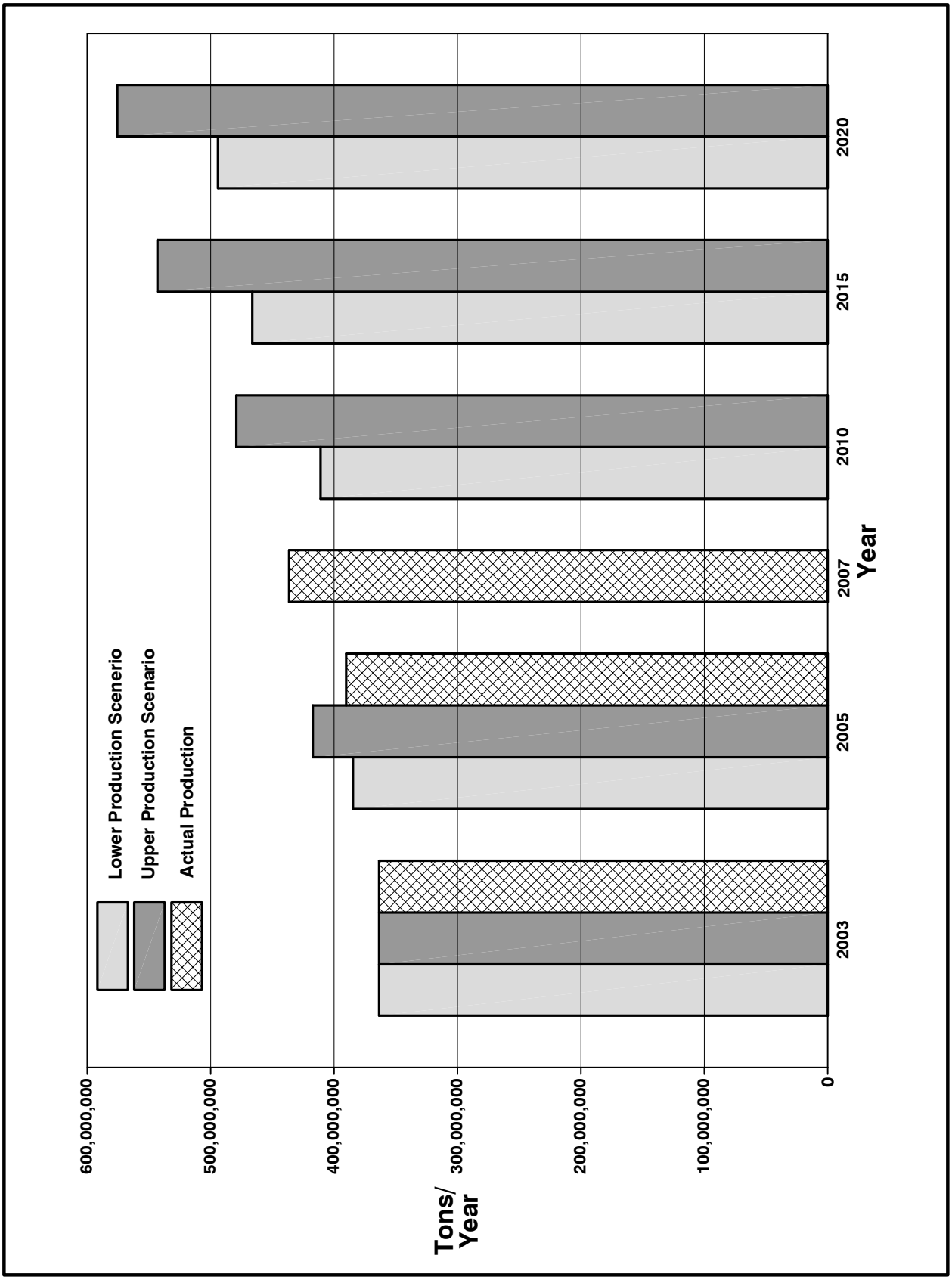


Figure 4-3. Projected Total Coal Production from Campbell and Converse Counties Under the Lower and Upper Production Scenarios.

Table 4-2. Baseline Year and Projected Wyoming PRB Coal Mine Development, Lower Coal Production Scenario.

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable For Reclamation[1] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-ft)
Baseline year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	586
South Gillette Subregion	77	21,249	6,783	6,107	8,359	1,174	544	1,373
Wright Subregion	231	35,498	11,401	13,992	10,105	3,090	1,709	2,295
Total for 2003	**363**	**68,794**	**21,238**	**23,459**	**24,097**	**5,010**	**2,640**	**4,254**
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	62	15,231	5,004	3,968	6,260	787	441	505
South Gillette Subregion	95	28,021	12,183	6,830	9,008	1,323	656	2,072
Wright Subregion	254	55,410	27,751	16,588	11,070	3,153	1,874	4,354
Total for 2010	**411**	**98,662**	**44,938**	**27,386**	**26,338**	**5,263**	**2,971**	**6,931**
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	74	17,457	6,654	4,202	6,601	830	543	505
South Gillette Subregion	112	32,356	15,683	7,314	9,359	1,369	764	2,072
Wright Subregion	281	67,423	38,851	16,983	11,589	3,186	2,077	4,354
Total for 2015	**467**	**117,236**	**61,188**	**28,499**	**27,549**	**5,405**	**3,384**	**6,931**
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	78	19,729	8,429	4,350	6,950	840	569	505
South Gillette Subregion	126	36,994	19,683	7,589	9,723	1,476	845	2,072
Wright Subregion	291	80,720	51,351	17,243	12,124	3,215	2,157	4,354
Total for 2020	**495**	**137,443**	**79,463**	**29,182**	**28,797**	**5,531**	**3,571**	**6,931**

[1] Area unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, topsoil stockpiles, etc.
Source: PRB Coal Review Task 2 Report (BLM 2005a)

Table 4-3. Baseline Year and Projected Wyoming PRB Coal Mine Development, Upper Coal Production Scenario.

Subregion	Annual Production (million tons)	Cumulative Disturbed Area (acres)	Cumulative Permanently Reclaimed Area (acres)	Cumulative Active Mining Area and Unreclaimed Mined Area (acres)	Cumulative Area Disturbed and Unavailable For Reclamation[1] (acres)	Total Mine Employment	Annual Water Consumption (mmgpy)	Annual Water Production (acre-ft)
Baseline Year (2003)								
North Gillette Subregion	55	12,047	3,054	3,360	5,633	746	387	586
South Gillette Subregion	77	21,249	6,783	6,107	8,359	1,174	544	1,373
Wright Subregion	232	35,498	11,401	13,992	10,105	3,090	1,709	2,295
Total for 2003	**363**	**68,794**	**21,238**	**23,459**	**24,097**	**5,010**	**2,640**	**4,254**
Reasonably Foreseeable Development for 2010								
North Gillette Subregion	78	15,911	5,404	4,217	6,290	811	570	505
South Gillette Subregion	117	29,279	13,416	7,536	8,328	1,375	807	2,072
Wright Subregion	284	57,258	27,951	18,236	11,070	3,153	2,101	4,354
Total for 2010	**479**	**102,448**	**46,771**	**29,989**	**25,688**	**5,339**	**3,478**	**6,931**
Reasonably Foreseeable Development for 2015								
North Gillette Subregion	104	18,490	7,329	4,500	6,660	905	785	505
South Gillette Subregion	138	35,624	18,616	8,248	8,760	1,431	952	2,072
Wright Subregion	301	70,431	39,451	19,391	11,589	3,186	1,834	4,354
Total for 2015	**543**	**124,545**	**65,396**	**32,139**	**27,009**	**5,522**	**3,571**	**6,931**
Reasonably Foreseeable Development for 2020								
North Gillette Subregion	121	21,311	9,529	4,766	7,013	1,019	935	505
South Gillette Subregion	148	42,981	25,016	8,758	9,206	1,444	1,018	2,072
Wright Subregion	307	84,797	51,651	21,021	12,124	3,215	2,279	4,354
Total for 2020	**576**	**149,089**	**86,196**	**34,545**	**28,345**	**5,678**	**4,232**	**6,931**

[1] Area Unavailable for reclamation includes disturbed areas occupied by permanent or long-term facilities such as buildings, roads, topsoil stockpiles, etc.
Source: PRB Coal Review Task 2 Report (BLM 2005a)

Tables 4-2 and 4-3 show the cumulative coal mining disturbance as of the baseline year and the cumulative coal mine disturbance projected for the future years for the upper and lower coal production scenarios. In these tables, the baseline year and cumulative projected disturbance areas are broken down into three categories:

- areas which are or projected to be permanently reclaimed;
- areas which are or projected to be undergoing active mining or which have been mined but are not yet reclaimed; and,
- areas which are or projected to be occupied by mine facilities, haul roads, stockpiles, and other long-term structures, and which are therefore unavailable for reclamation until mining operations are completed.

The two tables also include estimates of baseline year and projected future coal mining employment, water consumption, and water production.

The six LBA tracts in the general Wright analysis area are associated with three of the four currently operating mines (Jacobs Ranch, Black Thunder, North Antelope Rochelle, and Antelope) in the southern-most group of mines in the eastern PRB (Figure 1-1). Each of these four operating mines has a least one LBA pending (Table 1-2). The analysis assumes that if the LBAs are offered and if the applicant becomes the lessee, each mine will increase current production to a level where the four mines collectively will produce at an aggregate production level midway between the low and high projected coal production scenarios for 2015 and 2020 shown on Figure 4-3 and in Tables 4-2 and 4-3. The coal development levels and associated disturbance shown in Tables 4-2 and 4-3 include production at the four Wright area mines during the baseline year (2003) and projected production at the mines for 2010, 2015, and 2020.

As discussed above, the projected development levels shown in Tables 4-2 and 4-3 are based on projected demand and coal market forecasts, which are not affected by a decision to lease or not to lease the six LBA tracts in the general Wright analysis area. The reserves in these six LBA tracts, if offered, and if the applicants become the lessees, would add to the mine life of each of the three Wright area coal mines.

As discussed in Sections 1.1 and 2.1, Ark Land Company (ALC) estimates that there were 1,236.4 million tons of recoverable coal reserves on the existing Black Thunder Mine at the end of 2007. In 2007, the mine produced approximately 65.3 million tons and the currently approved (by WDEQ/AQD) air quality permit allows mining of up to 135 million tons of coal per year (mmtpy). If the mine produces at the estimated average of 135 million tons per year, the remaining recoverable reserves would be depleted in about 10 years (2017). ALC estimates that the North Hilight Field LBA Tract includes approximately 263.4 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the North Hilight Field LBA Tract would increase the recoverable reserves at the

Black Thunder Mine by about 21 percent. At the estimated future production level (135 mmtpy), mine life would be extended by about 2 years. However, if WDEQ/AQD approves a higher annual rate of production, the coal would be recovered more quickly. ALC estimates that the South Hilight Field LBA Tract includes approximately 213.6 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the South Hilight Field LBA Tract would increase the recoverable reserves at the Black Thunder Mine by about 17 percent. At the estimated future production level (135 mmtpy), mine life would be extended by about 1.6 years. However, if WDEQ/AQD approves a higher annual rate of production, the coal would be recovered more quickly. ALC estimates that the West Hilight Field LBA Tract includes approximately 377.9 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the West Hilight Field LBA Tract would increase the recoverable reserves at the Black Thunder Mine by nearly 31 percent. At the estimated future production level (135 mmtpy), mine life would be extended by about 2.8 years. However, if Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) approves a higher annual rate of production, the coal would be recovered more quickly.

As discussed in Sections 1.1 and 2.1, Jacobs Ranch Coal Company (JRCC) estimates that there were 423.0 million tons of recoverable coal reserves on the existing Jacobs Ranch Mine at the end of 2007. In 2007, the mine produced approximately 38.1 million tons and the currently approved (by WDEQ/AQD) air quality permit allows mining of up to 55 mmtpy. If the mine produces at the estimated average of 40 million tons per year, the remaining recoverable reserves would be depleted in about 10.6 years (2018). JRCC estimates that the West Jacobs Ranch LBA Tract includes approximately 669.6 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the West Jacobs Ranch LBA Tract would increase the recoverable reserves at the Jacobs Ranch Mine by about 158 percent. At the estimated future production level (40 mmtpy), mine life would be extended by about 16.7 years. However, if production levels increase to the currently permitted level (55 mmtpy) or if WDEQ/AQD approves a higher annual rate of production, the coal would be recovered more quickly.

As discussed in Sections 1.1 and 2.1, BTU Western Resources, Inc. (BTU) estimates that there were 1,031.4 million tons of recoverable coal reserves on the existing North Antelope Rochelle Mine at the end of 2007. In 2007, the mine produced approximately 91.5 million tons and the currently approved (by WDEQ/AQD) air quality permit allows mining of up to 105 mmtpy. If the mine produces at the estimated average of 95 million tons per year, the remaining recoverable reserves would be depleted in about 10.9 years (2018). BTU estimates that the North Porcupine LBA Tract includes approximately 601.2 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the North Porcupine LBA Tract would increase the recoverable reserves at the North Antelope Rochelle Mine by about 58 percent. At the estimated future production level (95 mmtpy), mine life would be extended by about 6.3 years. However, if production levels increase to the currently

permitted level (105 mmtpy) or if WDEQ/AQD approves a higher annual rate of production, the coal would be recovered more quickly. BTU estimates that the South Porcupine LBA Tract includes approximately 309.7 million tons of recoverable coal as applied for. Based on that estimate, acquisition of the South Porcupine LBA Tract would increase the recoverable reserves at the North Antelope Rochelle Mine by about 30 percent. At the estimated future production level (95 mmtpy), mine life would be extended by about 3.3 years. However, if production levels increase to the currently permitted level (105 mmtpy) or if WDEQ/AQD approves a higher annual rate of production, the coal would be recovered more quickly.

4.1.1.2 Coal-Related Development

Coal-related development as defined for this analysis includes railroads, coal-fired power plants, major (230-kV) transmission lines, and coal technology projects. Table 4-4 summarizes the estimated disturbance associated with coal-related development activities for the baseline year and the projected disturbance through 2020. The subsequent paragraphs summarize the existing coal-related development in the Wyoming PRB and the reasonably foreseeable development considered in the PRB Coal Review.

Table 4-4. Baseline Year and Projected Wyoming PRB Coal-Related Development Scenario.

	2003	**2010**	**2015**	**2020**
Coal-Related Disturbance (Acres)	4,891	4,966	5,911	5,911

Source: PRB Coal Review Task 2 Report (BLM 2005a)

4.1.1.2.1 Coal Transportation

As discussed above, electric utilities account for about 97 percent of Wyoming's coal sales. Most of the coal sold to electric utilities is transported to power plants by rail. A small part, about two percent in 2007, of national coal production is exported abroad, but data are not published as to where this export coal is produced. The coal mines in the South Gillette and Wright subregions are served by a joint Burlington Northern Santa Fe and Union Pacific (BNSF & UP) rail line. For the baseline year of 2003, the existing capacity of the line was estimated at approximately 350 mmtpy. For that same year, the existing capacity of the BNSF line, which services the North Gillette subregion, was estimated at 250 mmtpy. Expansion work was completed by 2008 that increased capacity to approximately 450 mmtpy, and plans have been announced to raise capacity to 500 mmtpy by 2012 (BNSF 2008, CANAC 2007).

The PRB Coal Review projected that two coal transportation projects would be developed prior to 2020 in Wyoming: expansion of the BNSF & UP rail facilities south of Gillette and the construction of the Dakota, Minnesota & Eastern Railroad Corporation (DM&E) rail line in Wyoming and South Dakota. A third

project proposed by the Tongue River Rail Company would be built between Decker and Miles City Montana.

BNSF & UP completed work to improve sections of the existing joint rail line and had increased capacity from 350 mmtpy to 450 mmtpy by 2008 with plans to improve additional sections of the existing joint rail line and to further increase capacity to 500 mmtpy by 2012. This work includes construction of third and fourth main line track segments where needed. The increased capacity would accommodate the projected upper and lower production rates at the southern mines, which are projected to produce 439 mmtpy and 455 mmtpy by 2020. The remaining planned expansion projects are considered highly likely to occur.

The proposed DM&E rail line would include new rail construction in South Dakota and Wyoming (approximately 15 and 265 miles, respectively) and 600 miles of rail line rehabilitation in South Dakota and Minnesota. Approximately 78 miles of the new rail construction would occur in the PRB study area, where the project would provide new rail spur services to the mines in the South Gillette and Wright subregions. The Surface Transportation Board (STB) released a final supplemental EIS for this project on December 30, 2005 and granted final approval to construct the rail line on February 15, 2006. The supplemental EIS, which addressed issues that were successfully appealed after an EIS was completed in 2001, was also appealed. The supplemental EIS was upheld by the U.S. Court of Appeals for the Eighth Circuit in December 2006. In 2007, Canadian Pacific Railway Ltd. (CP) acquired DM&E and plans to integrate DM&E's operations into Canadian Pacific Railway's operations. The STB approved CP's acquisition of DM&E on September 30, 2008 (AllBusiness 2008). The expansion into the PRB would require a substantial financial commitment and CP is concentrating on the acquisition of DM&E before making a decision on the expansion project.

The STB recently announced approval of the final stretch of the rail line proposed by the Tongue River Railroad Company. The company must acquire necessary federal and state permits and ROWs through private and public property before constructing the line. If it is constructed, it would provide a shorter route for some of the mines in the North Gillette subregion, which ship coal on the existing BNSF rail line (Billings Gazette 2007a).

For the purposes of the PRB Coal Review, it was projected that the DM&E line would be constructed when the total rail haulage requirement from the eastern Wyoming PRB reaches 450 to 500 million tons per year and would potentially be operational by 2015. The construction of this rail line is considered moderately likely to occur. The PRB Coal Review assigned a low likelihood of development by 2010 under the upper coal production scenario, and projected the construction of the Tongue River Railroad Company line would not occur unless the Otter Creek Mine is developed. In 2007, a request was submitted to lease two tracts of state coal at Otter Creek (Billings Gazette 2007). In July 2008, the Montana Department of Natural Resources and Conservation (DNRC) initiated

an appraisal of the Otter Creek lease tracts, which may be offered for lease in 2009.

4.1.1.2.2 Electric Power Generation

Currently, there are five coal-fired power plants in the Wyoming PRB study area for Tasks 1 and 2 (Figure 4-1). Black Hills Power Corporation owns and operates the Neal Simpson Units 1 and 2 (21.7-MW and 80-MW, respectively), Wygen I and II (80-MW and 95-MW, respectively), and Wyodak (330-MW) power plants, all of which are located approximately five miles east of Gillette, Wyoming. Pacific Power and Light's Dave Johnston Power Plant is located near Glenrock, Wyoming, outside of but adjacent to the study area.

There are also three separate interconnected gas-fired power plants (Hartzog, Arvada, and Barber Creek) located near Gillette, Wyoming (Figure 4-1). Each contains three separate 5-MW-rated turbines that provide electric power to Basin Electric and its customers. In winter, the maximum capacity can reach 22.6-MW from each site. All units are in operating condition, although they do not operate at maximum capacity.

Several additional power plants are projected to be built prior to 2020. The PRB Coal Review assumed that proposed coal-fired power plants that plan to initiate operation by 2010 would have to have been undergoing air permit review by 2003 in order to obtain the required construction permits and complete construction by 2010. The following two identified projects are considered likely for development by 2010:

- North American Power Group has permitted a coal-fired power plant (Two Elk Unit 1) at a 40-acre site located approximately 15 miles southeast of Wright, Wyoming. As originally permitted, the project also would include installation of a gas-fired turbine. The unit would be dry-cooled, requiring very little water. The state has approved several hundred million dollars in tax-exempt bonds for the power plant and North American Power Group is completing financing for the remaining cost of the plant. The company recently announced that it has signed a transmissions agreement with Pacificorp and is planning to have the 320-MW plant in operation by October 2011 (Gillette News Record 2007b, 2007c). The air permit originally was issued in August 2002, then revoked temporarily and restored by DEQ in 2007. In 2008, the Wyoming Environmental Quality Council (WEQC) denied a request by the Sierra Club for a new hearing on the air quality permit allowing construction of the facility. The Sierra Club filed a law suit in District Court in Cheyenne to reverse the DEQ decision (Gillette News Record 2008a).

- Basin Electric Power Cooperative obtained permits from the Wyoming Industrial Siting Council in June, 2006, and WDEQ/AQD in October, 2007, to construct and operate the Dry Fork Station Power Plant. As proposed, the Dry Fork Station would be a coal-based, mine-mouth 385-

MW power plant located near the Dry Fork Mine, north of Gillette, Wyoming. The issuance of the air permit allowed construction to start at the Dry Fork Station. Construction on the plant started in November, 2007. In late October, 2007, several environmental groups filed an appeal of the air permit issued by WDEQ. The WEQC denied requests to suspend construction. After due process, on November 20, 2008 the WEQC approved orders to dismiss the issues before it and terminated the appeal. The orders were signed on December 12, 2008. The environmental groups announced intent to appeal in Wyoming District Court.

- Basin Electric estimates that the plant will be operational by 2011 (WDEQ/ISD 2007). At the time of the PRB Coal Review study it was estimated that 1.2 million tons of coal per year would be required to fuel the facility. Construction and operation of this facility as scheduled is considered moderately likely.

The PRB Coal Review assumes that, under the upper coal production scenario, a maximum of one additional 700-MW coal-fired power plant would be constructed by 2020 in the Gillette area or near one or more of the operating coal mines. North American Power Group (NAPG) submitted an application in September 2007, for a 750-MW coal-fired power plant, Two Elk 2, to be located at the same site as the proposed Two Elk plant, which is discussed above. Black Hills Power Corporation has also announced plans to construct the Wygen III power plant, sized at 100-MW, which is planned to be similar in design to the Wygen II plant. As of November 5, 2008 the project was on schedule. The air permit for this facility was issued in March 2007 with construction planned starting in 2008. (SourceWatch 2007) The study assumes that all existing power plants in the PRB region would remain operational through 2020.

4.1.1.2.3 Transmission Lines

Major transmission lines in the Wyoming PRB study area that support the regional distribution system are associated with the Dave Johnston power plant located near Glenrock, Wyoming, and the power plants operated by Black Hills Power Corporation, which are located east of Gillette. These 230-kV transmission lines have been in place for several years, and their associated permanent disturbance is minimal. Distribution power lines associated with conventional oil and gas and coal bed natural gas (CBNG) development also occur within the study area. For the PRB Coal Review, these lines were included by factoring them in proportionally on a per well basis.

The PRB Coal Review estimated that by 2020, four major transmission lines would be constructed. Markets would dictate the size and location of such facilities, and these are not known as of this time. Because transmission lines are a necessary supporting infrastructure for power generating facilities to provide connection to the grid, the PRB Coal Review assumes they would be required as part of the overall system development for the proposed power plants discussed in the previous section. Six specific proposals for these transmission

lines have been identified by the PRB Coal Review analysis update. There is currently insufficient information to analyze or assign likelihood of development by 2020.

The governors of California, Nevada, Utah, and Wyoming entered into a Memorandum of Understanding to encourage development of a high voltage power transmission line, the Frontier Line, connecting those states in April, 2005. Since that time, no specific plans have been announced as to the location or timing of the Frontier Line. The 345-kV Wyoming-Colorado Intertie, as well as the Trans West and Gateway West and South projects have been proposed in Wyoming, in order to move power from Wyoming to growing Idaho and Nevada and other western U.S. load demand areas (Casper Star Tribune 2007b) (PRB Coal Review analysis update). The TransWestern Express proposes to move electric power from Wyoming to Arizona through Colorado or Utah. The High Plains Express is proposed to move power from Wyoming to New Mexico and Arizona.

4.1.1.2.4 Coal Conversion Technology

With rising energy prices, there has been considerable interest in either enhancing the quality of PRB coal and/or converting the coal to other fuels. Test facilities were previously constructed by KFx at the Fort Union Mine (now part of the Dry Fork Mine), by AMAX (predecessor to Foundation Coal West, Inc.) at the Belle Ayr Mine, and by ENCOAL at the Buckskin Mine, but no commercial production occurred and these facilities have either been dismantled or are no longer in use. Although several coal conversion projects have been proposed, as discussed below, only one (the KFx Coal Beneficiation Project) was considered to have a high enough likelihood of proceeding to include it in the PRB Coal Review, based on its status and available information.

The KFx (now Evergreen Energy, Inc.) coal beneficiation plant, located near the Dry Fork Mine, north of Gillette, was operational but did not reach full capacity. KFx reported making its first production run and shipping coal to two customers for test burns in late December, 2005. In August, 2006, KFx reported that a trainload of enhanced coal had been loaded and sent to a customer in Ohio. Commercially viable product was produced through 2007 until the plant was idled down in 2008. It was predicted that the plant would eventually produce approximately 750,000 tons of enhanced coal per year. This operation had a high likelihood of proceeding with production given the technology being used and the forecast market conditions in the PRB. Evergreen Energy, Inc. and its strategic partner, Bechtel Power Cooperation, enhanced the pilot plant's design with efficiency and production improvements and have decided to relocate their improved K-fuel refineries to different locations with a greater market. The company has suggested that up to five additional units will be built, some perhaps in the PRB, but the likelihood for development of additional units is not known (Evergreen 2009). As a result, the potential development of additional units was not analyzed in the PRB Coal Review.

The following coal conversion projects have been proposed, but were not included in the PRB Coal Review analysis because the likelihood of their occurrence was not known when the coal review analysis was conducted:

- Medicine Bow Fuel and Power, a subsidiary of DKRW Advanced Fuels, LLC, has announced that it plans to build a coal-to-liquids plant with an in-service year of 2013 in northern Carbon County, Wyoming. GE Energy and Rentech Clean Energy Solutions are also involved in the project, which would obtain coal from Saddleback Hills Mine facility. Both the plant and mine are located outside of the PRB. The primary product would be ultra-low-sulfur diesel fuel produced from sub-bituminous coal. The company is in the process of permitting the plant and expects to begin initial site work in 2010, with completion planned for 2011 (Casper Star Tribune 2007c, DKRW 2009).

- Coal gasification development projects are being actively pursued by several groups, including the Wyoming Business Council, Campbell County Economic Development Corporation (CCEDC), and Converse Area New Development Organization (CANDO). Specifically, CANDO is pursuing the development of coal gasification leading to production of pure hydrogen with carbon dioxide (CO_2) as a by-product within 5 to 8 years. While there appears to be substantial interest in these opportunities, it is unknown whether large-scale operations would be developed within the 2010 to 2020 timeframe, given permitting, engineering, and construction time requirements. When the PRB Coal Review was prepared, a project proponent with adequate financing to pursue a project that would utilize PRB coal had not been identified, and one has not been identified since.

A summary of past, present, and reasonably foreseeable coal mines, coal-related facilities, coal production, coal mine employment, and coal and coal-related disturbance in the Wyoming PRB is presented in Table 4-5.

4.1.2 Oil and Gas Development

The following information on existing conventional and CBNG development is summarized from the PRB Coal Review Task 2 Report (BLM 2005a). The information reported is for 2003, which was the baseline year for the coal review.

4.1.2.1 Conventional Oil and Gas

Conventional oil and gas development includes all non-CBNG development activity. Approximately 1,500 conventional oil and gas wells, including producing, non-producing and injection wells, were drilled between 1990 and 2003 (IHS 2004) in the PRB Coal Review Task 2 Study Area. Of those, 60 percent were development wells, drilled in established producing areas. The remaining 40 percent were classified as wildcat wells, which are wells that are drilled in non-producing areas or drilled to evaluate untested prospective zones

Table 4-5. Past, Present, and Projected Wyoming PRB Coal Mine and Coal-Related Development Scenario.

Year	Coal Production (mmtpy)	Number of Active Coal Mines[1]	Number of Active Power Plants	Number of Active Coal Conversion Facilities[2]	Direct Coal Mine Employment	Total Coal Disturbance (acres)[3]
Past and Present						
1990	163	18	3	1	2,862	na
1995	247	19	4	1	3,177	na
2000	323	12	4	2	3,335	na
2003	363	12	4	0	5,010	73,685
Projected Development - Lower Coal Production Scenario						
2010	411	13[1]	7	1[2]	5,263	103,628
2015	467	13[1]	7	1[2]	5,405	123,147
2020	495	13[1]	7	1[2]	5,531	143,354
Projected Development - Upper Coal Production Scenario						
2010	479	13[1]	7	1[2]	5,339	107,414
2015	543	13[1]	7	1[2]	5,522	130,456
2020	576	13[1]	8	1[2]	5,678	155,000

[1] Mines have consolidated and may in the future. Also, new mines may be permitted to better access the coal reserves projected for mining by 2020.
[2] Several coal conversion facilities currently are being evaluated; however, there is only one for which the likelihood of future development currently can be assessed.
[3] Disturbance area includes coal mine and coal-related disturbance areas.
Source: Annual Report of the Wyoming State Mine Inspector (Wyoming Department of Employment 1990, 1995, 2000, and 2003) and PRB Coal Review Task 2 Report (BLM 2005a)

in producing areas. Approximately 75 percent of the wildcat wells were plugged and abandoned. By 2003, the successful new field wildcat wells had resulted in the discovery of 61 new fields that produced 719,000 barrels of oil and 1.45 billion cubic feet (bcf) of non-CBNG (WOGCC 2004).

As of the end of 2003, there were approximately 3,500 producing conventional oil and gas wells in the Wyoming PRB study area plus 1,386 seasonally active wells (IHS 2004). The Wyoming Oil and Gas Conservation Commission (WOGCC) reported that these wells produced approximately 13 million barrels of oil and 40 bcf of conventional gas in 2003 (WOGCC 2004). The U.S. Geological Survey (USGS) estimated that the mean undiscovered non-coal bed hydrocarbon resource in the PRB (including Montana) is 1.8 billion barrels of oil equivalent (BOE) (USGS 2002a).

Most of Wyoming's current oil production is from old oil fields with declining production and the level of exploration drilling to discover new fields has been low (WSGS 2002). This situation is reflected in the PRB where, over the 10-year period from 1992 through 2002, oil production from conventional oil and gas wells in Campbell and Converse counties decreased approximately 60.4 percent (from 32.8 million barrels in 1992 to 13.0 million barrels in 2002). Oil prices have been increasing, which is reversing projections of a continuing decline in oil and gas production; production is now expected to increase in the PRB, with a peak around 2010 of approximately 15.7 million barrels (WSO-RMG 2005). Oil production in the short term may also be bolstered by some planned CO_2 flood

projects in the PRB (WSGS 2003). This projected temporary upward trend in conventional oil and gas development is reflected in the PRB Coal Review projections (Table 4-6).

The active wells identified in Table 4-6 include wells that produce year-round, seasonally producing wells, and service wells (mainly injection wells.) It is estimated that there are approximately 2,000 idle conventional oil and gas wells in the PRB study area (WOGCC 2005); however, the number of idle wells gradually would be reduced in the future through plugging programs, and the idle well locations (once the wells are abandoned) would be reclaimed and no longer represent a disturbance.

Table 4-6. Baseline Year and Projected Wyoming PRB Conventional Oil and Gas Development Scenario.

	Existing		Projected for Task 3 Study Area		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Annual Gas Production (bcf)[1]	39.9	36.3	33.8	30.9	28.0
Annual Oil Production (mmbo)	12.9	11.4	13.8	12.5	11.2
Active and Seasonably Active Wells	5,067	3,890	5,603	5,115	4,625

[1] Future gas production per well was estimated based on 2003 production levels per subwatershed. A greater number of future well sites were assumed to occur in locations with historically lower production rates, so the projected future conventional gas production varies within the cumulative effects study area relative to the number of projected producing wells.

Source: PRB Coal Review Task 2 Report (BLM 2005a)

4.1.2.2 CBNG Development

Natural gas production has been increasing in Wyoming. In the PRB, this is due to the development of shallow CBNG resources. Commercial development of these resources began in limited areas west of and adjacent to the northernmost surface coal mines in the late 1980s. Since that time, CBNG development has spread south and west into other parts of the PRB Coal Review Task 1 and Task 2 study area.

On private and state oil and gas leases, the WOGCC and the Wyoming State Engineers Office (SEO) authorize CBNG drilling. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling (federal, state, and private), as required by NEPA, before CBNG drilling can be authorized. BLM does not authorize drilling on state or private leases but must consider the impacts from those wells in their NEPA analyses. In many areas of the PRB, the coal estate is federally owned, but the oil and gas estate is privately owned. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBNG on a piece of land to the owner of the oil and gas estate.

Annual CBNG production increased rapidly in the PRB between 1999 and 2003 but has leveled off somewhat since then. At the end of 2003, there were 14,758 producing CBNG wells in the study area (IHS 2004), and total production for 2003 was 346 bcf, or 88 percent of the total gas production from the basin (WOGCC 2004). Total production for 2006 was 377 bcf (WOGCC 2007a). Average daily CBNG production was 900 mmcfpd in 2003 (Holcomb 2003) and it is estimated that it will average 1,150 million cubic feet of gas per day (mmcfpd) (1.15 bcfpd) for 2007 (WOGCC 2007b). From 1987 to 2003, the total cumulative gas production from PRB coals was over 1.2 trillion cubic feet. The total water production for the same time period was approximately 2.3 billion barrels (96,600 million gallons). Water production in 2003 amounted to more than 500 million barrels (21,000 million gallons), or about 1.4 million barrels per day. According to the WOGCC website, water production in the PRB associated with CBNG production has varied between just over 1.4 million barrels per day and about 2.2 million barrels per day since December 2003.

Since the early 1990s, the Wyoming BLM has completed numerous Environmental Assessments (EAs) and two EISs analyzing CBNG projects. The most recent of these is the four-volume Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project, which was completed in January 2003 (BLM 2003). The level of CBNG development since 2003 appears to be lower than was forecast in that document. New CBNG well numbers fell from a high of slightly more than 4,600 in 2001 to approximately 2,000 in 2004. The PRB Coal Review Task 2 Report discusses the uncertain trends for future CBNG activity in recent years. The methodology used to project future activity is detailed in Appendix E of that report. Table 4-7 shows the 2003 and projected 2010, 2015, and 2020 levels of CBNG development levels used to evaluate projected cumulative environmental impacts in the PRB Coal Review.

Table 4-7. Baseline Year and Projected CBNG Development Scenario for the Wyoming PRB.

	Existing		**Projected to Task 3 Study Area**		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Annual Production (bcf)	338	284	480	500	443
Active Wells	14,758	12,152	20,899	21,831	19,366

Source: PRB Coal Review Task 2 Report (BLM 2005a)

4.1.2.3 Oil and Gas Related Development

Oil and gas related development activities considered in the PRB Coal Review include major transportation pipelines and refineries. Table 4-8 summarizes the net disturbance, reclamation, and water production associated with oil and gas activity (conventional oil and gas, CBNG, and major transportation pipelines) for 2003 (baseline year) and projects disturbance, reclamation, and water production for future years.

4.1.2.3.1 Pipelines

The availability of pipeline capacity for the transport of oil and gas to outside markets is a key factor in the development of CBNG and conventional oil and gas resources in the Wyoming PRB. In 2003, the baseline year for the PRB coal Review, there were 13 major transportation pipeline systems in the PRB that transport gas resources to markets outside of the basin (Flores et al. 2001). The 2003 capacity of these pipeline systems was 1.9 bcf per day. The combined natural gas production (CBNG and conventional gas) in the Wyoming PRB Coal Review Task 1 and Task 2 study area was approximately 1.03 bcf per day.

Table 4-8. Wyoming PRB Conventional Oil and Gas, CBNG, and Related Development Disturbance and Water Production.

	Existing[1]		Projected for Task 3 Study Area[1]		
Category	**2003 Task 1 Study Area**	**2003 Task 3 Study Area**	**2010**	**2015**	**2020**
Cumulative Disturbed Area (Acres)[2]	187,761	148,602	237,883	304,543	361,331
Cumulative Permanently Reclaimed Area (Acres)	115,045	90,548	160,175	225,426	288,536
Cumulative Unreclaimed Area (Acres)	72,715	58,053	77,707	79,108	72,794
Annual Water Production (mmgpy)	26,405	21,204	39,108	41,484	37,350

1 Minor discrepancies in total acreages are the result of number rounding.
2 Inclusive of conventional oil and gas and CBNG activities and major transportation pipelines. Disturbance associated with ancillary facilities (including gathering lines and distribution power lines has been factored in a per well basis.
Source: PRB Coal Review Task 2 Report (BLM 2005a)

Major transportation pipelines also provide for transport of CO_2 to conventional oil fields for EOR. Increased recovery of crude oil also may depend somewhat on the availability of CO_2 for enhanced oil recovery (EOR) projects, as well as the availability of pipelines to transport oil to refineries for processing.

Gathering lines and power lines associated with conventional oil and gas and CBNG development also occur within the study area; disturbance from these ancillary facilities were factored into the PRB Coal Review analysis on a per well basis.

A 315-mile-long pipeline project, the Bison Pipeline Project, was originally proposed in 2004 to move natural gas northward, directly out of the PRB and into the Northern Border Pipeline system. Approximately 53 miles of the proposed route is within the Wyoming PRB Coal Review study area. If it is

constructed, it would have a 240 mmcfpd capacity as proposed. The Federal Energy Regulatory Commission (FERC) received an application for the 302-mile Bison project proposal in April 2009 (FERC 2009).

The following two proposed pipeline projects in the PRB were listed on the Wyoming Pipeline Authority webpage (http://www.wyopipeline.com) as of October 2007: the MDU Resources Group, Inc. Williston Basin Interstate Pipeline 'Grasslands Pipeline' Expansion and the ONEOK Cantera Gas Holdings Fort Union Gas Gathering Expansion. These are both expansion projects which involve adding capacity to an existing pipeline. Information on pipeline projects proposed in Wyoming can also be found in the "For Citizens" section of the Federal Energy Regulatory Commission website at http://www.ferc.gov.

The amount of available pipeline capacity could limit the amount of future CBNG development. In 2003, it was estimated that growth of Wyoming PRB CBNG production could rise from the 2003 level of 900 mmcfpd up to 3 to 4 bcf per day around 2007 and remain at or above those levels until 2015 (Holcomb 2003). If CBNG production levels reach 3 to 4 bcf per day, it is reasonable to assume that several pipeline projects with up to 1.0 bcf per day capacity each could be built in the PRB. However, as discussed previously, the actual average production for 2007 is currently projected to be 1.15 bcfpd and, based on the assumptions in Appendix E of the PRB Coal Review Task 2 Report, the basin-wide CBNG production is projected to reach approximately 1.7 bcf per day in 2020. New pipeline construction projects were not considered in the PRB Coal Review analysis because the likelihood for additional new pipeline construction was unknown when the PRB Coal Review was prepared.

The CO_2 pipeline from Bairoil, Wyoming, to Salt Creek, Wyoming, may be extended into the PRB Coal Review study area to the Sussex Field to support additional EOR activity. Although it took many years for a CO_2 source to reach the Wyoming PRB, it is very likely that several pipelines could be built in the study area in the near future to provide additional gas for EOR projects. However, no pipeline projects were identified that would transport CO_2 beyond Salt Creek and the likelihood for construction of additional CO_2 pipelines was unknown when the PRB Coal Review analysis was prepared, and they were not considered.

4.1.2.3.2 Refineries

Construction of a new refinery was completed in the Wyoming PRB study area in 2008. The NorthCut Refinery, owned and operated by Interline Resources, is located in Converse County, approximately 20 miles north of the town of Douglas, Wyoming. Construction of the refinery, which was a conversion of the previously existing Well Draw Gas Plant, included installation of a crude oil pipeline between the company's existing crude gathering system and the refinery.

The NorthCut Refinery is a crude oil topping plant, specifically engineered to process 4,000 barrels per day of sweet crude produced in the PRB. Output from the refinery will include naptha, off-road diesel, and reduced crude oil. The markets for the products include ethanol manufacturers, mines, and other refineries. The company-owned crude oil pipeline and third-party tanker trucks will be used for delivery of crude stocks. Tanker trucks also will be used to transport finished products from the facility (Interline Resources 2008).

The refinery is adjacent to and east of State Highway 59, with the joint BNSF&UP rail line located just to the west of the highway. The site previously had been the location of the Well Draw Gas Plant (approximately 20 acres), which shut down in 2002 following a fire. Interline has acquired an additional 12 acres bordering the original site for administrative, maintenance, and transportation-related uses (Interline Resources 2008).

The level and composition of outputs from the existing NorthCut Refinery would respond to various markets, potentially resulting in the construction of additional infrastructure and/or facilities in the future. Any future changes and associated disturbances would occur within the property currently owned by Interline Resources at the NorthCut site (Williams 2008). No specific plans for expansion currently have been identified. As a result, the likelihood for project expansion currently is considered speculative. Therefore, it has been eliminated from further analysis in this study.

No other reasonably foreseeable plans for construction and operation of new petroleum refineries in the Wyoming portion of the PRB have been identified.

4.1.3 Other Development Activity

4.1.3.1 Other Mining

Uranium, sand, gravel, bentonite, and clinker (or scoria) have been and are being mined in the Wyoming PRB study area.

There are three defined uranium districts in the PRB: Pumpkin Buttes, Southern Powder River, and Kaycee (BLM 2003). Numerous mined out or uneconomic uranium mining sites are present in these districts. Uranium is currently produced in the Southern Powder River District using the in-situ leach method. There is one operating in-situ uranium recovery site in the PRB, the Smith Ranch-Highland Mine in Converse County, but the recent increase in interest in uranium for power plants here and abroad is generating interest in new development in the PRB. According to the U.S. Nuclear Regulatory Commission website (http://www.nrc.gov), interest has been expressed in restarting in-situ operations at the Christianson Ranch Site in Johnson County, Wyoming, and an application has been received from Energy Metals Corporation to construct and operate an in-situ uranium recovery facility at Moore Ranch in Campbell County, Wyoming. Based on commodity forecasts and uranium activity as of June 2004, the likelihood and potential timing of new uranium

mining operations in the PRB was not known, and additional development was not projected in the PRB Coal Review analysis.

In the original Task 2 report (BLM 2005a), reasonably foreseeable uranium development was eliminated from further consideration because: 1) there were no specific projects with pending applications and 2) no development was anticipated, based on market conditions. Due to increased overall demand for energy in recent years, uranium prices have increased from a low of $7 a pound in 2001 to over $138 a pound in 2007 (Barry 2008). The price fell precipitously after that, but appears to be stabilizing at approximately $75 per pound.

In response to the increased price of uranium, a number of uranium mine developments currently are proposed in the Wyoming PRB study area (Table 4-9). These include seven new proposed developments, two proposed expansions, and one proposed restart, all of which would use in situ recovery. Most of the proposed developments are in the Pumpkin Buttes uranium district in southwestern Campbell County. The actual number of the proposed developments that would become operational would depend on several factors including price and approval of permits.

Bentonite is weathered volcanic ash that is used in a variety of products, including drilling mud and kitty litter, because of its absorbent properties. There are three major bentonite producing districts in and around the PRB: the Colony District in the Northern Black Hills, the Clay Spur District in the Southern Black Hills, and the Kaycee District west of Kaycee, Wyoming. Within the PRB Coal Review study area, bentonite is mined at Kaycee (WMA 2006). The PRB Coal Review assumed that bentonite mining would continue throughout the study period and that production would continue at existing active mines, with no new mines developed through 2020.

Aggregate, which is sand, gravel, and stone, is used for construction purposes. In the PRB, the more important aggregate mining localities are in Johnson and Sheridan counties (WSGS 2004). The largest identified aggregate operation is located in northern Converse County. It has an associated total disturbance area of approximately 67 acres, of which four acres have been reclaimed.

Scoria or clinker (which is formed when coal beds burn and the adjacent rocks become baked) is used as aggregate where alluvial terrace gravel or in-place granite/igneous rock is not available. Scoria generally is mined in the Converse and Campbell counties portion of the Wyoming PRB study area.

Increased sand, gravel, and scoria production and associated surface disturbance are anticipated in the Wyoming PRB study area in the future because aggregate would be required for road maintenance and new construction activities as other primary resources, such as coal and oil and gas, continue to be developed. New operations and increased production from existing operations can be expected. These operations would vary in size based on the immediate need from the primary industries, but there is no specific

Table 4-9. U.S. Nuclear Resources Commission Applications for In-Situ Recovery Uranium Projects in the Wyoming PRB Study Area.

Project/ Company	Location	Type Application	Watershed/Mining District	Likelihood/ Rationale
Moore Ranch/Uranium One (formerly Energy Metals Corporation)	T41-42N, R74-75W; Campbell and Converse counties.	New	Antelope Creek, Upper Powder River/Pumpkin Buttes District	Moderate for 2010. Application filed with U.S. Nuclear Regulatory Commission (USNRC) October 2007.
Nichols Ranch-Hank Unit/ Uranerz	Nichols Ranch: T43N, R76W; Campbell and Johnson counties. Hank Unit: T43-44N, R75W; Campbell County.	New	Upper Powder River/Pumpkin Buttes District	Moderate for 2010. Applications filed with USNRC and WDEQ.
Christensen Ranch/Cogema	T44N, R76W; Johnson County.	Restart	Upper Powder River/Pumpkin Buttes District	Moderate for 2010. USNRC application pending, received April 2007.
Smith Ranch/Cameco (Power Resources)	T36N, R74W; Converse County.	Expansion	Middle North Platte River/South Powder	Moderate for 2015. Expansion of existing facility, letter of intent March 2008, application expected 2009.
North Butte/Cameco	T44N, R76W; Campbell County.	Expansion	Upper Powder River/Pumpkin Buttes District	Moderate for 2015. Letter of intent to USNRC March 2008, application expected 2009.
Collins Draw/Uranerz	T42N, T43N, R76W; Campbell County.	New	Upper Powder River/Pumpkin Buttes District	Moderate for 2015. Letter of intent to USNRC March 2008, application expected 2009.
Ludeman-Allemand-Ross/Uranium One	Converse County	New	Antelope Creek	Moderate for 2015. Letter of intent to USNRC March 2008, application expected 2009.
Ruby Ranch/Cameco	T43N, R75W; Campbell County.	New	Upper Belle Fourche River/Pumpkin Buttes District	Moderate for 2015. Letter of intent to USNRC March 2008, application expected 2009.
Reno Creek/ Strathmore Minerals Corporation	T43N, R73; Campbell County.	New	Upper Belle Fourche River, Antelope Creek/Pumpkin Buttes District	Moderate for 2015. Letter of intent to USNRC March 2008, application expected 2010.
Southwest Reno Creek/ Strathmore Minerals Corporation	T42-43N, R73-74W	New	Antelope Creek/Pumpkin Buttes District	Speculative. No information on applications available.

Sources: Strathmore Minerals Corporation (2008), USNRC (2008a, 2008b, 2008c); World Information Service on Energy (2007)

information about these projected operations. As a result, new sand, gravel, or scoria operations were not analyzed in detail in the PRB Coal Review.

4.1.3.2 Industrial Manufacturing

There are a number of existing industrial manufacturing establishments located in the Wyoming PRB Coal Review study area. Most are relatively small with fewer than 25 employees; they predominately serve regional and local markets, and most are directly or indirectly related to energy resource development and production. Over the years, some of these firms have expanded such that they now support activities and serve markets outside of the region, but those operations remain dependent upon the local and regional markets to sustain their existing operations.

The PRB Coal Review anticipates that increased coal production would result in an increased demand for fuels and explosives. This increased demand could result in the need for the development of new off-site chemical feedstock plants in the study area. Project-specific information is not available, however, and the potential development of new chemical feedstock plants was not considered in the PRB Coal Review.

Local economic development organizations, including CCEDC and CANDO, are continually engaged in efforts to recruit or assist new business formation in the PRB study area. For example, CANDO has pursued development of long-term potential projects; however, the outcomes of those projects are uncertain and little information and detail are available. As a result, they were not considered in the PRB Coal Review.

4.1.3.3 Wind Power

Wind power facilities have been proposed at various sites in Wyoming, including the Powder River Basin region. There is potential in the Wyoming sites for wind power, and these facilities can contribute to meeting forecasted electric power demands, however they are dependent on available transmission capacity to send power to users. The transmission capability is a constraining factor (Gillette News Record 2008b). Wyoming ranks in seventh place in terms of wind energy potential with a current production in 14th place with 459 megawatts. Although many Wyoming locations having the highest potential are in the southern portion of the state, areas in both Converse and Campbell counties offer sufficient potential to support commercial-scale wind generation projects.

- One such project currently is under development in the Wyoming PRB study area, and another is in the planning stages. PacifiCorp is constructing a three-phase project in Converse County, approximately 15 miles north of the existing Dave Johnston Power Plant, on and near the site of the former Dave Johnson Mine. The first two phases, known as the Glenrock Wind Energy Project and the Rolling Hills Wind Energy Project, are scheduled for completion in 2008. The third, currently unnamed

phase is anticipated to be constructed between 2009 and 2011, depending on market demands and the performance of the first two phases. Each phase would consist of 66 wind turbine generators (each rated at 1.5 MW [99-MW total]) mounted on 80-meter-tall tubular towers, plus ancillary support facilities (PacifiCorp 2007). This project is considered highly likely.

- Third Planet Windpower is in the initial development phase of a wind generating project in the Pumpkin Buttes area of southwestern Campbell County. Third Planet Windpower has acquired 13,000 acres of land leases for the project, installed meteorological towers on site, and is currently doing environmental and feasibility studies. Contingent upon the meteorological data and other results, the company could install up to 167, 1.5-MW towers, yielding a total capacity of 250 MW, if fully constructed (Gartrell 2008). The site for the Reno Junction wind farm is close to the Black Hills Power substation and the companies are seeking an agreement for interconnection. Third Planet Windpower plans to start construction in June of 2010 with an online date in the end of 2010.

- Duke Energy's Campbell Hill Windpower Project is in the final site permitting stage, with construction anticipated to start in early 2009. The Campbell Hill Wind Power Project is to be located approximately 15 miles northeast of Casper, WY and will consist of 66 wind turbines generating 99 Megawatts per year. The facility is scheduled to come online in late 2009.

- Chevron Global Power Company is in the site planning stages of a wind energy project north of Evansville, WY, at the site of the Old Texaco Refinery currently owned by Chevron. The project plans for 13 turbines generating 20 megawatts of power. There is no projected online date at this time although Chevron Global Gas – Global Power is seeking to hire the Wind Farm Operations and Maintenance Manager.

4.1.3.4 Solar Power

Although Wyoming has been given a rating of very good for Annual Solar Potential for Flat Plate Collectors, there currently are no utility scale solar power collection facilities on federal, state, or privet lands in the State of Wyoming. Furthermore, no applications for the development of utility scale solar energy projects have been filed as of January 1, 2009.

The BLM and the U.S. Department of Energy (USDOE) are jointly preparing a solar energy Programmatic Environmental Impact Statement (PEIS) which could facilitate future solar energy development application processes. Wyoming is not covered in the PEIS but still may be affected by it. Information on the PEIS can be found at: http://solareis.anl.gov. The BLM currently evaluates solar energy project proposals on a case by case basis.

Solar energy utilization in Wyoming is, as of January 1, 2009, limited to private residences and private commercial establishments. Current Wyoming solar energy incentives include a sales tax rebate on industrial or commercial solar energy generation equipment, a one time grant of up to $3,000 offered thru lottery from the Wyoming Business Council, and the utility buy back of unused electricity at the wholesale price. Solar energy production equipment and installation at residential, commercial, and utility sites is expensive. Currently, the electric utility costs in Wyoming are such that, the cost of installation does not favor solar energy development over existing forms of energy development.

4.1.3.5 Reservoirs

Currently, there are five key water storage reservoirs in the Wyoming PRB Coal Review study area (Healy, Lake DeSmet, Muddy Guard No. 2, Gillette, and Betty No. 1) (HKM Engineering et al. 2002a and 2002b). The total disturbance associated with these five key water storage areas is 3,263 acres.

Based on the applicable water plans prepared for the Wyoming Water Development Commission for its Basin Planning Program (HKM Engineering et al. 2002a and 2002b), there are long range projections for development of additional reservoirs in the Wyoming PRB study area. However, none of these reservoirs have reached the planning stage; therefore, there was not enough information to analyze them in the PRB Coal Review.

4.1.3.6 Other Non-Energy Development

In addition to the specific projects and developments described above, a network of public and private physical infrastructure, private enterprises, and public activities has been developed in the PRB over time. Examples of infrastructure include the highway and road networks, airports, government offices, hospitals, public schools, municipal water systems, and extensive residential and commercial real estate development. Private enterprises include local retail and service establishments, newspaper publishing, and transportation and distribution firms.

The construction, maintenance, and continuing operations associated with this network of development represent an extensive series of public and private investments, as well as changes in land use, surface disturbances, water consumption, and the factors that characterize local air quality. Those investments and changes have occurred over a period of time and in response to many different influences.

Some of the identified and anticipated plans or proposals for future investment in public, private, and commercial infrastructure in the PRB are summarized below:

- The Wyoming Department of Transportation (WYDOT) State Transportation Improvement Program for 2004 includes anticipated 2005

through 2009 construction costs of approximately $215.4 million for highway and airport maintenance, reconstruction, and improvement projects in the PRB Coal Review Study area. No construction of new highways is scheduled and no new airports are proposed between now and 2009.

- The 2008 annual State Transportation Improvement Program (STIP) includes planned construction for the 2008 fiscal year and preliminary engineering estimates for projects with anticipated construction dates through 2013. In general, Wyoming transportation projects scheduled over the next 6 years include maintenance, reconstruction, and improvement projects. Airport improvement plans consist primarily of pavement rehabilitation and overlays, with some minor expansion of taxiways, aprons, and parking. No construction of new highways is scheduled, and no new airports are proposed.

- In addition to highway projects included in the STIP 2008, the Eagle Butte Mine has received approval from WYDOT to relocate a portion of U.S. Highway 14/16 in the vicinity of the Gillette/Campbell County Airport, north of the City of Gillette. The relocation is proposed to facilitate the recovery of approximately 40 million tons of additional coal recently acquired by the mine through the West Eagle Butte LBA Tract coal sale. Three alternative alignments, involving the construction of up to 6.8 centerline miles of new roadway, were identified and a preferred alternative was subsequently chosen and approved by WYDOT. Construction of the new highway segment is anticipated in 2011/2012 (WYDOT and Foundation Coal Company 2008).

- A $10.7 million expansion and renovation of the Campbell County Courthouse was completed in late 2005, and a new public health building was completed in 2007.

- Expansion of the Campbell County's detention center and remodeling of the Sheriff's Office were undertaken in 2007.

- Expansion of the CAM-PLEX conference and multi-event center facility in Gillette was approved in a special election in May 2005.

- The 2005 approved master plans for Wyoming public school facilities spending included a total of $72.3 million in new capital construction for the seven school districts that are completely or partially in the Wyoming PRB study area (WSFC 2005).

- Construction and maintenance projects for the City of Gillette include a recently completed project to renovate and expand the waste water treatment plant.

- Commercial development includes recently completed construction of a Home Depot store and expansion of the Wal-Mart store in Gillette.

- A new $10 million headquarters for the Campbell County Fire Department providing administrative, training, and storage space in addition to multiple parking bays for firefighting apparatus.

- A $55 million county recreation center is being planned, with opening expected in 2010.

- The city completed construction of a new Health Sciences Center at Gillette College. The facility will house the school's nursing program, providing classrooms, labs, faculty offices, and other spaces. The nursing program functions in conjunction with the Campbell County Memorial Hospital.

- The county, city, and Gillette College are partnering on a Campus Housing Complex and Industrial Technical Education Center. These facilities are part of a long-range master plan for the college that is designed to provide a broad college-level curriculum and provide more focused education and training to support local business and industry.

- Campbell County Memorial Hospital is in the planning stage for a major expansion and renovation project (City of Gillette 2008a).

A capital facilities tax ballot question in Campbell County in the 2004 election asking voters to approve the imposition of a $0.01 sales and use tax (to be used for updated and expanded diesel mechanic and welding programs at the Gillette Campus of the Northern Wyoming Community College (now Gillette College) and for two community development projects in Wright) and an increase in the lodging tax were defeated in 2004. A renewed attempt to get the lodging tax on the ballot for the 2006 primary election failed to gain the approval of the Campbell County Board of Commissioners. In their 2007 session, the Wyoming Legislature committed to pay half of the cost of a technical education center at Gillette College that will house diesel technology, welding and industrial electrician programs. The Campbell County Board of Commissioners has approved a tax increase to pay for the other half of the cost of the project.

Given the timing, scale, year-to-year variability, relatively short construction timetables associated with such investments, the existence of a relatively large and diversified construction industry in the region and nearby areas, and the limited potential for these projects to alter long-term conditions in the PRB, they are not included in the PRB Coal Review analysis. However, one or more of these and similar projects could warrant consideration in a cumulative analysis for a site-specific project due to proximity or coincidental project schedules and timetables.

4.2 Cumulative Environmental Consequences

Section 4.1 of this chapter discusses existing and projected levels of development in the Wyoming PRB, and includes summaries of the results of PRB Coal Review Task 2 studies. This section summarizes the existing conditions resulting from baseline year (2003) development and the cumulative environmental consequences of the projected development for 2010, 2015, and 2020 based on the results of the analyses conducted for PRB Coal Review Task 1 and 3 reports, respectively.

As discussed in Section 4.1, the Wyoming portion of the PRB is the primary focus of the PRB Coal Review analyses. For the majority of resources in the Task 1 analysis, the Wyoming PRB Coal Review study area encompasses all of Campbell County, all of Sheridan and Johnson counties outside of the Bighorn National Forest, and the northern portion of Converse County (Figure 4-1). The study areas for the Task 3 analyses are different. For the majority of the resources considered in the PRB Coal Review, the Task 3 study area is based on watershed boundaries in the PRB and includes the portions of the Upper Powder River, Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, Antelope Creek, and Dry Fork Cheyenne River subwatersheds that lie within Sheridan, Johnson, Campbell and northern Converse counties (Figure 4-4). This study area includes over 4 million acres. Table 4-10 summarizes the total disturbance and reclamation acreages for the baseline year of 2003 and the total projected disturbance and reclamation acreages for 2010, 2015, and 2020 within the Task 3 study area described above.

Table 4-10. Baseline Year and Projected Wyoming PRB Total Development Scenario – Task 3 Study Area.

Year	Total Acres Disturbed[1]	Acres Reclaimed[1]	Acres Unreclaimed[1]	Acres Unavailable for Reclamation[2]	Acres Affected by Coal Mining
Baseline Year					
2003	220,688	111,786	108,901	27,073	68,794
Projected Development - Lower Coal Production Scenario					
2010	339,912	205,113	134,799	29,389	98,662
2015	426,084	286,614	139,472	31,546	117,236
2020	503,085	367,999	135,085	32,794	137,443
Projected Development - Upper Coal Production Scenario					
2010	343,698	206,946	136,752	28,739	102,448
2015	433,392	290,822	142,570	31,006	124,545
2020	514,732	374,732	139,998	32,342	149,089

[1] Minor discrepancies in total acreages are the result of number rounding.
[2] Includes coal mine and coal-related disturbance.
Source: PRB Coal Review Task 2 Report (BLM 2005a)

A total of approximately 220,688 acres of this land area had been disturbed by development activities as of 2003, which represents about 5.6 percent of the Task 3 study area. This is projected to increase to as much as 514,732 acres in 2020 under the upper coal production scenario which would represent approximately 13.1 percent of the Task 3 study area. This projected disturbance

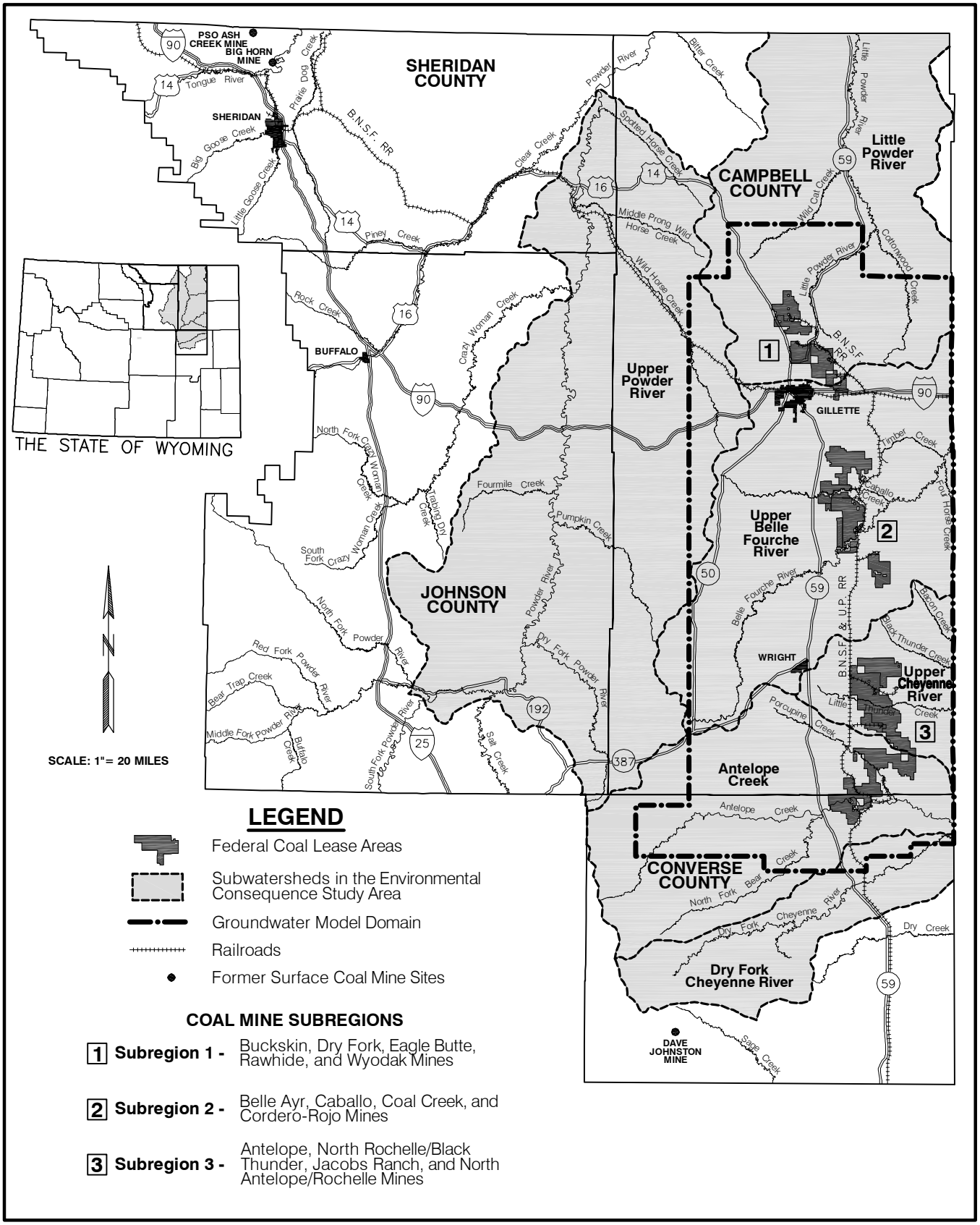


Figure 4-4. Wyoming Task 3 Study Area for PRB Coal Review Studies Evaluating Projected Environmental Consequences.

includes coal mining, coal-related development, and oil and gas and related development disturbance in the Task 3 study area. Areas reclaimed during each future time period shown in Table 4-10 reflect how much of the disturbed acreage is projected to be permanently reclaimed by that point in time. The acres of unreclaimed disturbance would be reclaimed incrementally or following a project's completion, depending on the type of development activity and permit requirements. The acres currently not available for reclamation are occupied by long-term facilities that are needed to conduct mining operations or coal-related activities. These areas would be reclaimed near the end of each mine or facility's life.

Adjustments were made to the study area described above and shown in Figure 4-4 for several resources as described below:

- The potential air quality impacts were evaluated over a multi-state area (including most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and northwestern Nebraska) because they would be expected to extend beyond the Wyoming and Montana PRB study area that was used to identify emissions sources for the air quality analysis.

- The socioeconomic impact analysis focused on Campbell County, but also considered Converse, Crook, Johnson, Sheridan, and Weston counties as directly affected and Niobrara and Natrona counties as indirectly affected.

The groundwater drawdown was evaluated in the area surrounding and extending west of the surface coal mines, shown in Figure 4-4, because that is the area where groundwater drawdown related to surface coal mining operations and CBNG production operations would overlap.

4.2.1 Topography and Physiography

The PRB is located within the Upper Missouri Basin Broken Lands physiographic subprovince that includes northeastern Wyoming and eastern Montana to the Canadian border. The topography generally is of low to moderate relief with occasional buttes and mesas. The general topographic gradient slopes down gently from southwest to northeast with elevations ranging from 5,000 to 6,000 feet above sea level on the southern and western portions of the basin to less than 4,000 feet above sea level on the north and northeast along the Montana state line. The major drainages in the basin are the Tongue, Powder, Belle Fourche, and Cheyenne rivers. Most of the drainages in the area are intermittent and have flows during high precipitation events or during periods of snowmelt. The drainages are part of the upper Missouri River Valley drainage basin.

The disturbance associated with the majority of the past, present, and projected activities have resulted in or would result in the alteration of the surface topography. Surface coal mining, which is projected to continue in the area of

the existing coal mines shown in Figure 4-4, permanently alters the topography by removing the overburden and coal and then replacing the overburden.

Recontouring during reclamation to match approximate original contours, as required by regulation, reduces the long-term impact to topography. After mined-out areas are reclaimed, the restored land surfaces are typically gentler, with more uniform slopes and restored basic drainage networks. Oil and gas exploration and development has occurred and is projected to continue throughout most of the Task 3 study area. It also results in the alteration of topography to accommodate facilities (e.g., well pads, power plants, etc.) and roads, but the disturbance tends to occur in smaller, more discrete areas than coal mining and the development is spread out over a larger area.

The disturbance and reclamation acreages associated with all existing and projected development in the Task 3 study area for the years 2003, 2010, 2015, and 2020 are given in Table 4-10.

4.2.2 Geology, Mineral Resources, and Paleontology

The cumulative effects study area for geology, mineral resources, and paleontology is the PRB Coal Review Task 3 study area (Figure 4-4).

The PRB is one of a number of structural basins in Wyoming and the Rocky Mountain area that were formed during the Laramide Orogeny. The basin is asymmetric with a structural axis that generally trends northwest to southeast along the western side of the basin (Flores et al. 1999). Natural earthquakes, landsides, and subsidence do not present a hazard in the PRB based on the lack of active faults in the study area (USGS 2004); the low risk of ground shaking in the region if a maximum credible earthquake were to occur (Frankel et al. 1997); and the absence of evidence of subsidence, landslides, or other geologic hazards in association with CBNG production. USGS monitors the magnitude of blasting activity in the PRB under the Routine Mining Seismicity Earthquake Hazards Program (USGS 2008). Coal mine blasting operations induced seismic activity does occur throughout the PRB and has reached a USGS local magnitude rating of 3.6 (USGS 2004).

4.2.2.1 Coal

Most of the coal resources of the basin are found in the Fort Union and Wasatch Formations. Although coals are present in the Wasatch, they are thinner and less continuous than the coals in the Fort Union and, therefore, they are not as economically important as the coals in the Fort Union for either coal mining or CBNG development. Projected levels of coal production and disturbance under the lower and upper coal production scenarios are shown in Tables 4-2 and 4-3.

In the coal mine areas, the overburden and coal would be removed and the overburden replaced, resulting in a permanent change in the geology of the area and a permanent reduction of coal resources.

4.2.2.2 Oil and Gas

Drilling for conventional oil and gas in the Wyoming PRB has declined considerably in the last 15 years. However, as discussed above, increasing prices have led to increased interest in drilling and there remains potential for finding and developing these resources in the deeper formations of the basin. Conversely, CBNG production increased rapidly from 1999 through 2002 but began to level off in 2003. Projected production rates for conventional oil and gas and CBNG in 2010, 2015, and 2020 are shown in Tables 4-6 and 4-7.

Oil and gas and related development accounts for most of the projected mineral disturbance outside of the coal mining areas. It generally would result in only shallow, discrete areas of surface disturbance, as discussed above. The acreages over which these impacts were occurring (as of 2003) and are projected to occur in the years 2010, 2015, and 2020 are shown in Table 4-10.

4.2.2.3 Other Mineral Resources

As discussed in Section 4.1.3.1, other mineral resources that are being mined in the Wyoming PRB include uranium, bentonite, clinker, and aggregate. Production of uranium and bentonite is not likely to be affected by development of coal or CBNG in the PRB. Aggregate and clinker production levels are more likely to be affected by other mineral development levels because these resources would be used in construction projects related to other mineral development.

4.2.2.4 Paleontology

Scientifically significant paleontological resources, including vertebrate, invertebrate, plant, and trace fossils, are known to occur in many of the geologic formations within the Wyoming PRB. These fossils are documented in the scientific literature, in museum records, and are known by paleontologists and land managers familiar with the area.

The Wasatch Formation is the most geographically widespread unit exposed on the surface over most of the Task 3 study area. It is underlain by the Fort Union Formation. The fossiliferous Morrison and Lance Formations crop out in the western portion of the basin but occur at depth in the vicinity of the coal mines and CBNG activity in the eastern portion of the basin. Within the Task 3 study area, the highly fossiliferous White River Formation occurs only on Pumpkin Buttes in southwestern Campbell County.

As of 2003, no significant or unique paleontological localities had been recorded on federal lands in the PRB. However, the lack of localities in the PRB does not mean that scientifically significant fossils are not present, as much of the area within and surrounding the PRB has not been adequately explored for paleontological resources. As a result, development activities in the Task 3 study area have the potential to adversely affect scientifically significant fossils, if they are present in or adjacent to disturbance areas.

The potential for impacts to scientifically significant fossils would be greatest in areas where Class 4 or 5 formations are present (see Section 3.3.3.1). The Wasatch Formation is classified as a Class 5 formation. The Fort Union Formation is classified as a Class 3 formation, which means that fossil content varies in significance, abundance, and predictable occurrence. The greatest potential impact to surface and subsurface fossils would result from disturbance of surface sediments and shallow bedrock during construction and/or operations, depending on the type of project. Potential subsurface disturbance of paleontological resources (e.g., during drilling operations) would not be visible or verifiable. The areas over which these impacts occurred as of 2003 and are projected to occur as a result of all projected development in the years 2010, 2015, and 2020 are shown in Table 4-10. As only portions of the Task 3 study area have been evaluated for the occurrence of paleontological resources, and discrete locations for development activities cannot be determined at this time, no accurate estimate can be made as to the number of paleontological sites that may be affected by cumulative development activities.

Development activities which involve federally owned surface and/or minerals are subject to federal guidelines and regulations protecting paleontological resources. Protection measures, permit conditions of approval, and/or mitigation measures would be determined on a project-specific basis at the time of permitting to minimize potential impacts to paleontological resources as a result of these activities.

4.2.3 Air Quality

There is substantial scientific evidence that increased atmospheric concentrations of greenhouse gases (GHG) and land use changes are contributing to an increase in average global temperature. However since these gases are not regulated pollutants, a discussion of this subject has been included in section 4.2.14.

The Task 1A Report for the PRB Coal Review (BLM 2005b) documents the modeled air quality impacts of operations during a baseline year, 2002, using actual emissions and operations for that year. Emissions from permitted minor sources were estimated, due to unavailability of actual emissions data. The baseline year analysis evaluated impacts both within the PRB itself and at selected sensitive areas surrounding the region. The analysis specifically looked at impacts of coal mines, power plants, CBNG development, and other development activities. Results were provided for both Wyoming and Montana at the individual receptor areas. The Task 2 Report for the PRB Coal Review (BLM 2005a) identifies reasonably foreseeable development activities for the years 2010, 2015, and 2020.

The Task 3A Report for the PRB Coal Review (BLM 2006b) evaluates the impacts on air quality and air quality-related values for the year 2010 using the development levels projected for 2010 and the same model and meteorological data that were used for the baseline year study in the Task 1A Report. BLM

updated the model and conducted impact analysis for the year 2015 (BLM 2008h) The updated Task 3A report for the PRB Coal Review Cumulative Air Quality Effects for 2015 uses a revised baseline year of 2004 with revised projected 2015 scenarios. Impacts for 2015 and 2020 were projected qualitatively based on evaluation of anticipated changes in emissions and on modeled impacts for the 2015 lower and upper coal production scenarios. The revised baseline year emissions inventory was developed using 2004 actual emissions data or emissions estimates and has incorporated the recent analyses of emissions in Wyoming and Montana, which were not available when the 2010 modeling study was done.

Existing and projected emissions sources for the baseline year (2004) and 2015 analyses were identified within a study area comprised of the following counties in the PRB in Wyoming and Montana:

- Campbell County, all of Sheridan and Johnson counties except the Bighorn National Forest lands to the west of the PRB, and the northern portion of Converse County, Wyoming.

- Rosebud, Custer, Powder River, Big Horn, and Treasure counties, Montana.

A state-of-the-art, guideline dispersion model was used to evaluate impacts of the existing and projected source emissions on several source groups, as follows:

- Near-field receptors in Wyoming and Montana covering the PRB Coal Review Task 1A and 3A study area in each state. Overall, the near-field receptor grid points were spaced at one kilometer intervals over the study area;

- Receptors in nearby federally designated pristine or “Class I” areas; and

- Receptors at other sensitive areas (Class II sensitive areas).

The EPA guideline CALPUFF model system version 5.8 (Scire et al. 1999a) was used for this study, which differs from the version used in the Task 1A and original Task 3A studies. The impacts for the baseline year (2004) and for 2015 lower and upper coal production scenarios were directly modeled. As discussed above, the modeling domain extends over most of Wyoming, southeastern Montana, southwestern North Dakota, western South Dakota, and western Nebraska. An interagency group participated in developing the modeling protocol and related domain that were used for this analysis.

The modeling approach for the updated Task 3A Report used actual emissions from existing sources representative of 2004 operations and projected those emissions for the expected level of development in 2015. Year 2004 emission inventory data were previously developed for the Montana Statewide Oil and Gas Supplemental Environmental Impact Statement. No specific emissions data

were available for the projected levels of development. The baseline year emissions data were gathered from a variety of sources, but mainly relied on data collected by the WDEQ/AQD and the Montana Department of Environmental Quality (MDEQ). Only actual emission sources inside the study area described above were included in the modeling. Key major sources were included, such as the coal-fired power plants, gas-fired power plants, and sources that were included in the Title V (operating permit) program. The Dave Johnston power plant, which is located outside of but adjacent to the study area in Converse County, was included in the baseline year study and in the projected emissions. Some operational adjustments were made to accommodate small sources with air permits that were presumed to be operating at less than full capacity. Emissions from other sources, including estimated construction-related fugitive dust emissions, were computed based on EPA emission factors and on input data from WDEQ/AQD.

The existing regional air quality conditions generally are very good in the PRB Coal Review Task 1A and Task 3A study area. There are limited air pollution emissions sources (few industrial facilities, including the surface coal mines, and few residential emissions in relatively small communities and isolated ranches) and good atmospheric dispersion conditions. The available data show that the region is in compliance with the ambient air quality standards for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). There have been no monitored exceedances of the annual particulates (PM_{10}) standard in the Wyoming PRB.

Air quality modeling indicates the projected mine activities at the three Wright area applicant mines will be in compliance with the PM_{10} and $PM_{2.5}$ near-field and short-term NO_2 air standards for the 2015 modeled air quality impacts at their currently permitted mining rates. All applicants have indicated that they propose to mine the respective LBA tracts at a rate equal to or below the mines' current air quality permit levels. Visibility data collected around the region indicate that, although there are some days with notable impacts at Class I areas, the general trend in the region shows little change in visibility impacts at Badlands National Park and at the Jim Bridger Wilderness area over the period from 1989 to 2005 (Figure 3-19).

Predicted impacts from baseline year (2004) and projected 2015 emissions were modeled for four air quality criteria pollutants (NO_2, SO_2, $PM_{2.5}$, and PM_{10}), along with changes in air quality-related values at Class I areas and at identified sensitive areas. For regulatory purposes, the Class I PSD (Prevention of Significant Deterioration) evaluations are not directly comparable to the air quality permitting requirements, because the modeling effort does not identify or separately evaluate increment consuming sources that would need to be evaluated under the PSD program. The cumulative impact analysis focuses on changes in cumulative impacts, but not on a comparison to PSD-related evaluations, which would apply to specific sources.

Table 4-11 presents the modeled impacts on ambient air quality at the near-field receptors in Montana and Wyoming. Results indicate the maximum impacts at

Table 4-11. Projected Maximum Potential Near-field Impacts (µg/m³).

Pollutant	Averaging Time	Base Year (2004) Impacts	2015 Lower Coal Development Scenario Impacts	2015 Upper Coal Development Scenario Impacts	NAAQS	Wyoming AAQS	Montana AAQS	PSD Class II Increments
Wyoming Near-field								
NO_2	Annual	31.3	46.7	47.4	100	100	--[1]	25
SO_2	Annual	15.3	16.2	16.2	80	60	---	20
	24-hour	112.3	119.6	119.6	365	260	---	91
	3-hour	462.0	814.1	814.1	1,300	1,300	---	512
$PM_{2.5}$	Annual	13.4	**18.7**	**21.4**	15	15	---	---
	24-hour	**87.6**	**179.5**	**179.5**	35	35	---	---
PM_{10}	Annual	38.4	**53.5**	**61.0**	---	50	---	17
	24-hour	**250.4**	**512.8**	**512.9**	150		---	30
Montana Near-field								
NO_2	Annual	3.3	6.5	6.5	100	---	100	
	1-hour	409.0	**826.3**	**826.4**	--- 150	---	564	---
SO_2	Annual	1.6	1.7	1.7	80	---	80	
	24-hour	16.1	16.5	16.6	365	---	365 25	91
	3-hour	65.0	66.5	66.5	1,300	---	1,300	512
	1-hour	162.9	166.6	166.6	---	---	1,300	---
$PM_{2.5}$	Annual	1.0	1.8	1.9	15	---	15 20	---
	24-hour	10.2	15.4	20.6	35	---	35	---
PM_{10}	Annual	2.8	5.2	5.3	---	---	50	17
	24-hour	29.1	44.0	58.5	150	---	150	30

[1] No standard or increment
Value units are microgram per cubic meter (µg/m³)
Bold values indicate projected exceedance of AAQS
Source: PRB Coal Review Task 3A Report (BLM 2008h)

any point in each receptor group, and data are provided for the baseline year (2004) analysis and for both coal production scenarios for 2015.

Based on the modeling results, the baseline year (2004) maximum impacts on ambient air quality were well below the ambient air quality standards for NO_2 and SO_2. The Annual $PM_{2.5}$ and PM_{10} impacts in Wyoming are predicted to be over the Wyoming Annual Air Quality Standard (AAQS) for the 2015 lower and upper development scenarios.

The 2004 maximum modeled 24-hour PM_{10} and $PM_{2.5}$ levels in Montana are also well below the state and national AAQS; however, the 2004 maximum modeled 24-hour PM_{10} and $PM_{2.5}$ levels are greater than the 150 µg/m^3 and 35 µg/m^3 AAQS, respectively, for some near-field receptors near PRB sources in Wyoming. The modeling also indicated that visibility impacts in the surrounding Class I and Class II areas for the modeled year 2015 showed some increase in visibility impacts.

For the Montana near-field receptors, the modeling for the 24-hour and annual PM_{10} and $PM_{2.5}$ levels projects a maximum impact below the state and national AAQS for both coal production scenarios for 2015. The upper coal production scenario shows an increase in the impact of roughly 100 percent above the baseline year for these two parameters. Projected impacts for SO_2 and annual NO_2 show compliance with the National Ambient Air Quality Standard (NAAQS) and Montana AAQS. The 1-hour NO_2 projected levels for the lower and upper development scenarios are above the Montana AAQS. For the Montana receptors, modeling for the NO_2 and SO_2 levels were projected to be essentially equal for both coal development scenarios for 2015.

For the Wyoming near-field receptors, the modeling projects maximum 24-hour PM_{10} levels greater than the 150 µg/m^3 ambient air standard for the 2015 lower and upper coal production scenarios at some receptors. For the 2015 upper development scenario, the modeled levels are above 150 µg/m^3 for several relatively small areas surrounding coal mines and CBNG operations in the Wyoming PRB. As shown in Table 4-11, the maximum modeled PM_{10} impacts from all sources for both the 2015 lower and upper coal development scenarios are over three times the 24-hour Wyoming AAQS standard. The maximum modeled $PM_{2.5}$ impacts from all sources for both the 2015 lower and upper coal development scenarios are over five times the 24-hour Wyoming AAQS standard.

As discussed in Section 3.4.2.2.1, modeling tends to over-predict the 24-hour impacts of surface coal mining and, as a result, WDEQ/AQD does not consider short-term PM_{10} modeling to be an accurate representation of short-term impacts. In view of this, a Memorandum of Agreement between WDEQ/AQD and EPA Region VIII, dated January 24, 1994, allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement also requires “Best Available Work Practice” mitigation measures in all coal mine permits. The monitored exceedances at surface coal mines in the Wyoming PRB and the measures that WDEQ/AQD has

implemented or is proposing to implement to prevent future exceedances of the PM_{10} NAAQS are discussed in Chapter 3, Sections 3.4.2.1 and 3.4.2.3.

The maximum modeled impacts on the annual $PM_{2.5}$ and PM_{10} levels are projected to be above the standards (15 µg/m^3 and 50 µg/m^3, respectively) at near-field receptors in Wyoming for the 2015 lower and upper coal production scenarios. EPA has revoked the annual PM_{10} standard of 50 µg/m^3, but until Wyoming enters into rule making to revise the WAAQS, that standard is still effective. It should be noted that WDEQ/AQD issues permits to mine coal. AQD cannot issue any permit that violates Ambient Air Quality Standards. Impacts of NO_2 and SO_2 emissions are predicted to be below the NAAQS and Wyoming AAQS at all Wyoming near-field receptors. A large portion of the impacts for all scenarios would be associated with coal-related sources, although non-coal sources would contribute a notable portion of the impact.

Table 4-12 lists the three Class I areas and two Class II areas where the modeled impacts are the greatest. Table 4-12 includes a comparison to ambient air quality standards and PSD increments; however, it must be noted that this modeling analysis did not separate PSD increment-consuming sources from those that do not consume increment. The PSD-increment comparison is provided for informational purposes only and cannot be directly related to a regulatory interpretation of PSD increment consumption. For the Class I Northern Cheyenne Indian Reservation, modeled impacts for the baseline year (2004) and the two coal production scenarios for 2015 are less than the annual SO_2 PSD Class I and Class II increment; below the PSD Class I and Class II increment levels for annual PM_{10}, 24-hour SO_2, and 3-hour SO_2. The levels for 24-hour PM_{10} are above the Class I and Class II PSD increment levels in the base line year of 2004 and show potential exceedences in both the lower and upper development scenarios. For annual NO_2, the modeled impacts for the Northern Cheyenne Reservations are less than the annual increment for the baseline year and lower and upper coal production scenarios. In the other two Class I areas, only the 24-hour PM_{10} impacts are higher than the comparison to the PSD increment levels for the baseline year and both coal production scenarios. In the sensitive Class II areas, all modeled impacts are well below the Class II PSD increment for the lower coal production scenario. The modeled 24-hour PM_{10} in both of the Class II areas indicates potential exceedences in the upper coal production scenario.

The projected modeled visibility impacts for the baseline year (2004) and for the lower and upper coal production scenarios for 2015 for all analyzed Class I and sensitive Class II areas are listed in Table 4-13. For the baseline year, the maximum visibility impacts at Class I areas were determined to be at the Northern Cheyenne Indian Reservation in Montana and at Wind Cave and Badlands National Parks in South Dakota. For these locations, modeling showed more than 200 days of impacts with a change of 10 percent or more in extinction. A 10 percent change in extinction corresponds to 1.0 deciview (dv).

Table 4-12. Maximum Predicted PSD Class I and Sensitive Class II Area Impacts (µg/m³)[1].

Location	Pollutant	Averaging Period	Base Year (2004) Impacts	2015 Lower Coal Development Scenario	2015 Upper Coal Development Production Scenario	PSD Class I/II Increments
Class I Areas						
Northern Cheyenne Indian Reservation	NO_2	Annual	0.4	0.6	**0.9**	2.5
	SO_2	Annual	0.5	0.6	0.7	2
		24-hour	3.1	3.4	3.4	5
		3-hour	9.4	9.6	9.6	25
	$PM^{2.5}$	Annual	0.3	0.5	0.5	---[2]
		24-hour	3.4	5.1	5.1	---
	PM_{10}	Annual	0.9	1.5	1.5	4
		24-hour	**9.6**	**14.4**	**14.6**	8
Washakie Wilderness Area	NO_2	Annual	0.0	0.0	0.0	2.5
	SO_2	Annual	0.2	0.2	0.2	2
		24-hour	3.0	3.1	3.1	5
		3-hour	6.3	6.3	6.3	25
	$PM^{2.5}$	Annual	0.1	0.1	0.1	---
		24-hour	1.6	1.6	1.6	---
	PM_{10}	Annual	0.2	0.2	0.2	4
		24-hour	4.5	4.6	4.7	8
Wind Cave National Park	NO_2	Annual	0.2	0.3	0.3	2.5
	SO_2	Annual	0.7	0.8	0.8	2
		24-hour	3.7	4.1	4.1	5
		3-hour	7.0	7.4	7.4	25
	$PM^{2.5}$	Annual	0.4	0.5	0.5	---
		24-hour	3.8	4.6	4.7	---
	PM_{10}	Annual	1.0	1.3	1.4	4
		24-hour	**10.9**	**13.3**	**13.6**	8
Sensitive Class II Areas						
Big Horn Canyon National Recreation Area	NO_2	Annual	0.6	0.6	0.7	25
	SO_2	Annual	0.5	0.6	0.6	20
		24-hour	3.6	3.7	4.0	91
		3-hour	14.3	14.3	14.3	512
	$PM^{2.5}$	Annual	0.5	0.5	0.7	---
		24-hour	5.9	7.8	11.9	---
	PM_{10}	Annual	1.4	1.6	2.1	17
		24-hour	16.9	22.3	**34.1**	30
Crow Indian Reservation	NO_2	Annual	0.9	1.4	1.7	25
	SO_2	Annual	2.3	2.3	2.3	20
		24-hour	14.4	14.6	14.6	91
		3-hour	76.8	77.0	77.0	512
	$PM^{2.5}$	Annual	0.8	1.0	1.4	---
		24-hour	7.2	9.4	14.3	---
	PM_{10}	Annual	2.2	2.9	4.1	17
		24-hour	20.5	26.9	**40.7**	30

[1] µg/m³ = microgram per cubic meter.
[2] No standard or increment.
Bold values indicate exceedance of PSD Class I or II standards.
Source: PRB Coal Review Task 3A Report (BLM 2008h)

Table 4-13. Modeled Change in Visibility Impacts at Class I and Sensitive Class II Areas.

Location	Base Year (2004)	2015 Lower Coal Development Scenario	2015 Upper Coal Development Scenario
	No. of Days >10%	Change in No. of Days >10%	Change in No. of Days >10%
Class I Areas			
Badlands National Park	218	26	26
Bob Marshall WA	8	0	0
Bridger WA	144	2	2
Fitzpatrick WA	91	2	2
Fort Peck Indian Reservation	105	10	10
Gates of the Mountain WA	55	0	0
Grand Teton National Par	70	2	2
North Absaroka WA	61	3	3
North Cheyenne Indian Reservation	243	32	47
Red Rock Lakes	42	2	2
Scapegoat WA	27	1	1
Teton W	57	4	4
Theodore Roosevelt National Park	178	5	9
UL Bend WA	77	8	10
Washakie WA	83	5	5
Wind Cave National Park	262	18	19
Yellowstone National Park	84	2	2
Sensitive Class II Areas			
Absaroka Beartooth WA	101	2	3
Agate Fossil Beds National Monument	251	20	20
Big Horn Canyon National Rec. Area	331	1	3
Black Elk WA	236	34	36
Cloud Peak WA	126	18	18
Crow Indian Reservation	360	4	4
Devils Tower National Monument	274	25	25
Fort Belknap Indian Reservation	66	6	7
Fort Laramie National Historic Site	260	10	10
Jedediah Smith WA	79	1	1
Jewel Cave National Monument	261	19	21
Lee Metcalf WA	97	2	2
Mount Naomi WA	51	1	1
Mount Rushmore National Monument	222	36	36
Popo Agie WA	139	4	4
Soldier Creek WA	268	18	18
Wellsville Mountain WA	130	10	10
Wind River Indian Reservation	217	2	5

Source: PRB Coal Review Task 3A Report (BLM 2008h)

To provide a basis for discussing the modeled visibility impacts resulting from the projected increased production under the lower and upper coal production scenarios for 2015, the modeled visibility impacts for 2004 were subtracted from the model results for 2015. Table 4-13 shows the number of additional days that the projected impacts were greater than 1.0 dv (10 percent in extinction) for each site for the upper and lower coal production scenarios. Using Badlands Park as an example, the modeling analysis showed 218 days with impacts greater than 1.0 dv in 2004. Under the 2015 lower coal production scenario, the modeling analysis projects an additional 26 days with impacts greater than 1.0 dv, or a total of 244 days with impacts greater than 1.0 dv.

For acid deposition, all predicted impacts are below the deposition threshold values for both nitrogen and sulfur compounds. There are substantial percentage increases in deposition under the lower and upper coal production scenarios for 2015; however, impacts remain well below the nitrogen and sulfur levels of concern (1.5 and 5.0 kilograms per hectare per year (kg/ha/yr), respectively). The acid neutralizing capacity (ANC) of sensitive lakes also was analyzed, and results are summarized in Table 4-14. The base year study indicated that none of the lakes had predicted significant impacts except Upper Frozen Lake; however, the lower and upper development scenarios for 2015 show an increased impact at Florence Lake, leading to an impact that is above the 10 percent acid neutralizing capacity.

The study also modeled impacts of selected hazardous air pollutant emissions (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) on the receptors with the highest ambient impacts. The near-field receptors in Wyoming and Montana were analyzed for annual (chronic) and 1-hour (acute) impacts. Model results for the base year (2004) and 2015 development scenarios show that impacts are predicted to be well below the acute Reference Exposure Levels, non-carcinogenic Reference Concentrations for Chronic Inhalation, and carcinogenic risk threshold for all hazardous air pollutants. The maximally exposed individual's carcinogenic risk factor due to benzene exposure is predicted to increase 50 percent as a result of projected PRB development, but even with this substantial increase the predicted risk is well below U.S. Environmental Protection Agency (EPA) carcinogenic risk thresholds.

For 2020, the PRB Coal Review updated Task 3A Report includes a qualitative analysis of potential air quality impacts and the impacts from individual source groups, based on the projected changes from 2004 to 2015 for the respective coal production scenarios. The production from conventional oil and gas activities is projected to peak at 2010, with slight declines predicted over the following decade. The production from CBNG activities is projected to peak at 2015, with slight declines predicted over the following decade. Therefore, from these sources, expected impacts would decrease slightly from 2015 to 2020. The coal mining sources would be the major contributors to PM_{10} and $PM_{2.5}$ impacts in the near-field between 2015 and 2020, and these impacts would result from the proximity of the receptors to the coal mining operations. If coal mines expand or relocate, those impacts likely would follow that development; however,

Table 4-14. Predicted Total Cumulative Change in Acid Neutralizing Capacity of Sensitive Lakes.

Location	Lake	Background ANC (µeq/L)	Area (hectares)	Base Year 2004 Change (percent)	2015 Lower Coal Development Scenario Change (percent)	2015 Upper Coal Development Scenario Change (percent)	Thresholds (percent)
Bridger Wilderness Area	Black Joe	67.0	890	4.00	4.11	4.11	10
	Deep	60.0	205	4.70	4.82	4.82	10
	Hobbs	70.0	293	3.95	4.03	4.03	10
	Upper Frozen	5.0	64.8	2.42	2.47	2.48	1[1]
Cloud Peak Wilderness Area	Emerald	55.3	293	5.24	5.97	6.02	10
	Florence	32.7	417	9.09	10.41	10.48	10
Fitzpatrick Wilderness Area	Ross	53.5	4,455	2.72	2.79	2.79	10
Popo Agie Wilderness Area	Lower Saddlebag	55.5	155	6.28	6.42	6.43	10

[1] Data for Upper Frozen Lake presented in changes in µeq/L rather than percent change. (For lakes with less than 25 µeq/L background ANC.)
Source: PRB Coal Review Task 3A Report (BLM 2008h)

the specific impacts would need to be addressed with a more refined modeling effort.

Power plants currently are the major contributors to all SO_2 impacts in the near-field in both states. However, the projected impacts are well below any ambient standard or PSD increment. According to the PRB Coal Review Air Quality modeling analysis, predicted future expansion modeled to the year 2020 should not jeopardize the attainment of those standards. Impacts on NO_2 concentrations are the result of emissions from all the source groups. No one source group dominates the NO_2 impacts in the near-field.

A pattern that is similar to the near-field receptors holds true for the Class I and sensitive Class II receptor groups. Essentially, the mine operations would continue to dominate the PM_{10} and $PM_{2.5}$ impacts, the power plants would continue to dominate the SO_2 impacts (although they would continue to be below the standards), and the overall source groups would continue to contribute to NO_2 impacts. Impacts should remain below the annual NO_2 standard for 2015 and 2020 in Wyoming and Montana. The 1-hour NO_2 Montana near-field impacts indicate potential exceedences.

Based on modeling results, one of lakes (Florence) in the Cloud Peak Class I area and one lake (Upper Frozen Lake) in the Bridger Class I area, exceeded the acid deposition thresholds for both the lower and upper coal production scenarios for 2015. With the exception of Florence and Upper Frozen lakes, the projected increases in coal development (and power plants) are not expected to raise the deposition levels above the thresholds, extended into 2020. The model results showed that the increased deposition, largely from SO_2 emissions from power plants, exceeded the thresholds of significance for the ANC at sensitive (high alpine) lakes. The results indicate that with increased growth in power plant operations, the reduced ANC of the sensitive lakes would need to be addressed carefully for each proposed major development project.

WDEQ/AQD and WDEQ/LQD mitigation and monitoring requirements for coal mine emissions are discussed in Sections 3.4.2.3 and 3.4.3.3. The discussion in these sections includes the operational control measures that are currently in place and would be required for mining operations on LBAs that are issued in the future, as well as measures that may be required to avoid future exceedances of the WAAQS and NAAQS and/or future mine-related impacts to the public.

4.2.4 Water Resources

Surface and groundwater are used extensively throughout the PRB for agricultural water supply, municipal water supply, and both domestic and industrial water supply. Surface water use is limited to major perennial drainages and agricultural areas within the basin are found mainly along these drainages. Municipal water supply comes from a combination of surface and

groundwater. Domestic and industrial water supply primarily is from groundwater.

The PRB Coal Review Task 1B Report (BLM 2006c) describes the existing water resource conditions in the PRB Task 1 study area (Figure 4-1). The Task 3B Report (BLM 2006d) provides an assessment of the cumulative impact to surface and ground water resources associated with future projected levels of coal mining, coal mine dewatering, CBNG groundwater withdrawal and surface disposal, and coal mine and conventional oil and gas surface disposal of groundwater in the Task 3 study area (Figure 4-4). The groundwater portion of the impact analysis has not yet been completed. The surface water analysis addresses the cumulative impacts to surface water quality and channel stability as a result of surface discharge of groundwater by CBNG development and coal mine dewatering. The surface water quality portion of this analysis has been completed, but the channel stability portion is not yet complete. The following discussion includes a summary of the results of the Task 1B Report and the Task 3B surface water quality impact analysis, including a recent channel stability study. The Task 3B groundwater impact analysis will be incorporated into future EIS analyses when completed.

4.2.4.1 Groundwater

There are five main aquifers in the PRB Coal Review Task 1 study area (Figure 4-1) that can be used for water supply:

- Madison Aquifer System;
- Dakota Aquifer System;
- Fox Hills/Lance Aquifer System;
- Fort Union/Wasatch Aquifer System; and
- Quaternary Alluvial Aquifer System.

The Fort Union/Wasatch Aquifer System includes the coal and overburden aquifers that are directly affected by surface coal mining and CBNG development. It is also a major source of local water supply for domestic and stock water use. Table 4-15 shows the recoverable groundwater in the components of the Fort Union/Wasatch Aquifer System. The volumes of recoverable groundwater from the sandstones within the Wasatch/Tongue River Aquifer, the Lebo Confining Layer, and the Tullock Aquifer were determined from the volume of sandstone in each of these units multiplied by the 13 percent specific yield value for sandstone. Similarly, the volume of recoverable groundwater from the coals within the Wasatch/Tongue River was calculated from the volume of coal multiplied by the 0.4 percent specific yield value for coal.

As a result of statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below.

Table 4-15. Recoverable Groundwater in the Fort Union/Wasatch Aquifer System.

Hydrogeologic Unit	Surface Area (acres)	Average Formation Thickness (ft)	Percentage of Sand/Coal	Average Sand/Coal Thickness (ft)	Specific Yield (percent)	Recoverable Groundwater (acre-feet)[1]
Wasatch-Tongue River Aquifer Sandstones	5,615,609	2,035	50.0	1,018	13.0	743,169,695
Wasatch-Tongue River Aquifer Coals	4,988,873	2,035	6.2	126	0.4	2,514,392
Lebo Confining Layer Sandstones	6,992,929	1,009	33.0	250	13.0	227,270,193
Tullock Aquifer Sandstones	7,999,682	1,110	52.0	430	13.0	447,182,224

[1] Calculated by multiplying Surface Area × Average Sand/Coal Thickness × Specific Yield. These numbers vary slightly from the numbers presented in Table 3-5 of the Final Environmental Impact Statement and Proposed Plan Amendment for the PRB Oil and Gas Project.
Source: BLM 2003

In 1987, the U.S. Geological Survey (USGS), in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of 1987) was published in 1988 in the USGS Water-Resources Investigation Report entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*", also known as the "USGS CHIA" (Martin et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS. The USGS CHIA analysis considered the proposed mining at the Antelope Mine. It did not evaluate potential groundwater impacts related to additional coal leasing in this area and it did not consider the potential for overlapping groundwater impacts from coal mining and CBNG development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If major amendments to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the six Wright Area Coal LBA tracts are leased to the respective applicants, the existing mining and reclamation permits for each current mine must be revised and approved to include the new lease before it can be mined.

The PRB Oil and Gas Project FEIS (BLM 2003) includes a modeling analysis of the groundwater impacts if an additional 39,000 new CBNG wells are drilled in the PRB by the end of 2011. The project area for this EIS, which covers all of Campbell, Sheridan, and Johnson counties, as well as the northern portion of Converse County, is similar to the study area for the PRB Coal Review Task 1 and Task 2 study area (Figure 4-1).

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ/LQD and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas.

The coal mine groundwater monitoring data are published each year by the Gillette Area Groundwater Monitoring Organization (GAGMO), a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, WDEQ, the Wyoming SEO, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. GAGMO also periodically publishes reports summarizing the water monitoring data collected since 1980 in the Wyoming PRB (e.g., Hydro-Engineering 1991, 1996, 2001, and 2007).

The major groundwater issues related to surface coal mining that have been identified are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with backfill material;
- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;
- the effects of the use of water from the subcoal Fort Union Formation by the mines;
- changes in water quality as a result of mining; and
- potential overlapping drawdown due to proximity of coal mining and CBNG development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

The effect of replacing the coal and overburden with backfill is the first major groundwater concern. The following discussion of recharge, movement, and

discharge of water in the backfill aquifer is excerpted from the USGS CHIA (Martin et al. 1988):

> Postmining recharge, movement, and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

Monitoring data verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991, 1996, 2001, and 2007). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 88 percent of the 51 backfill wells reported at that time (Hydro-Engineering 1991). In the GAGMO 20-year report, 79 percent of the 82 backfill wells measured contained water (Hydro-Engineering 2001). In the GAGMO 25-year report, 8.6 percent of the 101 backfill wells measured contained water (Hydro-Engineering 2007).

Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining the currently pending LBA tracts, including the six Wright Area Coal LBA tracts. Because the mined-out areas are being backfilled and the monitoring data demonstrate that recharge of the backfill is occurring, substantial additional impacts are not anticipated as a result of the pending leasing actions.

Scoria or clinker, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 4-5) and is believed to be the major recharge source for the backfill aquifer, just as it is for the coal. However, not all clinker is saturated. Some scoria is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the backfill aquifer is not being disturbed by current mining. Scoria occurs in very localized areas on only the North Hilight Field and North Porcupine LBA Tracts evaluated under Alternative 2, BLM preferred alternative tract configuration for each tract.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. In general, the saturated sand aquifers in the Wasatch Formation overburden have limited

extent and, as a result, the drawdowns in the Wasatch Formation are much smaller and cover much less area than the coal drawdowns. In this EIS, assessment of cumulative impacts to groundwater related to surface coal mining is based on impact predictions made by the Wright Area coal mines Those drawdowns are extrapolated to evaluate the potential impacts of mining of the North Hilight Field, South Hilight Field, West Hilight Field, North Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts. Figure 4-5 depicts the extrapolated extent of the 5-feet cumulative drawdown contour within the Wyodak coal aquifer resulting from the four mines (Jacobs Ranch, Black Thunder, North Antelope Rochelle, and Antelope) in the Wright subregion. The extent of the 5-feet drawdown contour is used by WDEQ/LQD to assess the cumulative extent of the impact to the groundwater system caused by mining operations.

The GAGMO 25-year report provides actual groundwater drawdown information after 25 years of mining (Hydro-Engineering 2007). Of the 530 monitoring wells included in the GAGMO 25-year report, 195 are completed in the coal beds and 193 are completed in the overlying sediments (which includes sand channels) or interburden between the coal beds at 16 active and proposed mine sites. The balance of the monitoring wells are completed in local alluvial aquifers or in strata below the lowest coal seam mined. Since 1996, some BLM monitor wells have been included in the GAGMO reports.

The USGS CHIA predicted the approximate area of 5 feet or more water level decline in the Wyodak coal aquifer which would result from “all anticipated coal mining”. “All anticipated coal mining” included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including the South Gillette and Wright Area coal mines, were considered in the USGS CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as 8 miles from mine pits, although the effects at that distance were predicted to be minimal.

As drawdown propagates to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of CBNG wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so it is unlikely that surface coal mining would cause adverse impacts to wells outside the immediate mine area.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 feet of a mine pit (Martin et al. 1988). Drawdown occurs farther from the mine pits in the coal than in the shallower aquifers

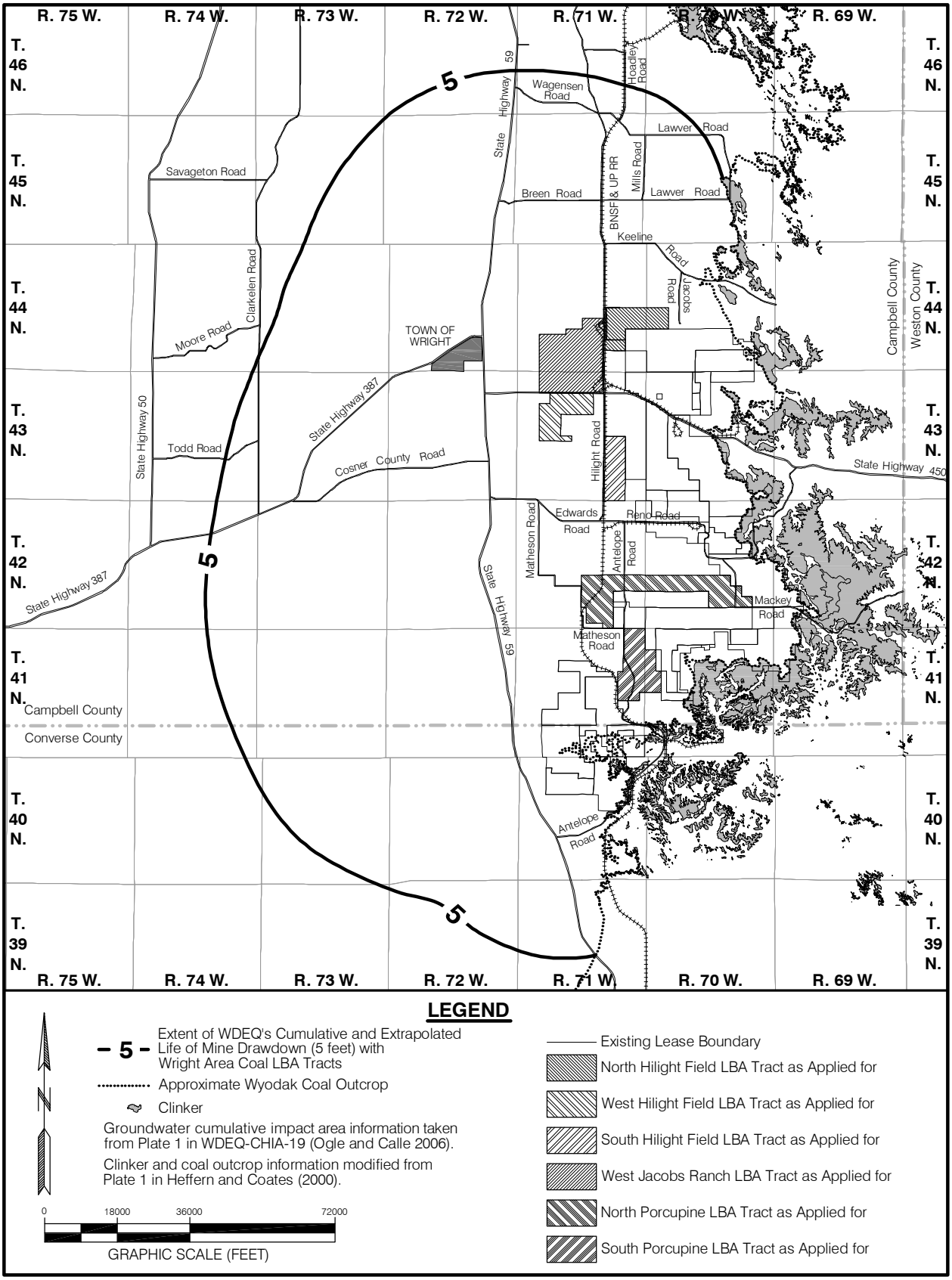


Figure 4-5. Extrapolated Extent of Life of Mine Cumulative Drawdown Within the Wyodak Coal Aquifer With the Addition of Wright Area Coal LBA Tracts.

because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-feet drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and often unconfined.

When the USGS CHIA was prepared, there were about 1,200 water supply wells within the maximum impact area defined in that study. Of those wells, about 580 were completed in Wasatch aquifers, about 100 in the Wyodak coal aquifer, and about 280 in strata below the coal. There were no completion data available for the remainder of the wells (about 240) at the time the USGS CHIA was prepared.

If the six Wright Area Coal LBA Tracts are leased and mined, the groundwater drawdown would be extended into the area surrounding the proposed new leases. When a lease is issued to an existing mine for a maintenance tract, the mine must revise its existing mining permit to include the new tract in its mine and reclamation plans. In order to do that, the lessee would be required to conduct a detailed groundwater analysis to predict the extent of drawdown in the coal and overburden aquifers caused by mining the new lease. WDEQ/LQD would use the revised drawdown predictions to update their cumulative hydrologic impact analysis (WDEQ CHIA) for this portion of the PRB. The applicant has installed monitoring wells that would be used to confirm or refute drawdown predicted by analysis. This analysis would be required as part of the WDEQ mine permitting procedure, which is discussed in Chapter 1 of this EIS.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the City of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within one mile of the pumped wells (Crist 1991, Martin et al. 1988). Most of the mines have water supply wells completed in zones below the lowest coal seam mined (e.g., subcoal Fort Union Formation and the underlying Lance-Fox Hills aquifer), but the mine facilities in the PRB are separated by a distance of one mile or more, so little interference between mine supply wells would be expected (refer to Section 3.5.1.2).

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM also commissioned a cumulative impact study of the subcoal Fort Union Formation to address the effects of mine facility wells on this aquifer (OSM 1984). Conclusions from these studies are similar and may be summarized as follows:

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.

- In the Gillette area, water levels in this aquifer have probably declined because the City of Gillette and several subdivisions have utilized water from the formation (Crist 1991). (Note: Gillette is mixing Fort Union Formation water with water from wells completed in the Madison Formation. Also, because drawdown has occurred, some operators are able to dispose of CBNG water by injecting it into the subcoal Fort Union Formation near the City of Gillette.)

- Because large saturated thicknesses are available (locally) in this aquifer unit, generally 500 feet or more, a drawdown of 100 to 200 feet in the vicinity of a pumped well would not dewater the aquifer.

Most of the existing coal mines in the PRB have permits from the Wyoming SEO for subcoal Fort Union Formation water supply wells. Four industrial water supply wells are completed in the Fort Union Formation and one industrial supply well is completed in the underlying Lance-Fox Hills aquifer within Black Thunder Mine's existing permit area. The Jacobs Ranch Mine uses five wells completed in the subcoal Fort Union Formation for industrial water supply. The North Antelope Rochelle Mine uses four wells completed in the subcoal Fort Union Formation and one well completed in the Lance-Fox Hills aquifer for industrial water supply. Locations of the three applicant mines' water supply wells are shown on Figures 3-20, 3-21, and 3-22, respectively. Extending the life of the three Wright Area coal mines by issuing new leases would result in additional water being withdrawn from the subcoal Fort Union Formation and Lance-Fox Hills aquifer systems, but no new subcoal water supply wells would be required. The additional water withdrawal would not be expected to extend the area of water level drawdown over a substantially larger area due to the discontinuous nature of the sands in the Tullock Member and the fact that drawdown and yield reach equilibrium in a well due to recharge effects. Due to the distances separating subcoal Fort Union Formation and Lance-Fox Hills aquifer wells used for mine water supply, these wells have not experienced interference and are not likely to in the future.

Water requirements and sources for proposed power plants are not currently known, however, there are no proposed power plants in the immediate vicinity of the three Wright Area coal mines. The Wyoming SEO is discouraging further development of the lower Fort Union Formation aquifers, so the most likely groundwater source for future power plants is the Lance-Fox Hills aquifer system. This would reduce the chances that the power plants would add to cumulative hydrologic impacts of mining and CBNG production.

The fourth issue of concern with respect to groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the backfill aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be higher in water

from backfill aquifers than in water from either the Wasatch Formation overburden or the Wyodak coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly from the overburden materials that were situated above the saturated zone in the premining environment.

One pore volume of water is the volume of water that would be required to saturate the backfill following reclamation. The time required for one pore volume of water to pass through the backfill aquifer is greater than the time required for the postmining groundwater system to reestablish equilibrium. According to the USGS CHIA, estimates of the time required to reestablish equilibrium range from tens to hundreds of years (Martin et al. 1988).

The major current use of water from the aquifers being replaced by the backfill (the Wasatch Formation overburden and Wyodak coal aquifers) is for livestock because these aquifers are typically too high in dissolved solids for domestic use and well yields are typically too low for irrigation (Martin et al. 1988). Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in backfill aquifers at 10 mines indicated that the quality of water in the backfill will, in general, meet the state standard for livestock use of 5,000 milligrams per liter (mg/L) for total dissolved solids (TDS) when recharge occurs (Martin et al. 1988).

The 2000 Annual GAGMO report (Hydro-Engineering 2001) evaluated samples from 48 backfill wells in 1999 and found that the TDS in 75 percent were less than 5,000 mg/L, TDS in 23 percent were between 5,000 and 10,000 mg/L, and TDS in one well was above 10,000 mg/L. An analysis of about 2,000 samples collected from 95 backfill monitoring wells between 1986 and 2002 found that the water quality in 75 percent of the wells were within the acceptable range for the Wyoming livestock standard, with 25 percent exceeding that standard (Ogle 2004).

WDEQ/LQD calculated a median TDS concentration of 3,293 mg/L for the backfill aquifer in the east-central area of the PRB, which includes the four mines located immediately south of Gillette, based on 1,384 samples (Ogle et al. 2005). These results suggest that the TDS in the backfill aquifer in the middle group of mines meets the requirements for livestock use and is similar to TDS found in the undisturbed Wasatch Formation overburden but typically larger than TDS found in the Wyodak coal aquifer. The 2005 Annual GAGMO report (Hydro-Engineering 2006) indicates that TDS concentrations in 2005 ranged from 656 mg/L at well RW2804 (at the Belle Ayr Mine) to 12,409 mg/L at well SP-4-NA (at the North Antelope Rochelle Mine). The GAGMO 25-Year Report (Hydro-Engineering 2007) reported samples collected from 57 backfill monitoring wells, and of the last samples that were collected from those wells in 2005, the TDS concentrations ranged from a low of 656 mg/L to and high of 12,409 mg/L, with an average of 3,800 mg/L and a median of 3,670 mg/L. WDEQ/LQD calculated a median TDS concentration of 3,670 mg/L based on 869 samples

collected from monitoring wells with at least 15 years of data that are completed in the backfill at the three applicant mines included in this analysis, and concluded that the recovered concentrations will be suitable for post-mining land use (Ogle and Calle 2006). The incremental effect on groundwater quality due to leasing and mining the six Wright Area Coal LBA Tracts would be to increase the total volume of backfill and, thus, the time for equilibrium to reestablish.

The fifth area of concern is the potential for cumulative impacts to groundwater resources due to the proximity of coal mining and CBNG development. The Wyodak coal is being developed by mining and CBNG production in the same general area. Dewatering activities associated with CBNG development have overlapped with and expanded the area of groundwater drawdown in the coal aquifer in the PRB over what would occur due to coal mining development alone, and this would be expected to continue.

Numerical groundwater flow modeling was used to predict the impacts of the cumulative stresses imposed by mining and CBNG development on the Fort Union Formation coal aquifer in the PRB Oil and Gas Project EIS (BLM 2003). Modeling was necessary because of the large areal extent, variability, and cumulative stresses imposed by mining and CBNG development on the Fort Union coal aquifers. Information from earlier studies was incorporated into the modeling effort for this analysis.

As expected, the modeling indicated that the groundwater impacts from CBNG development and surface coal mining would be additive in nature and that the addition of CBNG development would extend the area experiencing a loss in hydraulic head to the west of the mining area. The GAGMO 25-year Report stated that drawdowns in all areas have greatly increased due to the water production from the Wyodak coal aquifer by CBNG producers (Hydro-Engineering 2007).

Drawdowns in the coal caused by CBNG development would be expected to reduce the need for dewatering in advance of mining, which would be beneficial for mining operations. Wells completed in the coal may also experience increased methane emissions in areas of significant aquifer depressurization. There is a potential for conflicts to occur over who (coal mining or CBNG operators) is responsible for replacing or repairing private wells that are adversely affected by the drawdowns; however, the number of potentially affected wells completed in the coal is not large.

As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBNG development on water rights, a group of CBNG operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. All CBNG operators

on federal oil and gas leases are required to offer this water well agreement to the surface landowners (BLM 2003).

After CBNG development and coal mining projects are completed, it will take longer for groundwater levels to recover due to the overlapping drawdown impacts caused by the dewatering and depressuring of the coal aquifer by both operations.

4.2.4.2 Surface Water

For the PRB Coal Review Task 1B Report, which describes the baseline year (2003) water resource conditions including surface water use and surface water availability, the Wyoming PRB is divided into two major water planning areas: the Powder/Tongue River Basin and the Northeast Wyoming River Basins.

The main rivers in the Powder/Tongue River Basin are the Tongue River and the Powder River. The Powder/Tongue River Basin receives substantial surface water runoff from the Big Horn Mountains, leading to major agricultural development along drainages in the Tongue River and Powder River basins. Reservoirs are used throughout the basin for agricultural water supply and for municipal water supply in the Powder/Tongue River Basin. Water use in the Powder/Tongue River Basin as of 2002 is summarized in Table 4-16.

Table 4-16. Water Use as of 2002 in the Powder/Tongue River Basins.

	Dry Year		**Normal Year**		**Wet Year**	
	(acre-feet per year)					
Water Use Categories	**Surface Water**	**Ground-water**	**Surface Water**	**Ground-water**	**Surface Water**	**Ground-water**
Agricultural	178,000	200	184,000	200	194,000	300
Municipal	2,700	500	2,700	500	2,700	500
Domestic	---	4,400	---	4,400	---	4,400
Industrial[1]	---	68,000	---	68,000	---	68,000
Recreation			Non-consumptive			
Environmental			Non-consumptive			
Evaporation	11,300	--	11,300	--	11,300	--
Total	**192,000**	**73,100**	**198,000**	**73,100**	**208,000**	**73,200**

[1] Includes conventional oil and gas production water and CBNG production water.
Source: HKM Engineering et. al. 2002a

The Little Bighorn River, Tongue River, Powder River, Crazy Woman Creek, and Piney Creek carry the largest natural flows in the Powder/Tongue River Basin. Many of the other major drainages are affected by irrigation practices to the extent that their flows are not natural (HKM Engineering et al. 2002a). Water availability in the major sub-basins of the Powder/Tongue River Basin is summarized in Table 4-17. This table presents the amount of surface water in acre-feet that is physically available above and beyond allocated surface water in these drainages. As a result of the Yellowstone River Compact, Wyoming must share some of the physically available surface water in the Powder/Tongue River Basin with Montana.

Table 4-17. Surface Water Availability in the Powder/Tongue River Basins.

Sub-basin	Surface Water Availability (acre-feet per year) Wet Years	Normal Years	Dry Years
Little Bighorn River	152,000	113,000	81,000
Tongue River	473,000	326,000	218,000
Clear Creek	213,000	124,000	80,000
Crazy Woman Creek	69,000	32,000	16,000
Powder River	547,000	324,000	16,000
Little Powder River	48,000	12,000	3,000
Total	**1,502,000**	**931,000**	**414,000**

Source: HKM Engineering et al. 2002a

The main rivers in the Northeast Wyoming River Basins are the Belle Fourche in Campbell and Crook counties and the Cheyenne River in Converse, Weston, and Niobrara counties. Water in these rivers and their tributaries comes from groundwater baseline flow and from precipitation, especially from heavy storms during the summer months. Water use in the Northeast Wyoming River Basins as of 2002 is summarized in Table 4-18.

Table 4-18. Water Use as of 2002 in the Northeast Wyoming River Basins.

Water Use Categories	Dry Year (acre-feet per year) Surface Water	Ground-water	Normal Year Surface Water	Ground-water	Wet Year Surface Water	Ground-water
Agricultural	65,000	11,000	69,000	17,000	71,000	17,000
Municipal	---	9,100	---	9,100	---	9,100
Domestic	---	3,600	---	3,600	---	3,600
Industrial (Oil and Gas)[1]	---	46,000	---	46,000	---	46,000
Industrial (Other)[2]	---	4,700	---	4,700	---	4,700
Recreation			Non-consumptive			
Environmental			Non-consumptive			
Evaporation (Key Reservoirs)	14,000	---	14,000	---	14,000	---
Evaporation (Stock Ponds)	6,300	---	6,300	---	6,300	---
Total	**85,300**	**74,400**	**89,300**	**80,400**	**91,300**	**80,400**

[1] Includes conventional oil and gas production water and CBNG production water.
[2] Includes electricity generation, coal mining, and oil refining.
Source: HKM Engineering et al. 2002b

Stream flow in the major drainages of the Northeast Wyoming River Basins is much less than in the Powder/Tongue River Basin, due to the absence of a major mountain range to provide snow melt runoff. Water availability in the major sub-basins of the Northeast Wyoming Rivers Basin is summarized in Table 4-19.

Table 4-19. Surface Water Availability in the Northeast Wyoming River Basins.

Sub-basin	Surface Water Availability (acre-feet per year)		
	Wet Years	**Normal Years**	**Dry Years**
Redwater Creek	34,000	26,000	17,000
Beaver Creek	30,000	20,000	14,000
Cheyenne River	103,000	31,000	5,000
Belle Fourche River	151,000	71,000	13,000
Total	**318,000**	**148,000**	**49,000**

Source: HKM Engineering et al. 2002b

The portions of the PRB Coal Review Task 3B Report (BLM 2008i) that have been completed evaluate cumulative impacts to surface water quality as a result of CBNG, conventional oil and gas, and surface coal mining development in 2003, and projected development in 2010, 2015, and 2020 in the PRB Coal Review Task 3 study area (Figure 4-4). The surface water resources in the PRB Coal Review Task 3 study area consist primarily of intermittent and ephemeral streams and scattered ponds and reservoirs. A major impact of the projected development activities would be direct surface disturbance of these surface water features. Table 4-10 summarizes the cumulative baseline (2003) and projected (in 2010, 2015, and 2020) acres of surface disturbance and reclamation. The projected activities would result in surface disturbance in each of the six Task 3 study area subwatersheds (Figure 4-4). Discrete locations for development disturbance and reclamation areas cannot be determined based on existing information. However, the projected disturbance would primarily involve the construction of additional linear facilities, product gathering lines, and road systems associated with conventional oil and gas and CBNG activities, plus additional disturbance associated with extending coal mining operations onto lands adjacent to the existing mines.

Surface disturbing activities can result in sediment input to water bodies, which affects water quality parameters such as turbidity and bottom substrate composition. Contaminants also can be introduced into water bodies through chemical characteristics of the sediment. Studies have shown that TDS levels in streams near reclaimed coal mine areas have increased from one percent to seven percent (Martin et al. 1988). Typically, sedimentation effects are short-term in duration and localized in terms of the affected area. Suspended sediment concentrations would stabilize and return to typical background concentrations after construction or development activities have been completed. It is anticipated that sediment input associated with development disturbance areas would be minimized by implementation of appropriate erosion control measures, as would be determined during future permitting.

Future coal mining could remove intermittent or ephemeral streams and stock ponds in the Little Powder River, Upper Belle Fourche River, Upper Cheyenne River, and Antelope Creek subwatersheds. As discussed in Section 3.5.2, the Wright Area coal mines are in the Cheyenne River subwatershed. Coal mine

permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988).

Coal mining-related surface water would be discharged into intermittent and ephemeral streams in four subwatersheds (Antelope Creek, Little Powder River, Upper Belle Fourche River, and Upper Cheyenne River). Based on current trends, it is assumed that most, if not all, of the coal mine-produced water would be consumed during operation. As discussed in Section 3.5.2.2, changes in surface runoff would occur as a result of the destruction and reconstruction of drainage channels as mining progresses. Sediment control structures would be used to manage discharges of surface water from the mine permit areas. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards.

The PRB Coal Review assumes that future permitting would allow a portion of CBNG-produced water to be discharged to intermittent and ephemeral drainages as is currently allowed in the six subwatersheds in the PRB Coal Review Task 3 study area (Figure 4-4). It is estimated that up to 39,108, 41,899, and 37,390 mmgpy of water would be produced in 2010, 2015, and 2020, respectively.

The PRB Coal Review Task 3B surface water quality impact analysis utilizes the surface water model described in the Surface Water Quality Analysis Technical Report (Greystone 2003), which was prepared in support of the PRB Oil and Gas Project EIS (BLM 2003), to evaluate the cumulative impacts to surface water resources from surface discharge of CBNG development. Based on past monitoring in receiving streams, most CBNG discharge water either infiltrates or evaporates within a few miles of the discharge points and generally is not recorded at USGS Stream gauging stations. Impacts to surface water flow and quality are therefore generally limited to within a few miles of the discharge point. In view of this, the PRB Coal Review Task 3B water quality impact analysis assumes a conveyance loss of 70 percent for the water quality assessment and modeling analysis.

Key water quality parameters for predicting the potential effects of CBNG development in the surface water quality impact analysis focused on the suitability of surface water for irrigated agriculture. Sodium adsorption ratio, or SAR, and salinity, measured by electrical conductivity or EC, were utilized for this prediction. Most restrictive (MRPL) and least restrictive (LRPL) regulatory standards for EC and SAR applicable to the subwatersheds were developed and used in the analysis. The limits presented in Table 4-20 were used during the comparison of EC and SAR valued for resulting mixtures of existing streamflows and discharges from CBNG wells under various flow conditions and the CBNG water discharge projections for 2010, 2015, and 2020.

The impacts to water quality on the receiving drainages assumed two hydrologic conditions: dry year conditions and normal year conditions. The impact analysis, conducted using monthly flows, comparatively evaluated the water

Table 4-20. Summary of Proposed Limits for SAR and EC.

Subwatershed	Most Restrictive Proposed Limit (MRPL)		Least Restrictive Proposed Limit (LRPL)	
	SAR	EC (µS/cm)	SAR	EC (µS/cm)
Little Powder	5	2,000	9.75	2,500
Powder	2	2,000	9.75	2,500
Belle Fourche	6	2,000	10	2,500
Cheyenne, Antelope Creek	10	2,000	10	2,500

Source: Wyoming DEQ, Montana DEQ, and South Dakota Legislative Council

quality parameters (SAR and EC) of the receiving drainage before and after mixing with discharge water generated by the CBNG wells within that drainage. In general, the water discharged from the CBNG wells reflected increased levels of SAR and reduced levels of EC compared to the water quality of the receiving drainages. Impacts to water quality are likely to be maximized during the low flow months; consequently, the comparative evaluation of water quality also focused on the minimum monthly flow associated with the dry year and normal year conditions.

The water quality impact analysis made several observations regarding the overall effects of mixing CBNG well production water with surface water in the PRB Coal Review Task 3 study area. These general observations are summarized below.

Before mixing, the surface water in the Upper Powder River exceeds the MRPL for both EC and SAR throughout the majority of the year. Levels of SAR are less than the LRPL while EC values generally exceed the LRPL from July through December. After mixing, a minimal reduction in EC and a minor increase in SAR are projected, which reflects the relatively small contribution of CBNG well production water to the much larger flows in the Upper Powder River. Projected SAR values exceed the MRPL throughout the year while meeting the LRPL. Projected EC values exceed the MRPL throughout the majority of the year and the LRPL from July through December.

For Antelope Creek and the Dry Fork Cheyenne River under the before mixing scenario, the SAR values are relatively low and do not exceed the MRPL. The EC values exceed the MRPL during the low-flow months, but are typically less than the LRPL all year. After mixing, SAR levels increase but are projected to continue to meet the MRPL and a reduction in EC is projected that meets the MRPL throughout the year. This is a reflection of the lack of surface water in these streams combined with the relatively low values for EC and SAR in the CBNG well production water.

Before mixing, the surface water in the Little Powder River exceeds the MRPL for EC and SAR throughout the majority of the year. SAR levels remain below the LRPL throughout the year, but EC levels exceed the LRPL during the low flow months. After mixing, the projected SAR values exceed the MRPL throughout the year and exceed the LRPL from one month (in 2003) to five months (in 2010

and 2015) of the year. The projected EC exceeds the MRPL for four months of the year but meets the LRPL throughout the year.

For the Upper Cheyenne River before mixing, the SAR levels do not exceed the MRPL and the EC levels exceed the MRPL for eleven months of the year and the LRPL for nine months of the year. After mixing, the projected SAR levels continue to meet the MRPL throughout the year and the projected EC levels exceed the MRPL for 10 or more months of the year and the LRPL for six or more months of the year.

Before mixing, the surface water in the Upper Belle Fourche River exceeds the MRPL for SAR from November through January while meeting the LRPL throughout the year. The EC levels exceed the MRPL from September through January and exceed the LRPL from November through January. After mixing, the projected SAR values exceed the MRPL six or more months of the year while continuing to meet the LRPL throughout the year. The projected EC values meet the MRPL throughout the year.

The suitability of the mixed water for irrigation purposed is related to EC and SAR. In general, the water most suitable for irrigation has a relatively low SAR and a relatively high EC. Elevated SAR values may reduce permeability in clayey soils, which reduces the rate of water infiltration. As discussed above, the water discharged from the CBNG wells is generally characterized by higher levels of SAR and reduced levels of EC compared to the water quality of the receiving drainages. In those cases where mixing results in a significant increase in SAR and the EC is moderately low, the water was considered unsuitable. For Antelope Creek, the Dry Fork Cheyenne River, the Little Powder River and the Upper Belle Fourche River, the projected water quality after mixing demonstrated adequate suitability for irrigation during normal year conditions and unsuitability for irrigation during some to all of the irrigation season during dry year conditions. In general, for periods where CBNG well production water represents the majority of the flow available for irrigation purposes, there is a reduction in the suitability of the water for irrigation purposes.

4.2.5 Channel Stability

A qualitative assessment of the impacts to receiving drainages resulting from the introduction of CBNG well production water was made. The channel of the Belle Fourche River below Moorcroft would change by less than 0.2%, while the channel of the Little Powder River near Weston would change by less than 0.3% (Table 4-21). Given the low increase in mean annual discharge from introduced CBNG water, changes in channel geomorphology (width, depth, gradient, bed material transport and meander wavelength) are considered imperceptible.

Discharge of CBNG well production water into ephemeral drainages may start or exacerbate erosion in the channel. Given the potentially greater increase in ephemeral drainages due to a lower natural flow, channel geomorphology is more likely to be perceptible. Monitoring and mitigation for erosion are included

Table 4-21. Impact of CBNG Production Water on Perennial Streams.

Location	Channel Forming Discharge[1] (cfs)	CBNG Discharge		Estimated Width		Potential Impact [Increased Width]	
		(cfs)	(%)	Existing Conditions (ft)	Combined Discharge (ft)	(ft)	(%)
Little Powder River above Dry Creek near Weston, Wyoming (USGS Gage 06324970)	270 to 420	2.2	0.5% to 0.8%	47.3 to 56.3	47.4 to 56.4	0.15 to 0.12	0.3%
Belle Fourche River below Moorcroft, Wyoming (USGS Gage 06426500)	652 to 789	3.9	0.5% to 0.6%	66.9 to 72.1	67.0 to 72.2	0.16 to 0.14	0.2%

[1] Discharge associated with the 1.5 to 2 year recurrence interval.

in water management planning for oil and gas drilling approvals. According to the BLM Task 3B Report, a special study was done of the Caballo Creek drainage in the Belle Ayr mine permit area, to see how reclaimed drainages were impacted by increased CBNG discharges. It was determined that CBNG discharge represented less than 1% of the 2-year peak discharge. No active erosion was noted in the natural or diverted portions of the Caballo Creek channel, while an increase in vegetative diversity and density was noted. The minor amount of flow increase would not likely result in increased erosion in streams similar to Caballo Creek. While it is more likely that creeks with smaller drainage areas, like Duck Nest or Bone Pile Creeks may experience more erosion due to relatively larger flow increases due to CBNG discharge, such effects were not observed in the field (BLM 2008i).

4.2.6 Alluvial Valley Floors

The identified AVFs for all coal mines in the PRB Coal Review study area are described in the PRB Coal Review Task 1D Report (BLM 2005d), based on individual mine State Decision Documents. Regulatory determinations of AVF occurrence and location are completed as part of the permitting process for coal mining operations, because their presence can restrict mining activities under SMCRA and Wyoming laws. The WDEQ/LQD administers the AVF regulations for coal mining activities in Wyoming. Coal mine-related impacts to designated AVFs generally are not permitted if the AVF is determined to be significant to agriculture. If an AVF is determined not to be significant to agriculture or if the permit to affect the AVF was approved prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored to essential hydrologic function during reclamation.

The formal AVF designation and related regulatory programs described above are specific to coal mining operations; however, other development-related activities in the study area would potentially impact AVF resources. The

portions of the PRB Coal Review Task 3 study area that lie outside of the mine permit areas have generally not been surveyed for the presence of AVFs; therefore, the locations and extent of the AVFs outside of the mine permit areas have not been determined.

4.2.7 Soils

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to soils as a result of projected development activities in the PRB Coal Review Task 3 study area. The area of surface coal mining disturbance and reclamation for the baseline year (2003) and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Tables 4-2 and 4-3. The area of disturbance and reclamation for all development for the baseline year and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-10.

Development activities such as increased vehicle traffic, vegetation removal, soil salvage and redistribution, discharge of CBNG produced groundwater, and construction and maintenance of project-specific components (e.g., roads, ROWs, well pads, industrial sites, and associated ancillary facilities) would result in cumulative impacts to soils in the study area. In general, soil disturbance and handling from these activities would generate both long-term and short-term impacts to soil resources through accelerated wind or water erosion, declining soil quality factors, compaction, and the removal and replacement of soil resources at mining sites.

Of the types of development projects in the study area, coal mining activities would create the most concentrated cumulative impacts to soils. This is due to the large acreages involved and the tendency of mining operations to occur in contiguous blocks. These factors would encourage widespread accelerated wind and water erosion. Extensive soil handling would cause compaction and a corresponding loss of permeability to water and air; a decline in microbial populations, fertility, and organic matter; and potential mixing of saline and/or alkaline soil zones into seedbeds, which would reduce soil quality. There would be a limited availability of suitable soil resources for reclamation uses in some areas.

However, for surface coal mining operations, there are measures that are either routinely required or can be specifically required as necessary to reduce impacts to soil resources and to identify overburden material that may be unsuitable for use in reestablishing vegetation, as discussed in Sections 3.3.1.3, 3.4.2.3, and 3.8.3.

As described in Appendix E of the PRB Coal Review Task 2 Report (BLM 2005a), a variety of CBNG water disposal methods may be employed in the Task 3 study area. The potential impacts to soils would depend on the water treatment method, if any, and the nature of the disposal method. As discussed in the PRB Coal Review Task 3D Report (BLM 2005e), due to elevated SAR levels in water

produced from the Wyodak-Anderson coal zone in the Upper Powder River and Little Powder River subwatersheds, land applications of CBNG-produced water in those areas could increase soil alkalinity. As discussed above in Section 4.2.4.2, the SAR values are generally low for the Upper Belle Fourche subwatershed and tend to exceed the MRPL after mixing with discharged CBNG water during six months of the year while meeting the LRPL throughout the year. Land application of CBNG-produced water is not anticipated in this area. The specific approaches to CBNG water discharges, the resource conditions and locations in which they occur, the timing of discharges, and the discharge permit stipulations from regulatory and land management agencies would determine the extent and degree of potential impacts to soils.

4.2.8 Vegetation, Wetlands and Riparian Areas

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to vegetation, wetlands, and riparian areas as a result of projected development activities in the PRB Coal Review Task 3 study area. The area of surface coal mining disturbance and reclamation for the baseline year (2003) and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 related to surface coal mining are shown in Tables 4-2 and 4-3. For all projected development, the baseline year area of disturbance and reclamation and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-10.

4.2.8.1 Vegetation

The PRB is characterized as a mosaic of general vegetation types, which include prairie grasslands, shrublands, forested areas, and riparian areas. These broad categories often represent several vegetation types that are similar in terms of dominant species and ecological importance. Fourteen vegetation types were identified within the PRB Coal Review Task 1 study area, of which 10 primarily consist of native vegetation and are collectively classified as rangeland. These vegetation types include short-grass prairie, mixed-grass prairie, sagebrush shrubland, other shrubland, coniferous forest, aspen, forested riparian, shrubby riparian, herbaceous riparian, and wet meadow. The remaining vegetation types support limited or non-native vegetation and include cropland, urban/disturbed, barren, and open water. The vegetation types are described in more detail in the Task 1D Report for the PRB Coal Review (BLM 2005d).

Impacts to vegetation can be classified as short-term and long-term. Potential short-term impacts arise from the removal and disturbance of herbaceous species during a project's development and operation (e.g., coal mining, CBNG drilling and production, etc.), which would cease upon project completion and successful reclamation in a given area. Reclaimed mine land is defined by WDEQ/LQD as affected land that has been backfilled, graded, topsoiled, and permanently seeded in accordance with the approved practices specified in the reclamation plan (Christensen 2002). Species composition on the reclaimed lands may be different than on the surrounding undisturbed lands. The

removal of woody species would be considered a long-term impact since these species take approximately 25 years or longer to attain a size comparable to woody species present within proposed disturbance areas. Potential long-term impacts would also include permanent loss of vegetation and vegetative productivity in areas that would not be reclaimed in the near term (e.g., power plant sites, etc.).

4.2.8.2 Special Status Plant Species

Special status plant species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM Sensitive Species, USDA-FS Sensitive Species, and WGFD Species of Special Concern in Wyoming. Further discussions of species that are protected under the ESA, BLM Sensitive Species, and USDA-FS Sensitive Species are included in Appendices H and I of this EIS. One federally listed species (Ute ladies'-tresses orchid) and three USDA-FS sensitive species (Barr's milkvetch, Rosy palafox, and Lemonscent) are known to occur in the PRB Coal Review Task 3 study area. Three BLM sensitive species [Nelson's milkvetch and Laramie columbine (Casper Field Office) and William's wafer-parsnip (Buffalo Field Office) may occur in the PRB Coal Review Task 3 study area.

Potential direct impacts to special status plant species in the study area could include the incremental loss or alteration of potential or known habitat, associated with past and projected activities. Direct impacts also could include the direct loss of individual plants within the PRB Coal Review Task 3 study area, depending on their location in relation to development activities. Indirect impacts could occur due to increased dispersal and establishment of noxious weeds, which may result in the displacement of special status plant species in the long term.

4.2.8.3 Noxious and Invasive Weed Species

Once established, invasive and non-native plant species can out-compete and eventually replace native species, thereby reducing forage productivity and the overall vigor and diversity of existing native plant communities. The State of Wyoming has currently designated the following 25 plant species as noxious weeds:

- Field bindweed (*Convolvulus arvensis*)
- Canada thistle (*Cirsium arvense*)
- Leafy spurge (*Euphorbia esula*)
- Perennial sowthistle (*Sonchus arvensis*)
- Quackgrass (*Agropyron repens*)
- Hoary cress (*Cardaria draba*)
- Perennial pepperweed (giant whitetop) (*Lepidium latifolium*)
- Ox-eye daisy (*Chrysanthemum leucanthemum*)
- Skeletonleaf bursage (*Franseria discolor Nutt.*)

- Russian knapweed (*Centaurea repens L.*)
- Yellow toadflax (*Linaria vulgaris*)
- Dalmatian toadflax (*Linaria dalmatica*)
- Scotch thistle (*Onopordum acanthium*)
- Musk thistle (*Carduus nutans*)
- Common burdock (*Arctium minus*)
- Plumeless thistle (*Carduus acanthoides*)
- Dyers woad (*Isatis tinctoria*)
- Houndstongue (*Cynoglossum officinale*)
- Spotted knapweed (*Centaurea maculosa Lam.*)
- Diffuse knapweed (*Centaurea diffusa Lam.*)
- Purple loosestrife (*Lythrum salicaria L.*)
- Saltcedar (*Tamarix spp.*)
- Common St. Johnswort (*Hypericum perforatum*)
- Common Tansy (*Tanacetum vulgare*)
- Russian olive (Elaeagnus angustifolia L.)

Campbell County does not have a declared list of weeds.

Development-related construction and operation activities would potentially result in the dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, which would result in the displacement of native species and changes in species composition in the long term. The potential for these impacts would be higher in relation to the development of linear facilities (e.g., pipeline ROWs, oil- and gas-related road systems, etc.) than for site facilities (e.g., mines, power plants, etc.) due to the potential for dispersal of noxious weeds over a larger area.

Chapter 4, Section 2(d)(xiv) of the WDEQ/LQD rules and regulations requires that surface coal mines address weed control on reclaimed areas as follows:

> The operator must control and minimize the introduction of noxious weeds in accordance with Federal and State requirements until bond release.

Accordingly, the reclamation plans for all surface coal mines in the Wyoming PRB include steps to control invasion by weedy (invasive nonnative) plant species. As discussed in Chapter 3, Section 3.9.4, the Wright Area coal mines work with the Campbell County Weed and Pest Department and conduct an active noxious weed control program on their existing coal leases. Similar measures to identify and control noxious weeds are used at all of the surface coal mines in the Wyoming PRB as a result of the WDEQ/LQD regulatory requirements.

Mitigation to control invasion by noxious weeds for CBNG developers is determined on a site-specific basis and may include spraying herbicides before entering areas and washing vehicles before leaving infested areas. BLM reviews weed educational material during preconstruction on-site meetings with CBNG operators, subcontractors, and landowners. BLM also attaches this educational

information to approved Applications for Permit to Drill (APDs) or Plans of Development (PODs) (BLM 2003). BLM also participates in a collaborative effort with the South Goshen Cooperative Extension Conservation District, the USDA-Natural Resources Conservation Service (NRCS) , private surface owners, WGFD, and the Weed and Pest District in a prevention program that includes a long-term integrated weed management plan, public awareness and prevention programs, and a common inventory (BLM 2003).

4.2.8.4 Wetland and Riparian Species

Operations associated with development activities in the study area would result in the use of groundwater. Annually, during 2010-2020, from 30,000-35,000 mmgpy of CBNG-produced water would be discharged to impoundments or intermittent and ephemeral streams or reinjected. The discharge of produced water could result in the creation of wetlands in containment ponds, landscape depressions, and riparian areas along segments of drainages that previously supported upland vegetation. In addition, existing wetlands and riparian areas that would receive additional water would become more extensive and potentially support a greater diversity of wetland species in the long term. Alternately, the discharge of abnormally high flows or water with SARs of 13 or more could impact existing vegetation as discussed in the Task 1D Report for the PRB Coal Review (BLM 2005d). For agricultural uses, the current Wyoming water quality standard for SAR is 8.0 (WDEQ/WQD 2009). SARs of 5 to 10 have been observed in discharge waters in the study area (BLM 2003). Once water discharges have peaked and subsequently decrease in the long term, the extent of wetlands and riparian areas and species diversity would decrease accordingly. After the complete cessation of water discharges, artificially-created wetland and riparian areas once again would support upland species and previously existing wetland and riparian areas would decrease in areal extent.

4.2.9 Wildlife and Fisheries

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to wildlife as a result of projected development activities in the PRB Coal Review Task 3 study area. The area of habitat disturbance and reclamation related to surface coal mining for the baseline year (2003) and the projected cumulative areas of habitat disturbance and reclamation for 2010, 2015, and 2020 are shown in Tables 4-2 and 4-3. The baseline year area of total habitat disturbance and reclamation and the projected cumulative total areas of habitat disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-10.

Impacts to wildlife can be classified as short-term and long-term. Potential short-term impacts arise from habitat disturbance associated with a project's development and operation (e.g., coal mines, CBNG wells, etc.) and would cease upon project completion and successful reclamation in a given area. Potential long-term impacts consist of long-term or permanent changes to habitats and the wildlife populations that depend on those habitats, irrespective of

reclamation success, and habitat disturbance related to longer term projects (e.g., power plant facilities, rail lines, etc.). Direct impacts to wildlife populations as a result of development activities in the study area could include direct mortalities, habitat loss or alteration, habitat fragmentation, or animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

Habitat fragmentation from activities such as roads, well pads, mines, pipelines, and electrical power lines also can result in the direct loss of potential wildlife habitat. Other habitat fragmentation effects such as increased noise, elevated human presence, dispersal of noxious and invasive weed species, and dust deposition from unpaved road traffic can extend beyond the surface disturbance boundaries. These effects result in overall changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife populations, and changes in species composition. However, the severity of these effects on terrestrial wildlife would depend on factors such as sensitivity of the species, seasonal use, type and timing of project activities, and physical parameters (e.g., topography, cover, forage, and climate).

4.2.9.1 Game Species

Big game species that are present within the Task 3 study area include pronghorn, white-tailed deer, mule deer, and elk. Potential direct impacts to these species would include the incremental loss or alteration of potential forage and ground cover associated with construction and operation of the past, present and reasonably foreseeable future development discussed in Section 4.1. Development associated with coal mining, drilling for CBNG, ancillary facilities, agricultural operations, urban areas, and transportation and utility corridors result in vegetation removal. Assuming that adjacent habitats would be at or near carrying capacity and considering the variabilities associated with drought conditions and human activities in the study area, the PRB Coal Review Task 3D study concluded that displacement of wildlife species (e.g., big game) as a result of development activities would create some unquantifiable reduction in wildlife populations.

There are a number of big game habitat ranges within the PRB Coal Review Task 3 study area. In Wyoming, the WGFD and the BLM have established habitat classifications based on seasonal use. Classification types include crucial winter, severe winter, winter yearlong, and yearlong. Crucial winter range areas are considered essential in determining a game population's ability to maintain itself at a certain level over the long term. As discussed in the PRB Coal Review Task 2 Report, discrete locations for most of the disturbance related to the projected development could not be determined based on the available information. However, identified future coal reserves were used for the Task 3D Report to provide some level of quantification of potential future impacts to big game ranges. Tables 4-22 through 4-25 summarize the effects on pronghorn, deer, and elk game ranges as a result of the predicted lower and upper levels of coal production through 2020.

Direct and indirect effects to small game species (i.e., upland game birds, waterfowl, small game mammals) within the Task 3 study area as a result of development activities would be the same as discussed above for big game species. Impacts would result from the incremental surface disturbance of potential wildlife habitat, increased noise levels and human presence, dispersal of noxious and invasive weed species, and dust effects from unpaved road traffic.

Operations associated with development activities in the Task 3 study area would result in the use of groundwater. The PRB Coal Review assumes that most, if not all, of the coal mine-produced water would be consumed during operation and anticipates that up to approximately 39,108, 41,484, and 37,350 mmgpy of water would be produced in association with oil and gas production in

Table 4-22. Potential Cumulative Disturbance to Pronghorn Ranges from Development Activities—Lower and Upper Coal Production Scenarios (acres/percent affected).

Time Period/Scenario	Pronghorn Ranges[1]			
	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower	N/A	1,472 / 3%	33,196 / 2%	32,099 / 1%
2010/Upper	N/A	1,472 / 3%	34,760 / 2%	33,172 / 1%
2015/Lower	N/A	1,460 / 3%	32,649 / 2%	34,828 / 1%
2015 Upper	N/A	1,460 / 3%	34,177 / 2%	36,999 / 1%
2020/Lower	N/A	1,422 / 3%	33,637 / 2%	35,714 / 1%
2020/Upper	N/A	1,422 / 3%	33,580 / 2%	37,437 / 2%

1 Potential coal mine related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005e)

Table 4-23. Potential Cumulative Disturbance to White-tailed Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios (acres/percent affected).

Time Period/Scenario	White-tailed Deer Ranges[1]			
	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower	N/A	N/A	N/A	1,411 / 0.6%
2010/Upper	N/A	N/A	N/A	1,411 / 0.6%
2015/Lower	N/A	N/A	N/A	1,497 / 0.7%
2015 Upper	N/A	N/A	N/A	1,495 / 0.7%
2020/Lower	N/A	N/A	N/A	1,704 / 0.7%
2020/Upper	N/A	N/A	N/A	1,707 / 0.8%

1 Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005e)

Table 4-24. Potential Cumulative Disturbance to Mule Deer Ranges from Development Activities—Lower and Upper Coal Production Scenarios (acres/percent affected).

Time Period/Scenario	Mule Deer Ranges[1]			
	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower	N/A	N/A	6,808 / 0.4%	25,390 / 1%
2010/Upper	N/A	N/A	6,924 / 0.4%	26,641 / 1%
2015/Lower	N/A	N/A	6,956 / 0.4%	26,420 / 1%
2015 Upper	N/A	N/A	7,285 / 0.5%	27,205 / 1%
2020/Lower	N/A	N/A	6,958 / 0.4%	27,004 / 1%
2020/Upper	N/A	N/A	7,413 / 0.5%	27,990 / 1%

1 Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005e)

Table 4-25. Potential Cumulative Disturbance to Elk Ranges from Development Activities—Lower and Upper Coal Production Scenarios (acres/percent affected).

Time Period/Scenario	Elk Ranges[1]			
	Crucial Winter	Severe Winter	Winter Yearlong	Yearlong
2010/Lower	24 / 0.4%	N/A	375 / 1%	1,444 / 0.9%
2010/Upper	24 / 0.4%	N/A	375 / 1%	1,444 / 0.9%
2015/Lower	24 / 0.4%	N/A	351 / 1%	1,161 / 0.7%
2015 Upper	24 / 0.4%	N/A	351 / 1%	1,162 / 0.7%
2020/Lower	24 / 0.4%	N/A	351 / 1%	1,121 / 0.7%
2020/Upper	24 / 0.4%	N/A	351 / 1%	1,168 / 0.7%

1 Potential coal mine-related impacts to big game ranges were determined based on GIS information as follows: the total acres of a big game range (e.g., crucial winter, severe winter, winter yearlong, and yearlong) within the PRB Coal Review Task 3 study area was divided by the sum of the potential disturbance acreage for the time period (based on GIS mapping of coal reserves for the lower coal production scenario) and existing (2003) disturbance from coal mine development.

Source: PRB Coal Review Task 3D Report (BLM 2005e)

2010, 2015, and 2020, respectively. The portion of the water that is produced in association with the CBNG and discharged to impoundments or intermittent and ephemeral streams would be available for area wildlife (e.g., waterfowl). Although much of the water would evaporate or infiltrate into the ground, it is anticipated that substantial quantities of water would remain on the surface and would result in the expansion of wetlands, stock ponds, and reservoirs, potentially increasing waterfowl breeding and foraging habitats. The median sodium concentration of CBNG-produced water from the Fort Union Formation is 270 mg/L. If sodium concentrations are maintained below 17,000 mg/L in the evaporation ponds, the potential adverse effects to waterfowl would be minimal.

4.2.9.2 Non-game Species

Potential direct impacts to non-game species (e.g., small mammals, raptors, passerines, amphibians, and reptiles) would include the incremental loss or alteration of existing or potential foraging and breeding habitats from construction and operation of past, present and reasonably foreseeable future development activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts also could result in mortalities of less mobile species (e.g., small mammals, reptiles, amphibians, and invertebrates), nest or burrow abandonment, and loss of eggs or young in the path of vehicles and heavy equipment. Indirect impacts would include increased noise levels and human presence, dispersal and invasion of noxious weeds, and dust effects from unpaved road traffic. Assuming that adjacent habitats would be at or near carrying capacity, and considering variable factors such as drought conditions and human activities in the study area, the PRB Coal Review concluded that displacement of wildlife species from the Task 3 study area would result in an unquantifiable reduction in wildlife populations.

Numerous migratory bird species have been documented within the PRB over the last two to three decades of wildlife monitoring. Development activities that occur during the migratory bird breeding season (April 1 through July 31) could cause the abandonment of a nest site or territory or the loss of eggs or young, resulting in the loss of productivity for the breeding season. Loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of the Migratory Bird Treaty Act and could potentially affect populations of important migratory bird species that may occur in the PRB.

Breeding raptor species that occur within the Task 3 study area include the bald eagle, golden eagle, ferruginous hawk, red-tailed hawk, rough-legged hawk, Swainson's hawk, American kestrel, prairie falcon, northern harrier, great horned owl, short-eared owl, burrowing owl, and long-eared owl (*Asio otus*). Bald eagles and long-eared owls are rare nesters in the area.

One potential direct impact to raptors is habitat (nesting and foraging) loss due to additional surface disturbance within the Task 3 study area. In the event that development activities were to occur during the breeding season (February 1 through July 31), these activities could result in nest or territory abandonment, or loss of eggs or young. Such losses would reduce productivity for the affected species during that breeding season. As discussed above, loss of an active nest site, incubating adults, eggs, or young would not comply with the intent of several laws, including the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Additional direct impacts could result from construction of new overhead power lines in the region. New power line segments in the study area would incrementally increase the collision and/or electrocution potential for migrating and foraging bird species (e.g., raptors and waterfowl) (APLIC 1994). However,

the potential for avian collisions with overhead power lines is typically dependent on variables such as the location of the structures relative to high-use areas (e.g., nesting, foraging, staging, and roosting habitats), the orientation of the power line to flight patterns and movement corridors, species composition, line visibility, and structure design.

In addition, new power lines could pose an electrocution hazard for raptor species attempting to perch on the structure. Configurations greater than 69 kV typically do not present an electrocution potential, based on conductor placement and orientation (APLIC 2006). It is assumed that future permitting for power lines would require the use of appropriate raptor-deterring designs, thereby minimizing potential impacts. For example, SMCRA requires that surface coal mine operators use the best technology available to ensure that electric power lines are designed and constructed to minimize electrocution hazards to raptors. Power line impacts to raptors can be reduced with the increased use of underground power lines wherever possible. Many of the power lines for CBNG development currently are being constructed underground.

4.2.9.3 Fisheries

Potential cumulative effects on fisheries as a result of development activities in the Task 3 study area would be closely related to impacts on ground and surface water resources. In general, development activities could affect fish species in the following ways: 1) alteration or loss of habitat as a result of surface disturbance; 2) changes in water quality as a result of surface disturbance or introduction of contaminants into drainages; and 3) changes in available habitat as a result of water withdrawals or discharge. The potential effects of development activities on aquatic communities are discussed below for each of these impact topics.

The predominant aquatic habitat type in the Task 3 study area consists of intermittent and ephemeral streams and scattered ponds and reservoirs. In general, perennial streams within the study area are limited to the Little Powder River and Belle Fourche River. Warm water game fish and non-game species are present in some perennial stream segments and numerous scattered reservoirs and ponds. However, the latter features are typically stocked artificially either following construction or annually, depending on the depth of the water body. Due to the lack of constant water in most of the potentially affected streams and static water bodies, existing aquatic communities are mainly limited to invertebrates and algae that can persist in these types of habitats. The removal of stock ponds would eliminate habitat for invertebrates and possibly fish species. This loss would be temporary if the stock ponds are replaced during reclamation.

Development activities could result in the loss of aquatic habitat as a result of direct surface disturbance. Table 4-10 summarizes the cumulative acres of surface disturbance and reclamation as of 2003 and projects cumulative acres of surface disturbance and reclamation in 2010, 2015, and 2020. Discrete

locations for development disturbance and reclamation areas cannot be determined based on existing information. However, projected development that could result in the loss of aquatic habitat would involve the construction of additional linear facilities, product gathering lines and road systems associated with conventional oil and gas and CBNG activities, as well as any additional disturbance that would be associated with extending coal mine operations onto lands adjacent to the existing mines. The removal of aquatic habitat eliminates existing and potential habitat for invertebrates and some fish species. This loss would be temporary if such ponds are reconstructed and recharged as part of the reclamation process.

Projected activities would result in surface disturbance in each of the six Task 3 study area sub-watersheds. Information relative to the stream crossing locations for the majority of the linear facilities is not available at this time. The initial phases of the proposed Bison Pipeline project commenced in April 2008 and is projected to be completed by November 2010. If the project is constructed as planned, it would cross Cottonwood Creek, a tributary of the Little Powder River. Typically, the associated disturbance corridor would consist of a 100-foot-wide construction ROW; however, site-specific stream crossing methods and reclamation would be determined at the time of project permitting.

Future coal mining also could remove intermittent or ephemeral streams and stock ponds in the Antelope Creek, Upper Cheyenne River, Upper Belle Fourche River, and Little Powder River sub-watersheds. Coal mine permits provide for removal of first- through fourth-order drainages. During reclamation, third- and fourth-order drainages must be restored; first- and second-order drainages often are not replaced (Martin et al. 1988). As discussed in Section 3.5.2, the Cheyenne River and its tributaries drain the general Wright analysis area. All streams within the LBA tracts and adjacent applicant mine permit areas are typical for the region, in that flow events are ephemeral. Under natural conditions, aquatic habitat is limited by the ephemeral nature of surface waters in the general Wright analysis area. The results of fish surveys conducted in the Belle Fourche River, Caballo Creek, Antelope Creek, and various area stock ponds during baseline studies for the mines in the South Gillette and Wright subregions that started in the mid-1970s were discussed in Section 3.10.7.1; no uncommon species were documented during those efforts.

The PRB Coal Review assumes that surface disturbing activities would not be allowed in perennial stream segments or reservoirs on public lands that contain game fish species. It also assumes that other types of development operations would not occur within stream channels nor would they remove ponds or reservoirs as part of construction or operation and, therefore, would not result in the direct loss of habitat for these species.

Water quality parameters such as turbidity and bottom substrate composition can be impacted by surface disturbing activities through erosion of sediment into water bodies. Contaminants can also be introduced into those systems through the chemical characteristics of the eroded sediment. Potential related

effects on aquatic biota could include physiological stress, movement to avoid affected areas, or alterations of spawning or rearing areas (Waters 1995). Studies have shown that TDS levels in streams near reclaimed coal lands have increased from one percent to seven percent (Martin et al. 1988). Typically, sedimentation effects are short-term in duration and localized in terms of the affected area. TDS concentrations would stabilize and return to more typical concentrations after construction or development activities have been completed. The PRB Coal Review anticipated that the use of appropriate erosion and spill control measures during both development and reclamation activities, as determined during the permitting process, would minimize the introduction of additional sediments into the sub-watershed.

The removal of streamside vegetation would impact both riparian vegetation and stream parameters in those locations. Loss of vegetation along stream channels would reduce the shade and increase bank erosion, both of which would degrade aquatic habitats. Effects on aquatic habitats from linear projects, such as ROWs, would be limited to a relatively small portion of the stream (generally no more than 100 feet in width), whereas mine-related disturbance could affect considerably larger stretches. Because perennial streams are protected from development by a buffer zone on either side of center, these types of impacts would presumably be limited to intermittent and ephemeral creeks. It is anticipated that reclamation practices to restore riparian vegetation would be required during future project permitting, thereby minimizing such impacts.

CBNG and coal mining are the primary types of development activities that use or manage water as part of their operations. Based on current trends, the PRB Coal Review assumes that most, if not all, of the water produced during coal mining would be consumed during operation. As discussed in Section 3.5.2.2, changes in surface runoff characteristics and sediment discharges would occur during surface coal mining as a result of the destruction and reconstruction of drainage channels as mining progresses, and the use of sediment control structures to manage discharges of surface water from the mine permit area. State and federal regulations require treatment of surface runoff from mined lands to meet effluent standards. After treatment, coal mine-related surface water in the region would ultimately be discharged into intermittent and ephemeral streams in four sub-watersheds (Antelope Creek, Upper Cheyenne River, Belle Fourche River, and Little Powder River). The PRB Coal Review projects that up to approximately 39,108, 41,484, and 37,350 million gallons per year (mmgpy) of water would be produced in association with oil and gas production in 2010, 2015, and 2020, respectively, and assumes that a portion of the water that is produced in association with the CBNG would be discharged to intermittent and ephemeral drainages in the general analysis area, much as is currently allowed in the six sub-watersheds in the study area. Based on past monitoring in receiving streams, no change in surface flows would be expected beyond approximately two miles from the discharge points (BLM 2003). Water discharged from CBNG wells has supplied some drainages and water bodies in the PRB nearly continuously for several years. Within the general analysis area, Spring Creek has experienced an influx of CBNG water in recent years, but has

not become perennial. The same is true for other streams elsewhere in the PRB that receive CBNG discharge water.

4.2.9.4 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species (species that are protected under the ESA), BLM Sensitive Species, USFS Sensitive Species, and WGFD Species of Special Concern in Wyoming. Further discussions of species that are protected under the Endangered Species Act (ESA), as well as BLM and USFS Sensitive Species, are included in Appendices G and H, respectively, of this EIS. The USFWS also has a list of Migratory Bird Species of Management Concern in Wyoming, which is discussed in Section 3.10.6. Special status species potentially occurring in the Task 1 study area are identified in Section 2.4.3.5 of the PRB Coal Review Task 1D Report (BLM 2005d). Additional information about the occurrence of these species in the general Wright analysis area can be found in the Annual Wildlife Reports for the Black Thunder, Jacobs Ranch and North Antelope Rochelle mines, which are on file with the WDEQ/LQD in Cheyenne, Wyoming.

Potential impacts to special status terrestrial species would be similar to those discussed above for non-game wildlife (e.g., small mammals, birds, amphibians, and reptiles). Potential direct impacts would include the incremental loss or alteration of potential habitat (native vegetation and previously disturbed vegetation) from construction and operation of development activities (e.g., vegetation removal for coal mines and CBNG wells, ancillary facilities, and transportation and utility corridors). Impacts could also result in mortalities of less mobile species (e.g., small mammals, reptiles, and amphibians), nest or burrow abandonment, and loss of eggs or young in the path of vehicles and heavy equipment. Indirect impacts would include increased noise levels and human presence, introduction and dispersal of noxious weeds, and dust effects from unpaved road traffic.

In general, direct and indirect impacts to special status species would result in a reduction in habitat suitability and overall carrying capacity for species currently inhabiting the PRB Coal Review Task 3 study area. Development within potential habitat for special status species likely would decrease its overall suitability, and potentially would reduce or preclude use by some species due to increased activity and noise. Future use by a special status species of habitats subject to development would be strongly influenced by the quality and composition of remaining habitat, with the degree of impact dependent on variables such as breeding phenology, nest and den site preferences, the species' relative sensitivity to disturbance, and possibly the presence of visual barriers (e.g., topographic shielding) between nesting efforts and disturbance activities.

Bird species that have been identified as occurring within the PRB and are on two or more of the special status species lists include common loon, American

bittern, white-faced ibis, trumpeter swan, greater sandhill crane, mountain plover, upland sandpiper, long-billed curlew, black tern, yellow-billed cuckoo, Lewis' woodpecker, pygmy nuthatch, sage thrasher, loggerhead shrike, Baird's sparrow, sage sparrow, Brewers sparrow, and greater sage-grouse. Any development activities (oil and gas, coal mining, other operations and associated infrastructure) that occur during the breeding season (April 1 through July 31) could result in the abandonment of a nest site or territory, or the loss of eggs or young. As discussed previously, loss of an active nest site, incubating adults, eggs, or young as a result of any of these development activities would not comply with the intent of the Migratory Bird Treaty Act and could potentially impact populations of important migratory bird species that are known to or may occur in the PRB.

A number of raptor species have been documented in the PRB and are on two or more of the special status species lists including bald eagle, ferruginous hawk, northern goshawk, merlin, peregrine falcon, western burrowing owl, and short-eared owl. Those species that have been documented in the general Wright analysis area are discussed at length in Appendices G and H of this EIS. Potential direct impacts to raptors would result from the surface disturbance of nesting and foraging habitat, as well as injury or mortalities due to collisions with vehicles and equipment. Breeding raptors in or adjacent to development activities could abandon their nest sites or territories, or lose eggs or young. As previously described, such losses would constitute non-compliance with the intent of several laws including the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act, and could potentially affect populations of important migratory bird species that are known to or may occur within the region. Incremental construction of new overhead power lines in the area to support energy industries would increase risks of electrocution and collision for perching, migrating, and foraging bird species such as the larger raptors. Use of current APLIC guidelines for construction designs and retrofitting measures for new and existing utility structures would help mitigate these impacts.

A total of 239 greater sage-grouse strutting grounds (leks) were identified in the six sub-watersheds in the PRB Coal Review Task 3 study area as of 2003, though that study did not evaluate the status (i.e., active or inactive) of those leks. As discussed in Section 3.10.5 and in the PRB Coal Review Task 1D Report, the trend in the sage-grouse population for the Sheridan Region suggests about a 10-year cycle with periodic highs and lows. More recent population peaks have been lower than previous highs, suggesting a steadily declining sage-grouse population with the Sheridan Region (Oedekoven 2001). Direct and indirect impacts to sage-grouse as a result of development activities would result from the incremental surface disturbance of existing and potential habitat, increased levels of noise and human presence, introduction or dispersal of noxious and invasive weed species, and effects of dust from increased traffic on unpaved roads. In addition to disturbance-related impacts, sage-grouse are susceptible to infection with West Nile Virus, and the incidence of infection is much higher in northeastern Wyoming than the rest of the state.

As discussed in Section 3.10.5.1, ten sage-grouse leks have been documented within the six combined general analysis areas for the six LBA tracts analyzed in this EIS. Four of the leks have been active during recent survey years and are classified as occupied (Hansen Lakes, Payne, and Kort I and Kort II leks; Kort leks likely represent a shift in lekking activity rather than two distinct leks). Two of the leks have not been attended by displaying grouse for at least the last 10 years and are classified as unoccupied/abandoned (Butch and Wilson leks). There is insufficient data on two leks, therefore they have been classified as undetermined (Stuart I and Stuart II). Two leks have been eclipsed by mining activities at the adjacent Black Thunder and North Antelope Rochelle mines (Black Thunder and Rochelle leks, respectively).

The occupied leks, Hansen Lakes and Payne, are within the BLM study areas for the North Hilight Field and North Porcupine LBA Tracts, respectively, and are therefore likely to be directly impacted if these two tracts are leased and mined under the Proposed Action and/or Alternative 2, BLM's preferred alternative. The 3-mile radii of concern for the two other occupied leks (Kort I and Kort II leks, which are likely only one strutting ground that has been relocated slightly), overlap the North Porcupine LBA Tract. If the North Porcupine LBA Tracts as applied for and/or the additional areas evaluated by BLM under Alternative 2, the BLM's preferred alternative, is leased and mined, potential nesting habitat for grouse that were bred at the Kort I and II leks would likely be affected by mining activity in those areas.

Stuart II, one of the two undetermined leks, is within the West Hilight Field LBA Tract as applied for, and the 3-mile radii of both undetermined leks (Stuart I and Stuart II) overlap both the West Hilight Field and West Jacobs Ranch LBA Tracts as applied for. The 3-mile radius is the area in which two-thirds of the hens that were bred at those leks would be expected to nest. As previously discussed, the Stuart I and Stuart II leks are classified undetermined, but they are likely unoccupied/abandoned and will probably not be re-occupied in the near future due to the presence of nearby CBNG development activities and facilities. Therefore, if the West Hilight Field and West Jacobs Ranch LBA Tracts as applied for and the additional areas evaluated by BLM under Alternative 2 are leased and mined, it is unlikely that those two undetermined leks would be affected. However, as also previously discussed, no sage-grouse nests or broods have been recorded on any of the six LBA tracts as applied for or on lands added under Alternative 2, BLM's preferred alternative for each tract, during specific surveys or incidental to other wildlife surveys conducted in those areas annually since at least 1994. The noise associated with mining operations may disrupt sage-grouse breeding and nesting activities that might occur in those areas. Direct and indirect effects to greater sage-grouse within the general Wright analysis area as a result of development activities are outlined in Appendix H.

Based on existing information, the spatial relationship between projected future disturbance and reclamation areas for the coal production scenarios and the resource-specific information in the Geographic Information Systems (GIS) layers could not be determined for the PRB Coal Review. However, the analysis did use

GIS layers for future coal reserves to provide some quantification of potential future coal mining-related impacts to greater sage-grouse. The results of this analysis are summarized in Table 4-26. The difference in the number of lek sites that would occur within two miles of coal mining activities under the lower coal production scenario versus the upper coal production scenario is due to slight variations in the projected disturbance areas. An unquantifiable number of lek sites initially could be impacted by CBNG activity, which would occur in advance of coal mine development. Potential direct impacts to sage-grouse, if present, could include loss of foraging areas, abandonment of a lek site, or loss of eggs or young as a result of development activities.

Table 4-26. Potential Cumulative Impacts to Greater Sage-grouse Leks from Coal Mine Development - Upper and Lower Coal Production Scenarios.

Lek Categories	2010/ Lower	2010/ Upper	2015/ Lower	2015/ Upper	2020/ Lower	2020/ Upper
Number of Directly Affected Leks	10	10	15	15	15	15
Number of Leks within Two Miles of Coal Mining Activity	47	47	47	49	50	49

Source: PRB Coal Review Task 3D Report (BLM 2005e)

Seven special status fish species potentially occur in the PRB Coal Review Task 3 study area sub-watersheds: the flathead chub (*Platygobio gracilis*) (Antelope Creek, Upper Cheyenne River, and Little Powder River sub-watersheds), plains topminnow (*Fundulus sciadicus*) (Upper Cheyenne River), goldeye (*Hiodon alosoides*) (Little Powder River), lake chub (*Couesius plumbeus*) (Little Powder River), mountain sucker (*Catostomus platyrhynchus*) (Little Powder River), silvery minnow (*Hybognathus argyritis*) (Little Powder River), and plains minnow (Upper Cheyenne River, Upper Belle Fourche River, and Little Powder River). Potential impacts to special status fish species as a result of development activities would be similar to effects discussed above for fisheries. Surface disturbance in three sub-watersheds (Upper Cheyenne River, Upper Belle Fourche River, Little Powder River) could alter habitat or affect water quality conditions for special status fish species. Erosion control measures, as required by existing (2003) and future permits, and National Pollution Discharge Elimination System (NPDES) permit requirements would be implemented for each project. These efforts would help decrease disturbance-related sediment input into stream segments that may contain one or more of the special status fish species. Therefore, it is anticipated that impacts to special status fish species would be low.

4.2.10 Land Use and Recreation

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to land use and recreation as a result of projected development activities in the PRB Coal Review Task 3 study area (Figure 4-4). The baseline year (2003) area of disturbance and reclamation related to surface

coal mining and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Tables 4-2 and 4-3. Table 4-10 shows the total area of disturbance and reclamation for the baseline year and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020.

The PRB is a predominantly rural, wide open landscape. With little rainfall and limited alternative sources of water, the primary land use is grazing. Nevertheless, there is a range of other land uses. The major categories include agriculture, forested, mixed rangeland, urban, water, wetlands, coal mines, and barren land. The relative amounts of these lands in the PRB Coal Review Task 1 and Task 2 study area (Figure 4-1) is tabulated in Table 4-27.

Table 4-27. Land Use by Surface Ownership.

	Surface Ownership (acres)				Total	
Use Category	**BLM**	**USDA-FS**	**State**	**Private**	**Acres**	**Percent**
Agriculture	2,627	14,197	13,770	472,811	503,405	6.3
Barren	165	205	187	9,396	9,953	0.1
Forested	137,555	14,604	48,645	332,062	532,866	6.7
Mixed Rangeland	732,014	218,156	561,363	5,271,644	6,783,177	86.0
Urban	893	17	1,039	25,469	27,418	0.3
Water	35	73	334	4,773	5,215	<0.1
Wetlands	0	104	559	1,566	2,229	<0.1
Coal Mines	149	7,236	2,805	40,917	51,107	0.6
Total	**873,438**	**254,592**	**628,702**	**6,158,638**	**7,915,370**	**100.0**

Source: PRB Coal Review Task 1D Report (BLM 2005d)

A large part of the PRB consists of split estate lands (privately owned surface lands underlain by federally owned minerals). This results in conflicts between surface users, which are mainly ranching interests, and mineral developers. There also may be conflicts with some dispersed rural residences, although specific locations cannot be identified until development is proposed.

Much of the study area is also used for dispersed recreational activities such as hunting. The study area includes surface lands that are federally, state, and privately owned. With nearly 80 percent of the area privately owned, public lands provide important open space and recreation resources including both developed recreation facilities and areas to pursue dispersed recreation activities. The private sector contributes the elements of commercial recreation opportunities and tourism services such as motels and restaurants. Some private land owners also allow hunting with specific permission, sometimes for a fee.

4.2.10.1 Grazing and Agriculture

Potential impacts to grazing in the Task 3 study area as a result of development activities can be classified as short-term and long- term. Potential short-term impacts arise from:

- the temporary loss of forage as a result of vegetation removal/ disturbance;
- temporary loss of AUMs;
- temporary loss of water-related range improvements, such as improved springs, water pipelines, and stock ponds;
- temporary loss of other range improvements, such as fences and cattle guards; and
- restricted movement of livestock within an allotment due to the development and operation of projects like surface coal mines, which would cease after successful reclamation had been achieved and replacement of water-related and other range improvements had been completed.

The discharge of produced water could increase the availability of water to livestock, which may offset the temporary loss of water-related range improvements. Potential long-term impacts consist of permanent loss of forage and forage productivity in areas, such as power plants, that would not be reclaimed in the near term. Indirect impacts may include dispersal of noxious and invasive weed species within and beyond the surface disturbance boundaries, which decreases the amount of desirable forage available for livestock grazing in the long term.

Development activities could result in short- and long-term impacts to agricultural land, depending on their spatial relationship. Short-term impacts would include the loss of crop production during development and operational phases of the projects. Long-term impacts would result from the permanent loss of agricultural land due the development of permanent facilities such as power plants and railroads.

Table 4-28 contains an estimate of the number of AUMs unavailable on lands disturbed and not yet reclaimed through 2020 for the high and low levels of predicted development activity, along with the acreage of cropland estimated to be affected.

Table 4-28. AUMs and Acres of Cropland Estimated Unavailable on Lands Disturbed and Not Yet Reclaimed as a Result of Development Activities.

Category	2003/ Baseline	2010/ Lower	2010/ Upper	2015/ Lower	2015/ Upper	2020/ Lower	2020/ Upper
Unavailable AUMs[1]	18,150	22,467	22,792	23,245	23,761	22,514	23,333
Unavailable Crop Land (acres)	48	59	60	134	139	206	289

[1] Based on an average stocking rate of six acres per AUM.
Source: PRB Coal Review Task 3D Report (BLM 2005e)

4.2.10.2 Urban Use

It is expected that there would be additional expansion of urban residential and commercial development as a result of the projected 48 percent growth in population (between 2003 and 2020) in Campbell County. Section 4.2.12 and the Task 3C Report of the PRB Coal Review (BLM 2005f) contain additional information on employment and population issues in the study area. A majority of the new urban development would be expected to occur adjacent to existing communities, primarily Gillette, which accounts for approximately 60 percent of the Campbell County population and, to a lesser extent, Wright and other small communities. Most of this development would occur on land that is currently in use for grazing or agriculture.

4.2.10.3 Recreation

Accessible public lands provide diverse opportunities for recreation, including hunting, fishing, ORV use, sightseeing, and wildlife observation. The National System of Public Lands generally provides dispersed recreational uses in the study area. Some developed recreational facilities occur in special management areas, including recreation areas. While opportunities are available on public lands throughout the PRB, the majority of dispersed recreational uses occur in the western part of the PRB Coal Review Task 1 and Task 2 study area, including the South Big Horn Mountains area and along the Powder River. Public lands elsewhere consist mainly of isolated tracts of land that are too small to provide a quality recreational experience. Larger parcels of public lands occur in the southwest part of Johnson County and along the Powder River (administered by BLM) and in the Thunder Basin National Grassland (administered by the USFS). Public lands are accessible via public roads or across private land with the landowner's permission.

Hunting is a major recreation use of state and federal lands in the study area. Various big game and upland game bird species are hunted in the region. Fishing is a popular year-round activity for residents of the study area.

Mule deer and pronghorn hunting are by far the most popular hunting activities in the Task 1 study area, accounting for 35,529 and 21,304 hunter days, respectively, in 2003 (Stratham 2005). The next highest were cottontail rabbit (2,348 hunter days) and elk (2,055 hunter days), followed by wild turkey (1,019), sharp-tailed grouse (508), and sage-grouse (38). Consistent trends in hunter activity over the past decade are not discernible from the WGFD data considered in the PRB Coal Review. All of the most prominent species hunted in the study area have had high years and low years. Pronghorn hunting, for example, was greatest from 1993 to 1996, while elk hunting was at its peak in 2001 and 2002. Mule deer hunting has been the most consistent, ranging from a low of 28,311 hunter days in 1996 to a high of 37,307 hunter days in 2002.

ORV use in the Task 1 study area is available on most BLM-managed lands. Most of the public land in Johnson, Sheridan, and Campbell counties has been

inventoried and designated as open, limited, or closed to ORV use. For the baseline year, approximately 20,386 acres were open to unlimited vehicle travel on and off roads. There were 4,680 acres in the area that were closed to all ORV use and approximately 867,534 acres were available for limited use. Limited use typically means ORVs are restricted to existing roads and vehicle routes.

Recreational use of public lands in the Task 1 study area has increased substantially over the past two decades, and is expected to continue to increase by about five percent every 5 years for most recreational activities (BLM 2003). Total visitor use by residents and nonresident visitors in Campbell and Converse counties in 1980 was projected at 1,276,000 visitor days (BLM 1979). The total visitor days of 1,881,763 estimated for 1990 was approximately 47 percent higher than the 1980 visitor days (BLM 2001a). Fewer than three percent of visitor days were estimated to occur on public lands.

Few, if any, of the developed recreation sites in the PRB Coal Review Task 3 study area would be affected by development related disturbance. As most of the projected disturbance area would occur on privately owned surface land, the extent of effects on dispersed recreation activities largely would depend on whether the disturbance areas had been open to public or private lease hunting. It is projected that cumulative development activities, especially the dispersed development of CBNG and, to a lesser extent, conventional oil and gas, would tend to exacerbate the trend toward a reduction in private land available for public hunting, which has been observed by WGFD in recent years (Shorma 2005). A reduction in available private land for dispersed recreation would contrast with the anticipated increase in demand for recreational opportunities and would tend to push more recreationists toward public lands where the BLM has projected a five percent increase in use every 5 years (BLM 2001a). After coal- and oil and gas-related development activities have been completed and the disturbed areas have been reclaimed, many of the adverse effects on dispersed recreation activities would be reduced.

It is expected that the development activities also would tend to expand and exacerbate the qualitative degradation of the dispersed recreation experience, in general, and of the hunting experience, in particular, as reported by the WGFD (Jahnke 2005). As noted in the Task 1D Report of the PRB Coal Review (BLM 2005d), reductions in land available for hunting also make herd management more difficult for the WGFD and reduce its hunting-derived revenues (Shorma 2005).

No direct effects on wilderness or roadless areas would be expected from the projected development activities. There are no designated wilderness areas in the study area, and mineral development would not be permitted in the Fortification Creek Wilderness Study Area until and unless Congress acts to remove it from Wilderness consideration.

There would be no effects on Wild and Scenic Rivers as the only river segment identified as both "eligible" and "suitable" in the Task 1D Report of the PRB Coal Review is not in the PRB Coal Review Task 3 study area.

4.2.11 Cultural Resources and Native American Concerns

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to cultural resources as a result of projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation related to surface coal mining and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Tables 4-2 and 4-3. Table 4-10 shows the total area of disturbance and reclamation for the baseline year and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020.

Cultural sites occur throughout the study area. Surface disturbing activities can result in the loss or destruction of these sites. Table 4-29 contains an estimate of the amount of projected disturbance through 2020 for the projected lower and upper levels of coal development activity, along with the number of cultural sites estimated to be affected. The sites fall into two categories; prehistoric sites and historic sites, as described below. Also below are description of Native American traditional cultural places and a summary of the program to protect sites in any of these categories.

4.2.11.1 Prehistoric Sites

All recognized prehistoric cultural periods, from Clovis through Protohistoric (about 11,500 to 200 years ago), are represented in the PRB Coal Review study area (see Section 3.12 for additional discussion about the prehistoric cultural periods.) The earliest prehistoric cultural periods, Paleoindian through Early Plains Archaic, are represented by only a small number of sites. Archaic and later prehistoric period sites (Archaic to Protohistoric) are represented in increasing numbers as a result of higher populations through time and better preservation of more recent sites. Important prehistoric site types in the region include artifact scatters, campsites, stone circles, faunal kill and processing sites, rock alignments and cairns, and stone material procurement areas.

Artifact scatters dominate prehistoric sites in the study area. When there is adequate information to evaluate these types of sites, most are not eligible to the NRHP. However, complex sites and sites with buried and dateable material can yield important information and are often field evaluated as eligible. The proportion of unevaluated sites is lower in the subwatersheds in which more studies and more follow-up studies have been conducted, such as Antelope Creek, Upper Cheyenne River, and Upper Belle Fourche River. Some portions of some of the subwatersheds which have more varied habitats or conditions more conducive to preservation are very rich in significant prehistoric sites. Within the PRB Coal Review Task 3 study area, these areas include the lower Antelope

Table 4-29. Square Miles of Projected Cumulative Disturbance and Number of Potentially Affected Cultural Resource Sites in the PRB Coal Review Task 3 Study Area – Lower and Upper Coal Production Scenarios.

		Lower Coal Production Scenario						Upper Coal Production Scenario					
		Year 2010		Year 2015		Year 2020		Year 2010		Year 2015		Year 2020	
Sub-watershed	**Average Number of Sites per Square Mile[1]**	**Square Miles[2]**	**Sites[3]**	**Square Miles[2]**	**Sites[3]**	**Square Miles[2]**	**Sites[3]**	**Square Miles[2]**	**Sites[3]**	**Square Miles[2]**	**Sites[3]**	**Square Miles[2]**	**Sites[3]**
Antelope Creek	4.7	74	346	97	484	122	608	75	376	99	496	126	629
Dry Fork Cheyenne River	8.9	8.3	74	12	109	17	151	8.3	74	12	109	17	151
Little Powder River	4.6	90	415	108	495	123	567	91	419	109	502	125	577
Upper Belle Fourche River	4.3	164	704	186	801	209	899	166	713	192	824	219	940
Upper Cheyenne River	5.2	60	314	72	375	83	433	62	321	74	387	85	445
Upper Powder River	5.0	135	674	190	953	232	1,159	135	674	191	953	232	1,159
Total		**531**	**2,527**	**665**	**3,217**	**786**	**3,817**	**537**	**2,577**	**677**	**3,271**	**804**	**3,901**

1 Average number of sites per square mile based on previous surveys in the study area.
2 Calculated, based on database disturbance acreages prepared for the Task 2 Report for the PRB Coal Review, Past and Present and Reasonably Foreseeable Development Activities (Appendices A and D) (BLM 2005a).
3 The number of sites was calculated by multiplying the average density of known cultural sites per square mile (based on previous surveys) by the number of square miles of projected cumulative disturbance.
Source: Task 3D Report for the PRB Coal Review Cumulative Environmental Effects (BLM 2005e)

Creek drainage and eastern portions of the Upper Belle Fourche River. While prehistoric sites do exist in the general Wright analysis area, it does not appear to be particularly plentiful in significant prehistoric sites. More detailed information on the known cultural sites that are present in the PRB based on the existing surveys is included in the Task 1D Report for the PRB Coal Review (BLM 2005d).

4.2.11.2 Historic Sites

In the PRB region, sites are documented within the broad contexts of Rural Settlement, Urban Settlement, Mining, Transportation, Military, Exploration, and Communication. Each of these site categories and the types of sites they include are detailed in the Task 1D Report for the PRB Coal Review (BLM 2005d). Evaluation of the importance of historic sites, districts, and landscapes must consider aspects of both theme and period in assessing the historic character and contributing attributes of the resources.

4.2.11.3 Native American Traditional Cultural Places

General ethnographies of the tribes that may have had traditional ties to this region do not provide information on specific resources in the study area that are likely to be traditional cultural concerns because these resources are considered confidential by the tribes. Within this region, there are prominent and identifiable places such as the Medicine Wheel to the west in the Big Horn Mountains and Devils Tower to the east in the Black Hills area. These known sites offer some indication of the types of places valued by the Plains horse cultures in the historic period. Any identification of sacred or traditional localities must be verified in consultation with authorized tribal representatives.

4.2.11.4 Site Protection

At the time an individual project is permitted, the development activities considered in this study would be subject to the following regulations relative to cultural resources. Section 106 of the National Historic Preservation Act of 1966 as amended, its implementing regulations (including but not limited to 36 CFR 800, 36 CFR 61, and Executive Order 11593), and NEPA and its implementing regulations, including 40 CFR 1500 - 1508, provide the legal environment for documentation, evaluation, and protection of historic properties (i.e., cultural resources eligible for inclusion on the National Register of Historic Places) that may be affected by development activities. In cases of split estate (where surface ownership and mineral ownership differ), surface resources, such as cultural sites, belong to the surface owner. The surface owner must be consulted about investigation, mitigation, or monitoring.

4.2.12 Transportation and Utilities

The PRB Coal Review Task 3D Report (BLM 2005e) discusses potential cumulative impacts to transportation and utilities systems as a result of

projected development activities in the PRB Coal Review Task 3 study area. The baseline year (2003) area of disturbance and reclamation related to surface coal mining and the projected cumulative areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Tables 4-2 and 4-3. The total area of disturbance and reclamation for the baseline year and the projected cumulative total areas of disturbance and reclamation for 2010, 2015, and 2020 are shown in Table 4-10.

Generally, transportation systems in the study area would not be directly affected by the disturbance associated with projected development. Site-specific instances of disturbance may require that segments of highways, pipelines, transmission lines, or railroads be moved to accommodate expansion of certain coal mines. In such cases, the agencies authorized to regulate such actions would have to approve any proposal to move any segments of any transportation systems and construction of alternative routing would be required prior to closing existing links so that any disruptive effects on transportation systems would be minimized.

The coal mines in the North Gillette subregion currently ship most of their coal via the east-west BNSF rail line through Gillette. That subregion produced 55 mmtpy in the baseline year (2003), which was just 22 percent of the estimated 250 mmtpy capacity of the BNSF rail line (BLM 2005a). The coal mines in the South Gillette and Wright subregions produced approximately 308 mmtpy in 2003, which was 88 percent of the estimated 350 mmtpy capacity of the joint BNSF & UP line serving those areas in the baseline year.

Potential effects of development activities on transportation and utilities may be either short- or long-term in nature, varying with the type of development. A power plant or an urban community development would be considered long-term, and the demand for transmission line capacity would be virtually permanent, lasting for the economic life of the activity. The effects of coal production and the related demand for rail capacity would vary with market changes. In recent years, coal production has been increasing and the PRB Coal Review projects that the trend would continue, as shown in Tables 4-2 and 4-3. Similarly, the demand for pipeline capacity would vary with market conditions as well as with the rate of depletion of the oil or gas resource.

Potential direct effects of projected development on roads and highways would include increased vehicular traffic and risk of traffic accidents on existing roadways in the PRB Coal Review Task 3 study area from daily travel by workers and their families. Indirect effects would include increased wear and tear on existing roads, additional air emissions from vehicles, additional fugitive dust from roads, noise, increased potential access to remote areas, and an increased risk of vehicle collisions with livestock and wildlife. Direct effects on railroads, pipelines, and transmission lines primarily would include increased demand for capacity to move coal, oil and gas, and electricity from production locations in the study area to markets outside the area. Indirect effects would include potential impacts of the accumulation of coal dust and fines blowing or sifting

from moving, loaded rail cars. The PRB Coal Review Task 3D Report does not discuss the cumulative effects of coal dust resulting from the transport of coal along rail lines.

The socioeconomic analysis conducted as a part of Task 3C of the PRB Coal Review projects a population increase of approximately 48 percent between 2003 and 2020 in Campbell County under the upper coal production scenario (BLM 2005f). Campbell County accounts for most of the population in the PRB Coal Review Task 3 study area. Based on traffic studies conducted independently of the PRB Coal Review, vehicle miles traveled tend to increase at or above the rate of population growth. Consequently, highway traffic would be expected to increase by at least 48 percent by 2020. Approximately 60 percent of the population growth would occur in or near Gillette, which would indicate that the same proportion of traffic would originate in the Gillette area. The remainder of the traffic growth would be dispersed throughout the study area. Under this scenario, the greatest impact on traffic would occur in the Gillette area, where existing traffic volume to capacity ratios are highest. The increased traffic would be expected to cause delays in the Gillette area and might require widening of some streets and roads or other measures to increase traffic capacity. It is anticipated that there would be an increase in the risk of traffic accidents approximately proportional to the increase in traffic. Highway capacity on major routes away from Gillette would be expected to be sufficient to accommodate the growth without substantial constraints.

Existing rail lines, together with proposed upgrades on the joint BNSF & UP line, would be expected to accommodate the projected coal transportation traffic through 2015 (Table 4-30). The PRB Coal Review Task 2 Report (BLM 2005a) projects that the proposed DM&E line would be built and operational by 2015 (pending completion of additional environmental analysis), which would add 100 mmtpy in additional shipping capacity for the South Gillette and Wright subregions. A collaborative effort between the National Coal Transportation Association, the mines, and the BNSF and UP Railroads is resulting in measures to reduce coal dust emissions from loaded, moving rail cars.

The Task 2 Report for the PRB Coal Review projected that basin-wide production of CBNG could potentially double by 2020, which would suggest that additional pipelines could be built. One potential additional pipeline (Bison Project) was identified for completion by November 2010. The filing for this project was made with Federal Energy Regulatory Commission (FERC) on June 2, 2008. Other potential projects are discussed in Section 4.1.2.3.1 was (Bison Pipeline 2008).

An estimated 1,700 MW of new power production capacity is anticipated in the cumulative effects area by 2020. This level of production would require construction of additional transmission line capacity. It is assumed that new transmission lines would be constructed to connect new power plants to the grid.

Table 4-30. PRB Rail Lines Coal Hauling Capacity and Projected Use.

Rail Line	2010 Projected			2015 Projected			2020 Projected		
	2010 Capacity	Rail Use Increase[1]		2015 Capacity	Rail Use Increase[1]		2020 Capacity	Rail Use Increase[1]	
	mmtpy	mmtpy	%	mmtpy	mmtpy	%	mmtpy	mmtpy	%
North BNSF	250	62-78	25-31	250	74-104	30-42	250	78-121	31-48
South BNSF & UP	400	349-401	87-100	500	393-439[2]	79-88[2]	500	417-455[2]	83-91[2]
DM&E	0	0	0	-[2]	-[3]	-[3]	-[2]	-[3]	-[3]

[1] The range of increase in use shown for each year reflects the increases that are projected for the Lower and Upper Coal Production Scenarios, respectively.
[2] The DM&E is assumed to be built and operational by 2015, adding 100 mmtpy of capacity for the mines served by the BNSF & UP South line.
[3] The BNSF & UP South figures represent the projected combined traffic and percent capacity on the BNSF & UP South line and the projected DM&E line.
Source: PRB Coal Review Task 3D Report (BLM 2005e)

4.2.13 Socioeconomics

The cumulative socioeconomic impact analysis focuses on Campbell County, but also considers Converse, Crook, Johnson, Sheridan, and Weston counties as directly affected and Niobrara and Natrona counties as indirectly affected. Recent and projected socioeconomic conditions are described in more detail in the Task 1C and 3C reports for the PRB Coal Review (BLM 2005c and 2005f).

REMI Policy Insight (REMI), a professionally recognized regional economic model, was used to develop the cumulative employment and population projections presented below. The version of the REMI model for the Coal Review was comprised of two economic regions: one being Campbell County alone, the second composed of those Wyoming counties bordering Campbell County and linked to its economy by established industrial and consumer trade linkages and by work force commuting patterns. Results for the second region were analyzed to focus on the five counties, Converse, Crook, Johnson, Sheridan, and Weston, that are the most directly linked. Collectively, these five counties are referred to in the PRB Coal Review Task 3C Report (BLM 2005f) as the surrounding counties. Additional analysis was undertaken to translate the population and employment forecasts for each of the surrounding counties into housing needs and to project future school enrollment.

During the 1970s and early 1980s, the PRB emerged as a major coal producing region. Federal coal leasing has been a high profile activity because over 90 percent of the coal resources in the PRB are federally owned. The surface coal mines that developed during the 1970s and early 1980s are now mature operations, providing a stable economic and social foundation for the region. While energy development has produced periodic surges in population, followed occasionally by population declines in some communities, the growth in domestic energy consumption, coupled with the PRB's vast energy resource base, has resulted in a 50-year growth trend in the region without the severe

economic dislocations that have characterized other western U.S. resource booms.

This period of extended energy development has been accompanied by substantial economic changes and benefits, including economic growth, employment opportunity, tax revenue growth, and infrastructure development for local governments, both locally and across Wyoming, funded by tax revenues generated by production of coal and other energy resources. At the same time, periods of rapid growth have stressed communities and their social structures, housing resources, and public infrastructure and service systems.

The emergence of the coal and other energy resource development industries in the PRB has had long-term cumulative affects on regional social and economic conditions. In general, Campbell County and the entire PRB region have developed an enhanced capacity to respond to and accommodate growth. The regional coal industry also provides a measure of insulation from dramatic economic and social dislocations. Key cumulative social and economic conditions identified in the PRB Coal Review are described below.

4.2.13.1 Employment and the Economic Base

Energy resource development since 1970 has resulted in substantial economic expansion across the PRB. Total employment expanded by 163 percent as 40,674 net new jobs were added between 1970 and 2004. The most rapid expansion occurred between 1975 and 1980. After modest growth and slight decline in the 1980s and early 1990s, employment growth resumed in the late 1990s, led by increases in coal mine employment, including subcontractors, and CBNG development. Across the six-county area, total employment was 65,597 in 2004. Nearly half of the net job gain occurred in Campbell County, where total employment increased from 6,026 jobs in 1970 to 25,921 jobs in 2004. Strong gains also were posted in Sheridan County (9,821 jobs) and Converse County (4,421 jobs).

The economic stimuli associated with the gains in mining and CBNG employment and the long-term population growth triggered secondary job gains in construction, trade, services, and government. In 2004, business and consumer services accounted for 51 percent of all jobs in the region, while mining and government accounted for 14 percent and 16 percent of all jobs, respectively. Farm employment in the region, as a share of total employment, declined from 14 percent in 1970 to 5.0 percent in 2004. However, that shift is primarily due to growth in non-farm employment rather than declines in farming, as total farm employment in the PRB recorded a net decline of only 375 jobs, from 3,571 to 3,196 (U.S. Bureau of Economic Analysis 2006).

The largest impetus to future growth over the PRB Coal Review study period (2003 to 2020) is expected to occur by 2010. Under the lower production scenario, employment in 2010 related to coal mining, oil and gas production, and oil field services is projected to increase by one-third, or more than 2,300

jobs, as compared to 2003 levels. Many of the jobs gained would be the result of increased oil and gas development. While the number of coal mining jobs would increase, the projected coal mine-related productivity gains would limit increases in the number of mine employees required for operations.

Beyond 2010, total mining industry employment would decline as major infrastructure development (e.g., additional CBNG compression capacity) is completed and the pace of conventional oil and gas drilling decreases. Increases in CBNG production and coal mining employment would occur thereafter, such that total mining employment would approach pre-2010 levels by the end of the forecast period (2020). Under the development scenarios, construction of three new power plants, having a combined capacity of 1,000 MW and a peak work force of approximately 1,550 in 2007-2008, is assumed to occur concurrently with the increases in mining employment. Under the upper production scenario, a second temporary construction work force impact would occur between 2016 and 2020 in conjunction with the construction of an additional 700-MW power plant.

The net effects of these activities, including secondary effects on suppliers, merchants, service firms, state agencies and local government in the region, would be the creation of more than 8,700 new jobs in the region between 2003 and 2010. Of those, more than 5,600 jobs (a 22 percent increase over 2003) would be based in Campbell County. The pace of economic expansion, at least in terms of jobs, would moderate after 2010. Total employment growth of 2,017 additional jobs is projected in Campbell County between 2010 and 2020, with 1,741 additional jobs projected in the surrounding counties.

However, to achieve the projected levels of energy and mineral development activity through 2010 assumes that industry has access to the necessary equipment, materials, labor, and other vital inputs. Current oil and gas exploration and development across the Rocky Mountain region has absorbed the available inventory of drilling rigs and crews. A lack of access to resources could delay or limit the job gains below the levels projected, even though prospects for such growth remain. Furthermore, competition for equipment, combined with tight labor markets, could negate the productivity gains that underlie the projections, such that the employment and associated impacts do materialize, but are associated with lower levels of activity (e.g., a lengthier construction period for a power plant or fewer new wells drilled each year).

Employment effects associated with the upper coal production scenario, assuming productivity gains in coal mining equivalent to those in the lower coal production scenario, would result in total employment gains of 11,563 jobs by 2010 in the six-county study area, with an additional 3,667 jobs by 2020[2]. As

[2] The number of jobs in the coal mining industry under the upper production scenario was estimated assuming future productivity gains comparable to those used for the lower production scenario. This approach differs from that described for the upper production scenario in the Task 2 report of the coal study, whereby a 16 percent higher production would be achieved with a 2.5 percent increase in workforce. Although that assumption reflects a continuation of historic productivity gains, it may underestimate population and employment growth and related socioeconomic effects if the production levels are achieved but productivity lags. Using the productivity gains from the lower production scenario provides a more conservative perspective on potential long-term population growth for purposes of the cumulative analysis.

compared to the employment projections under the lower coal production scenario, those gains include 2,821 additional jobs in 2010 and 3,214 additional jobs in 2020. Most of the incremental gains would be in Campbell County, further stressing labor markets, housing, and other community resources. Such pressures could delay or affect the development plans of individual firms and operators, such that the projected employment levels would not be realized in the time frames shown. Nonetheless, substantial growth in employment is expected to occur, and even if the projected total employment levels are not realized, substantial social and economic impacts still would be anticipated.

The economic stimuli associated with the projected development also would stimulate increases in employment in other nearby counties beyond the five surrounding counties identified above. However, the potential effects in these areas are not addressed in the PRB Coal Review Task 3C Report because most of the effects would comprise indirect or induced growth that would be limited in scale relative to the size of the respective economies. Furthermore, the economic outlook for those areas is influenced by factors that are beyond the scope of this study, such as the role of the oil and gas support services industry based in Natrona County in supporting energy development in the south-central and southwestern portions of Wyoming.

4.2.13.2 Labor Market Conditions

Labor market conditions in the PRB reflect a generally healthy economy, with average annual county unemployment rates between 2.1 percent (Campbell) and 3.5 percent (Weston) in 2006. Statewide and national unemployment rates for the period were 3.2 percent and 4.6 percent, respectively (U.S. Bureau of Labor Statistics 2007).

Over time, local unemployment levels and rates have reflected the influences of the large, relatively stable employment baseline associated with the region's coal mining industry and the more transitory and variable influences of natural gas development. Prior to the onset of CBNG development in 1989, unemployment in Campbell County fluctuated between 4.8 and 5.3 percent, slightly above the corresponding statewide averages. Labor demand associated with CBNG development contributed to a decline in unemployment to below 3.0 percent in the 2001. As the pace of CBNG development stabilized, labor demand eased and unemployment rates climbed to 3.7 percent in 2003, before again falling to current record lows.

The employment effects identified above indicate substantial pressures on local labor markets. Strong demand for labor would maintain low unemployment, creating upward pressure on wages and salaries. Those influences would stimulate substantial economic migration into Campbell County, causing impacts to population, housing demand, and other economic and social conditions. Similar influences would occur in surrounding counties, although the implications are less severe because the scale of effects would be smaller and would be distributed over multiple communities and service providers.

4.2.13.3 Personal Income

A benefit associated with energy resource development, whether it is mineral mining or oil and gas development, is local wages and salaries that are among the highest in the state. Personal income registered strong gains across the region, but especially in Campbell County, during the late 1970s and early 1980s. In 1981, per capita personal income in Campbell County was $17,520, compared to the national average of $11,280 and the statewide average of $12,879. Personal income growth was tempered by several years of economic stagnation during the late 1980s. Renewed economic vitality since then resulted in per capita personal income in Campbell County reaching $33,388 in 2004. Those gains notwithstanding, per capita income among Campbell County's residents was below statewide and national norms, as well as that for Sheridan ($35,716) County. When measured on a median household or family income basis in the 2000 census, Campbell County led statewide, national, and other counties in the PRB by considerable margins. That pattern has been maintained due to the strong economic growth in the region; in 2006 the median household income in Campbell County was $60,800 compared to a statewide median of $43,785 and national median of $44,374. Median household incomes for the other five PRB counties ranged from $40,195 to $46,883 (U.S. Census Bureau 2006a).

In terms of total personal income, Campbell County led the six-county region with $1.22 billion in 2004. Sheridan County residents recorded aggregate personal income of $972 million in 2004. Total personal income in the other counties was substantially lower, ranging from $193 million in Crook County to $389 million in Converse County.

Personal incomes in the region would increase over the time period 2007-2020, both in aggregate and on a per capita basis, in conjunction with the economic outlooks foreshadowed by the projected development scenarios. In 2004, total personal income in the six-county area was $3.24 billion. Under the lower production scenario, total personal income would more than double to $7.57 billion in 2020 (in nominal dollars). The upper production scenario would generate an additional $266 million per year in Campbell County and an additional $35 to $40 million per year in the surrounding counties by 2020. Annual per capita incomes are projected to increase by approximately 27 percent (in real terms) across the region between 2003 and 2020. Households with one or more workers employed directly in the energy industry, associated service firms, and the construction industry likely would realize larger shares of the gains (BLM 2005f).

4.2.13.4 Population and Demographics

Population change over time is perhaps the single best indicator of cumulative social and economic change in the PRB. Campbell County was not among the original 13 counties when Wyoming was admitted to statehood, but was carved from Weston and Crook counties in 1911. Campbell County's 1920 population

of 5,233 ranked it seventeenth among Wyoming's counties. Forty years later and prior to the onset of coal development in the region, Campbell County ranked eighteenth among Wyoming's counties in terms of population, with a 5,861 residents. Neighboring Converse, Sheridan, and Weston counties all had larger populations.

By 1980, Campbell County's population had increased by more than 300 percent, to 24,367, seventh among Wyoming's counties. Energy development contributed to population growth in Sheridan, Converse, Johnson, and Crook counties during that period. Weston County recorded a population decline during the period; however, the combined population of the PRB climbed from 49,311 in 1960 to 82,598 in 1980.

Annual coal production in the PRB has increased by nearly 560 percent since 1980, accompanied by expanded mine service and rail transportation capacity, stimulating further growth. The impetus for growth in local employment was tempered by substantial productivity increases in the mining industry, coupled with declining production of other energy resources. Consequently, the region's population gained a relatively modest 11 percent, 9,318 residents, between 1980 and 2000, reaching 91,916. Campbell County registered a net gain of 9,331 residents during that period, raising its total population to 33,698 in 2000, fourth highest in the state. Across the PRB, the loss of about 2,000 residents in Converse County was offset by modest gains in the other four counties (U.S. Census Bureau 2001).

More recently, the PRB has seen renewed population growth, primarily linked to CBNG development. Population estimates for 2006 indicate a total regional population of 100,504, a 9.3 percent increase over the 2000 census population. Gains were reported for all six counties, ranging from 118 persons in Weston County to 5,236 persons in Campbell County (Table 4-31).

Table 4-31. Recent and Projected PRB Population.

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six County PRB Total
Census							
2000	33,698	12,104	5,895	7,108	26,606	6,642	92,053
2003	36,381	12,326	5,971	7,530	27,116	6,665	95,989
2006	38,934	12,866	6,255	8,014	27,673	6,762	100,504
Lower Coal Production Scenario							
2010	45,925	13,103	6,542	8,389	28,459	7,108	109,526
2015	48,905	13,671	6,759	8,867	30,016	7,174	115,392
2020	50,995	14,193	6,989	9,326	31,467	7,208	120,178
Upper Coal Production Scenario							
2010	47,662	13,160	6,570	8,424	28,579	7,137	111,532
2015	51,558	13,763	6,802	8,924	30,214	7,219	118,480
2020	54,943	14,313	7,045	9,403	31,733	7,266	124,703

Source: U.S. Census Bureau (2006a) and PRB Coal Review Task 3C Report

The magnitude and timing of projected employment changes from 2003-2020 under either coal production scenario would trigger corresponding effects to population across the PRB, particularly in Campbell County (Figure 4-6).

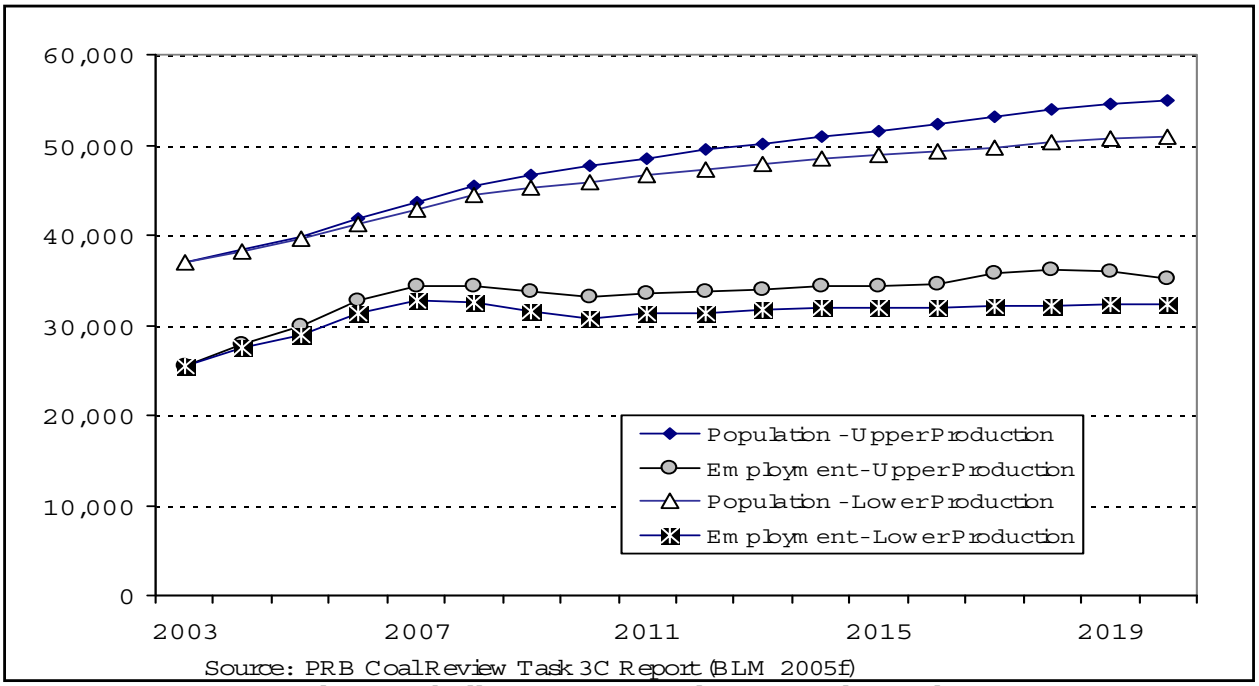


Figure 4-6. Projected Campbell County Population and Employment to 2020

Under the lower coal production scenario, Campbell County's population is projected to increase by more than 14,550 residents between 2003 and 2020, nearly 9,500 of which are anticipated by 2010. Growth over the next 3 years will maintain pressures on housing and other community resources. The projected energy and mineral development in the lower coal production scenario would also result in substantial population growth elsewhere in the PRB, with Sheridan, Johnson, and Converse counties all projected to gain substantial population. Population growth, like employment growth, would moderate after 2010. Projected population growth between 2003 and 2020 ranges from 0.5percent compounded annual growth rate (CAGR) in Weston County to 2.0 percent CAGR in Campbell County. In absolute terms, the net change ranges from 537 additional residents in Weston County to a gain of 14,557 residents in Campbell County. The total population of the six-county study area is projected to climb to 120,178 in 2020, a 1.3 percent CAGR.

As with employment, changing development conditions could result in actual population growth varying from projected growth. If project schedules or levels of development vary from the projected levels, corresponding effects on population growth could result (e.g., lower growth). Population demographics could also change due to migration and commuting, with more immigrating construction workers being single-status, rather than accompanied by families. Another possibility is that the spatial distribution of population growth could shift as a result of housing or labor constraints, such that less growth would occur in Gillette and Campbell County, and more growth would occur elsewhere.

Projected population growth through 2020 under the upper coal production scenario is approximately 19 percent higher than under the lower coal production scenario (28,625 compared to 24,100, with the six-county population reaching 124,703 by 2020). Much of the incremental population growth would occur by 2010 in Campbell County, and in particular in and near Gillette.

Community population growth under the upper coal production scenario generally would mirror growth under the lower coal production scenario but with higher growth in Wright, Douglas, and Newcastle due to the effects of higher coal production, coal transportation, and power generation concentrated in the southern portion of Campbell County.

4.2.13.5 Housing

While the population grew by 55 percent in the 1970s, the housing stock in the study area grew by almost 78 percent. Housing growth was especially rapid during the 1970s in Campbell County, where population grew by 88 percent and the housing stock grew by 140 percent. The expansion in housing supply, combined with the slowdown in the rate of population growth, produced double-digit vacancy rates for rental housing in the late 1980s and early 1990s. After growth resumed in the mid-1990s, most county-level vacancy rates for ownership units were at or below the state levels in 2000. Vacancy rates for rental units declined even more sharply. Vacancy rates have fallen even more as a result of recent growth, with current rates below 1.5 percent in five of the six-counties, and that in Johnson County at only 2.8 percent (Table 4-32).

Table 4-32. Rental Housing Vacancy Rates, 2004 4Q and 2006 4Q.

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Wyoming
2004 4Q	2.8%	8.3%	10.4%	2.1%	4.5%	5.0%	4.8%
2006 4Q	0.4%	1.4%	1.0%	2.8%	0.5%	0.0%	2.4%

Source: Wyoming Housing Database Partnership (2007)

In 2000, the housing inventory in the six-county study area was 41,203 units (Table 4-33). Total housing inventory had expanded to 43,363 units in 2005, a net addition of 2,160 since 2000. However, new construction hasn't kept pace with population growth, resulting in tighter market conditions in terms of availability, and higher prices.

Table 4-33. Total Housing Stock in 2000 and 2005.

Year	Campbell County	Converse County	Crook County	Johnson County	Sheridan County	Weston County	Six-county PRB Region
2000	13,288	5,669	2,935	3,503	12,577	3,231	41,203
2005	14,085	5,852	3,132	3,694	13,283	3,317	43,363
Change	797	183	197	191	706	86	2,160

Source: U.S. Census Bureau (2006b)

In 2005, the average sales price of homes in the study area varied from $80,303 in Weston County to $186,095 in Sheridan County. The average home price

statewide in 2006 was $178,183 (Wyoming Housing Database Partnership 2007). In addition to Sheridan County, Campbell ($185,874) and Johnson ($180,209) counties also had average home sale prices above the statewide average in 2006. The average sales price in Converse County was $149,096, 17 percent below the statewide average.

Monthly costs for rental housing in the PRB, measured in the fourth quarter of 2006, were highest in Campbell County (Table 4-34).

Table 4-34. Monthly Housing Rents in 2006[1] in the PRB Study Area and Percent Change from 2004.

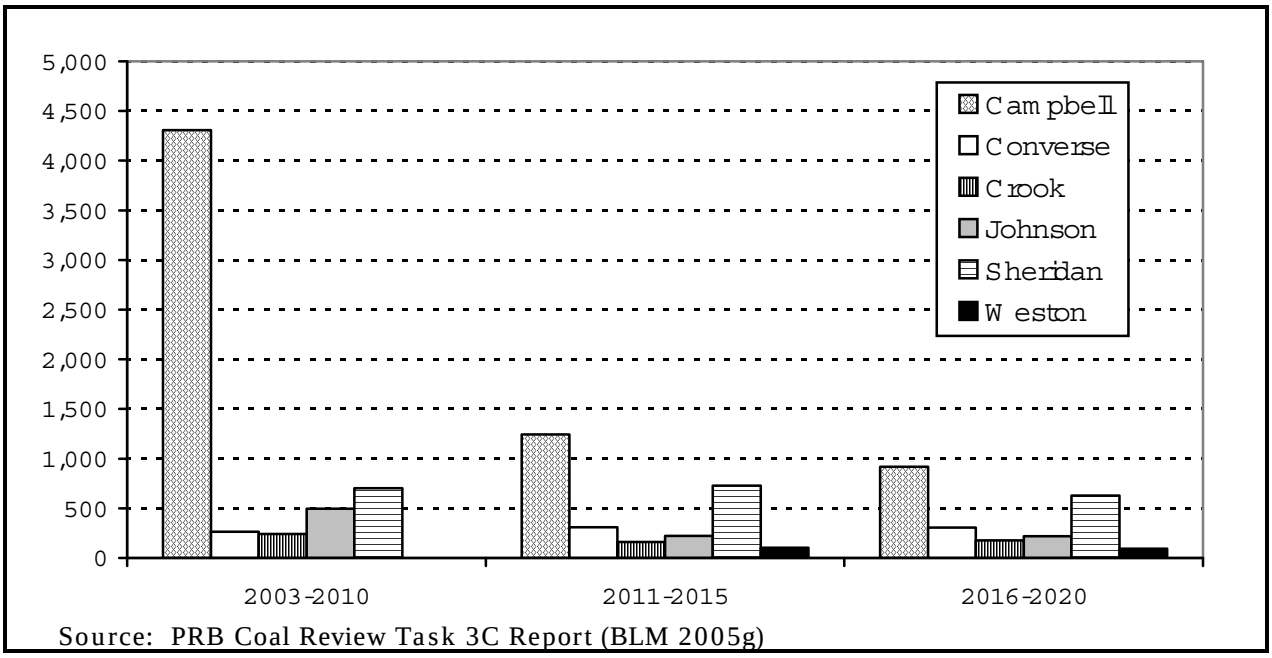
County	Apartments		Mobile Home Lots		Houses		Mobile Homes on a Lot	
	Rent	Change	Rent	Change	Rent	Change	Rent	Change
Campbell	$697	25.8%	$283	22.0%	$975	23.0%	$758	20.5%
Converse	$515	31.4%	$152	1.3%	$545	2.8%	$452	22.5%
Crook	$391	17.4%	$125	5.9%	NA	NA	NA	NA
Johnson	$477	-5.4%	$170	16.4%	$700	15.3%	$518	5.5%
Sheridan	$571	14.0%	$285	4.4%	$857	27.9%	$650	26.7%
Weston	$459	47.1%	$119	17.8%	$567	36.3%	$505	27.5%
Wyoming	$567	14.1%	$225	15.4%	$782	13.0%	$561	15.2%

[1] Data are for the fourth quarter of 2006. Change is the percent change since fourth quarter of 2004.
NA = information not available due to insufficient sample size.
Source: Wyoming Department of Administration and Information (2006)

Temporary housing resources are available in the PRB in the form of hotel-motel rooms, private and public campgrounds, and vacant spaces in mobile home parks. In all, there are more than 70 lodging establishments with a total of more than 2,500 rooms. These temporary housing resources, supplemented by whatever apartments, townhouses, and mobile home spaces are available in Gillette, Wright and Douglas, have accommodated temporary housing needs associated with natural resource and energy projects in the past.

Both projected coal production scenarios indicate a strong demand for housing across the six-county study area through 2020. Net housing requirements under the lower coal production scenario are for approximately 9,110 units through 2020, a 21 percent increase above the 2006 existing inventory (Figure 4-7). New housing requirements under the upper coal production scenario are estimated at 10,900 units, a 25 percent increase compared to the 2006 inventory and 1,790 units more than for the lower coal production scenario. Approximately 60 percent of the overall demand for new housing through 2010 would be in Campbell County.

A substantial portion of the near-term housing demand in Campbell County would be associated with the assumed concurrent construction of three power plants. If that occurs, one or more project sponsors may be required by the Wyoming Industrial Siting Administration to pro-actively provide housing (e.g., a construction camp for single-status workers). Such actions could temper the needs for more housing; however, the remaining needs would nonetheless be substantial, straining public and private sector residential development capacity.



Source: PRB Coal Review Task 3C Report (BLM 2005g)

Figure 4-7. Projected Housing Demand in the PRB Study Area Under the Lower Coal Production Scenario.

Although smaller in scale than those in Campbell County, housing demands in the surrounding counties may also strain the capabilities of the residential construction sector to respond. Furthermore, residential contractors would be competing for available labor, contributing to the population growth and housing demand, and fueling increases in construction costs and housing prices.

The relative scale of the housing needs can be evaluated in comparison to past growth in the study area. One benchmark for comparison is the rapid growth that occurred in the PRB in the 1970s. During that decade, the number of housing units in the six-county study area rose by approximately 14,900 units, approximately 1,500 units per year on average compared to the 850 to 975 new units per year projected under the upper and lower coal production scenarios through 2010. The rapid pace of development in the 1970s coincided with a period of economic expansion and strained the region's construction trade and building supply industries. Although the underlying economies of the region are now larger, the projected needs would tax the ability of communities to respond. Signs of strain are apparent in Gillette and could surface elsewhere as greater housing needs arise in the remaining counties of the six-county study area under the low coal production scenario.

Projected housing demands under either coal production scenario, although lower than what Campbell County and the region experienced in the "boom" years of the 1970s, would exert substantial pressure on housing markets, prices, and the real estate development and construction industries, all at a time when demand for labor and other resources would be high overall.

4.2.13.6 Public Education

There are 10 school districts in the six-county PRB study area, ranging in size from CCSD #1 with 7,337 students in the 2005 school year to Sheridan County School District # 3 (based in Clearmont, Wyoming) with fewer than 100 students. CCSD #1, based in Gillette, and Converse #1 in Douglas, serve the primary energy and resource development region.

Public school enrollment trends generally mirrored population trends during the period of rapid population growth. District-wide enrollment in Campbell County grew by more than 4,600 students (131 percent) between 1975 and 1985. Enrollment increased in all districts in Converse and Sheridan counties as well. Enrollment in Campbell County School District (CCSD) #1 subsequently peaked, but remained near record high levels for nearly a decade. Elsewhere in the region enrollments generally declined with a combined enrollment of 9,525 in the other study area districts in 2005, the lowest since 1975 (Wyoming Department of Education 2006). Recent natural gas and mining development has tempered, but not reversed, the trend of declining school enrollments across the region.

Communities across the PRB study area would see population growth due to economic migration from 2003 to 2020; however, the effects of such migration on public school enrollments would vary. As the demographics of the population change, school districts in the PRB would be affected by new trends. In some counties, the size of the school-age population (generally aged five to 17 years) may even trend in the opposite direction of total population in the short-term due to underlying demographics of the established resident population.

The demographic projections for the two coal production scenarios forecast growth in elementary school enrollments in Campbell County through 2010 and after 2010 for most PRB school districts. Projected enrollments in CCSD #1 would be approximately 10 percent higher by 2020 under the upper coal production scenario, with those in the surrounding districts about one percent higher. However, several districts still may experience enrollment levels in 2020 below current levels, as growth from 2010 to 2020 would not offset recent declines or those projected to occur before 2010.

Under the lower coal production scenario, Campbell County would experience an increase of 1,587 students, or 22 percent above recent levels, in school enrollment through 2020. However, the net impact on CCSD #1 would be composed of two trends; a substantial increase in grades K-8 but only small increases in grades 9-12 (Figure 4-8). School districts in the surrounding counties are projected to experience declining elementary and middle school enrollments through 2010 and declining high school enrollments through 2015. Thereafter, growth and the associated influences on demographics would generate renewed enrollment growth, particularly in the elementary grades in Johnson, Sheridan, and Converse counties.

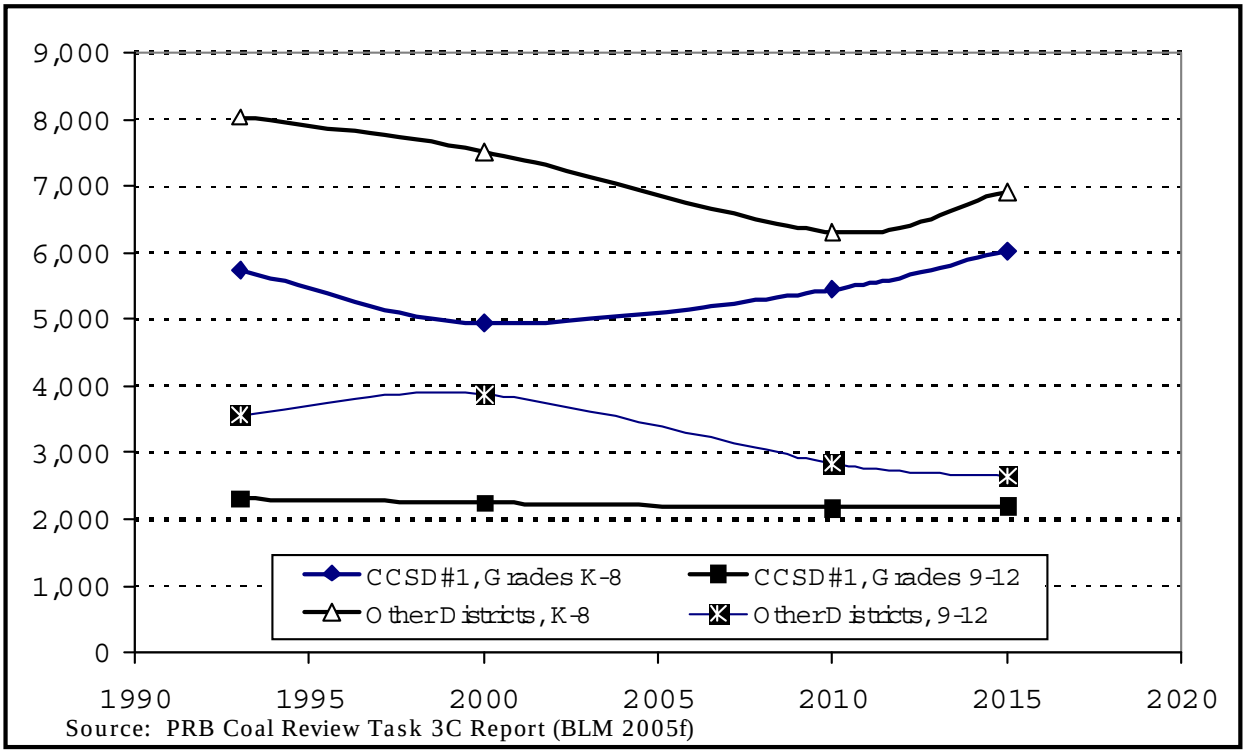


Figure 4-8. Projected School Enrollment Trends to 2020 Under the Lower Coal Production Scenario.

Under either scenario, projected enrollments may cause short-term school capacity shortages, depending on the specific grade levels and residential locations of the additional students. Under the Wyoming School Facilities Commission planning guidelines, impacted school districts generally need to accommodate minor capacity shortages through the use of temporary facilities, such as portable classrooms. For larger and more long-term increases, the Commission's policy is to fund capital expansion where warranted by projections developed during updates of school districts' five-year plans. The approved five-year plan for CCSD #1 has a $57.4 million budget covering construction of several new schools and numerous major maintenance and facility upgrade projects. The approved five-year plans for the other school districts have combined cost of $163 million. Capital investment in public education facilities has been a statewide priority in Wyoming for the past decade, with taxes and royalties on mineral and energy resources the primary source of program funding (Wyoming School Facilities Commission 2007 and CREG 2007).

4.2.13.7 Facilities and Services

The types and levels of facilities and services provided by local governments reflect service demand, revenue availability, and community values regarding appropriate services and service standards. As with most socioeconomic characteristics, the level and availability of local government facilities and services varies by county and community across the PRB. There are literally several hundred separate service providers in the region. Although virtually all

local government facilities and services are affected by energy development and the demand related thereto, the critical facilities and services include municipal water and sewer systems, law enforcement at the county level, and hospitals. A comprehensive assessment of facilities and services is beyond the scope of the PRB Coal Review. However, an initial screening revealed no critical needs or shortfalls and indicated that most providers are engaged in an ongoing long-term process to maintain and improve facilities and services to meet community needs and to comply with various regulations and standards.

The PRB Coal Review socioeconomic analysis focuses on water supply and wastewater systems (two essential services that are costly and have the longest lead times to develop) and law enforcement, emergency response, and road maintenance (three services that typically are most affected by energy development).

Water supply and wastewater systems in most communities have the capacity to accommodate the cumulative population growth associated with either projected coal production scenario through 2020, assuming ongoing or planned improvements are completed. In Gillette, there may be a timing issue with planned water supply system expansions, as completion of planned improvements would occur when substantial growth is anticipated under both projected coal production scenarios. Consequently, Gillette may experience water shortages in the summer months for several years, particularly if growth follows that under the upper coal production scenario. Douglas is looking to add water treatment capacity to provide additional capacity and management flexibility to address needs during times of drought.

The ability to provide desired levels of services to the projected energy-related population and development is less clear in Campbell County, Gillette, Wright, and outlying rural communities. Campbell County and its communities would experience a 25 percent increase in population between 2003 and 2010 under the lower coal production scenario and 30 percent under the upper coal production scenario.

Growth rates and the resultant facility and service demand in other counties within the study area would be substantially less during the 2003 to 2010 period under either scenario; all communities other than Johnson County and Buffalo would grow substantially less than 10 percent during the period. The populations of Johnson County and Buffalo would increase 10 percent by 2010, driven primarily by CBNG development.

Growth rates and resultant increases in service demands would slow substantially during both the 2011 to 2015 and 2016 to 2020 periods under either projected coal production scenario. In most communities except Sheridan County and the city of Sheridan, there would be little difference in population growth and service demand between the two scenarios.

4.2.13.8 Fiscal Conditions

Federal mineral royalties and state and local taxes levied on coal and other mineral production are vitally important sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional revenues to support public facilities and services. These revenues benefit not only those jurisdictions within which the production or activity occurs, but also the federal treasury, state coffers, school districts, and local governments across the state through revenue-sharing and intergovernmental transfer mechanisms.

Coal and other minerals produced in Wyoming, regardless of ownership, are subject to ad valorem taxation by local taxing entities and a statewide levy to support public education. Statewide ad valorem taxable valuation on coal production in 2005 was $2,280.1 million. Of that total, 88 percent was based on production in the PRB.

The total assessed valuation of Campbell County, boosted by recent increases in CBNG production, was $4,264 million in 2006. Valuations on aggregate mineral production accounted for 87 percent of that total. Because Campbell County has been the primary beneficiary of mineral production gains over the past three decades and the recent gains tied to CBNG, the county's assessed valuation in 2006 was nearly 38 times that of Weston County ($112.5 million) and 31 times that of Crook County ($137.2 million). The 2006 valuation of 2005 coal production in Campbell County was $1,995.3 million (Wyoming Department of Revenue 2006).

Wyoming levies a severance tax on coal and many other minerals produced in the state. The severance tax rate, levied on the value of production, has varied from 1.0 percent to 10.5 percent over time. The current rate of 7.0 percent was established in 1992. Cumulative statewide severance tax proceeds on coal production since 1970 exceed $2.8 billion. Cumulative severance tax revenues on coal produced in Campbell County total $1.89 billion. Cumulative severance tax revenues for the corresponding period total $96.5 million from Converse County, $60.5 million from Sheridan County, and $758.0 million from the remainder of the state (Wyoming CREG 2007 and Wyoming Department of Revenue 2006).

Producers pay a 12.5 percent royalty to the federal treasury on the value of all surface coal production from federal leases. Total federal mineral royalties of nearly $3.3 billion have been paid on coal produced in Wyoming since 1970, approximately half of which is returned to the state. Estimated 2005 mineral royalties of about $377 million were paid on federal coal produced in the PRB (Minerals Management Service 2006).

At the foundation of the mineral development revenue projections for the period 2003 to 2020 are projected levels of future energy and mineral resource production. The projected total value of annual mineral production under the

lower coal production scenario will climb by $3.49 billion (2004 dollars) over 2003 levels, reaching $8.54 billion by 2020, a 69 percent increase over the 2003 value. The aggregate value of energy and mineral resource production under the upper coal production scenario would increase to $9.21 billion in 2020. The incremental difference, compared to the value under the lower coal production scenario, would be $670 million per year, all of which represents the value of higher annual coal output.

The overwhelming majority of future mineral production value is anticipated to be in Campbell County. Over time, the future value of production in Sheridan and Johnson counties would climb. Total annual mineral production value by 2020 is projected to reach $6.37 billion in Campbell County and $2.17 billion in the surrounding counties. Between 2005 and 2020, total royalty and tax receipts derived from the key selected sources range between $21.1 and $22.6 billion for the lower and upper coal production scenarios, respectively. Receipts derived from coal production would account for the majority of the totals under either scenario, with federal mineral royalties on coal at $4.9 to $5.7 billion being the single largest source. Severance taxes, ranging from $6.3 to $6.7 billion, also would accrue to the state (Tables 4-35 and 4-36).

Table 4-35. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Lower Coal Production Scenario (million $).

Industry and Taxes	2005-2010	2011-2015	2016-2020	Total
Coal[1]	$3,164.8	$3,178.9	$3,756.3	$10,100.0
CBNG	$2,915.2	$3,076.4	$3,288.7	$9,280.3
Conventional Oil and Gas	$568.5	$576.4	$614.0	$1,759.0
Totals	**$6,648.5**	**$6,831.7**	**$7,659.0**	**$21,139.3**
Severance Tax	$1,995.9	$2,012.4	$2,249.3	$6,257.6
Federal Mineral Royalties	$2,754.1	$2,839.4	$3,166.3	$8,759.8
State Mineral Royalties	$233.5	$225.8	$251.4	$710.7
Ad Valorem Tax (Counties)	$417.6	$443.0	$502.8	$1,363.3
Ad Valorem Tax (Schools)	$1,247.5	$1,311.1	$1,489.3	$4,047.9
Totals	**$6,648.6**	**$6,831.7**	**$7,659.1**	**$21,139.3**

[1] Does not include coal lease bonus bids due to the uncertainty regarding timing.
Source: PRB Coal Review Task 3C Report (BLM 2005f)

The federal and state governments also benefit from coal lease bonus bids derived from future coal leasing. Bonus bids have risen over time, with successful bids for recent sales ranging from 30 cents per ton to 97 cents per ton. There is no guarantee of that trend continuing. Considerable uncertainty also exists with respect to the timing and scale of future leases, although BLM currently has pending applications for more than four billion tons of federal coal, including this application. The state receives 50 percent of the bonus bid revenue.

Taxes and mineral royalties levied on energy and mineral resource production accruing to the state are disbursed to the Permanent Water Development Trust Fund, Wyoming School Foundation and Capital Facilities funds, capital

Table 4-36. Summary of Mineral Development Tax Revenues Associated with Energy Resource Production Under the Upper Coal Production Scenario (million $).

Industry and Taxes	2005-2010	2011-2015	2016-2020	Total[1]
Coal[1]	$3,538.0	$3,703.0	$4,350.0	$11,591.0
CBNG	$2,915.2	$3,076.4	$3,288.7	$9,280.3
Conventional Oil and Gas	$568.5	$576.4	$614.0	$1,759.0
Totals	**$7,021.7**	**$7,355.8**	**$8,252.7**	**$22,630.3**
Severance Tax	$2,104.1	$2,159.0	$2,415.4	$6,678.5
Federal Mineral Royalties	$2,946.3	$3,099.9	$3,461.4	$9,507.6
State Mineral Royalties	$233.5	$225.8	$251.4	$710.7
Ad Valorem Tax (Counties)	$435.8	$472.0	$535.0	$1,442.8
Ad Valorem Tax (Schools)	$1,302.3	$1,398.9	$1,589.8	$4,291.0
Totals	**$7,022.0**	**$7,355.6**	**$8,253.0**	**$22,630.6**

[1] Does not include coal lease bonus bids due to the uncertainty regarding timing.
Source: PRB Coal Review Task 3C Report (BLM 2005f)

construction fund for state and local government facilities, and other programs according to a legislatively-approved formula. Through these funds, the revenues derived from resource development benefit the entire state, not just agencies, businesses, and residents of the PRB.

County governments and school districts would realize benefits from future energy and mineral resource development in the form of ad valorem taxes. Such taxes, estimated on the basis of future coal, oil, and natural gas production, are estimated to range between $5.4 billion and $5.7 billion through 2020. Those sums do not include future property taxes levied on the new power plants, expanded rail facilities, or new residential and commercial development associated with future growth, or sales and use taxes levied on consumer and some industrial purchases. These latter revenues are not estimated in this study, but would be substantially lower than those on resource production.

Local governments would benefit from property taxes on new development, as well as from sales and use taxes on taxable sales within their boundaries. Such revenues are not estimated for this study due to the large number of jurisdictions and other analytical considerations.

4.2.13.9 Social Setting

The past 30 years have seen sweeping social change in the U.S. and throughout much of the world. But in addition to the broad forces that have driven social change in the U.S. as a whole, social conditions in some PRB communities have been substantially influenced by energy development. Factors that have affected social conditions in the PRB include industrial and natural resource development, economic and demographic change, housing

and public infrastructure development, and institutional change at the local and state government levels.

One of the key drivers of social change in the PRB has been energy-related population growth. When the first oil boom occurred in the late 1950s, Campbell County was a relatively stable, sparsely-populated rural county. Like many places in Wyoming and throughout the rural west, Campbell County was a small, relatively homogeneous ranching community (ROMCOE 1982). The oil booms of the 1950s and 1960s brought an influx of new people. Development of coal mines, continued oil and gas drilling, and power plant construction precipitated another round of growth. In all, Campbell County population grew by almost 600 percent between 1950 and 2000.

On the one hand, this population growth, combined with a robust economy, generated a variety of positive social effects. Financial and technical resources poured into the community as it mobilized to accommodate the new population. Job opportunities were created in the construction industry, as the community responded to demands for housing, public facilities, and retail goods and services. The large and rapid influx of new residents, eager to take advantage of the employment opportunities, created energy, vitality, and a sense of economic optimism about the community. Where economic advancement had been limited before the boom, there was now opportunity (Gardiner 1985).

On the other hand, it is likely that many residents had mixed feelings about these changes (Heinecke 1985). New residents brought new ideas, new ways of doing things, new preferences for goods and services, and new demands for government services. Some long-time residents, particularly those who were not directly participating in the economic benefits of energy development, viewed these changes as negative.

Today, almost any organization, committee, or government body is made up of a cross-section of energy employees, ranchers, and other community members whose tenure in the community may be long or short (Bigelow 2004, Spencer 2004). Moreover, because of the turnover in the energy companies, the community has become accustomed to newcomers.

Cumulative energy development in the PRB through the year 2020 has the potential to generate both beneficial and adverse effects on community social conditions. Social effects of development activities in the PRB would vary from county to county and community to community under the coal production scenarios developed for this study, based on the existing social setting and the type of development that would occur.

Beneficial social effects would be associated with an expanding economy and employment opportunities associated with energy development and resulting improvements in living standards for those employed in energy-related industries. Adverse social effects could occur as a result of conflicts over land

use and environmental values. Negative social effects also could occur if the pace of growth exceeds the abilities of affected communities to accommodate energy-related employees and their families with housing and community services.

In the PRB, social conditions in Campbell County, the city of Gillette, and the town of Wright are most likely to be affected because the county would host much of the cumulative energy development workforce, and the county and its municipalities would receive the largest increments in population growth. Campbell County and its municipalities have a long history of energy development, and they have developed infrastructure and management systems to plan for and manage growth; consequently, major adverse social effects would not be anticipated. However, under either scenario, the county and the two municipalities may face challenges in providing adequate housing and expanding community services in anticipation of population growth through 2010, particularly if several power plant and coal mine construction projects occur simultaneously. As municipalities receive only sales and use tax revenues directly from development and purchases made within their boundaries, Gillette and Wright could face challenges in securing the necessary funding to improve municipal facilities and services. Housing shortages and limitations in public services could contribute to adverse community social effects in these communities.

Many of the people who would immigrate to Campbell County for energy-related jobs are likely to share characteristics with much of the current population; therefore, few barriers to social integration are anticipated.

Social effects on other communities in the PRB are likely to be minimal to moderate. Energy-related population growth is anticipated to be moderate in other communities. Sheridan County, also familiar with coal mining, is the only other county anticipated to host a major construction project under the development assumptions used for either projected coal production scenario. Converse, Weston, and Crook counties could experience spillover growth from projects in Campbell County.

Johnson, Sheridan, and Campbell counties could experience continued conflict over split estate and water issues associated with CBNG development, and the pace and scale of energy development across the PRB is likely to continue to generate social and political conflict over environmental issues under either coal production scenario.

4.2.14 Coal Mining and Coal-Fired Power Plant Related Emissions and By-Products

As discussed in Chapter 1, BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered in this EIS because it is a logical consequence of issuing a maintenance lease to an existing mine. The use of the coal after it is mined is also not determined at the time of

leasing, however, almost all of the coal that is currently being mined in the Wyoming PRB is being used by coal-fired power plants to generate electricity. As a result, a discussion of emissions and by-products that are generated by burning coal to produce electricity is included in this section of the EIS.

As discussed in Chapter 2, under the currently approved mining plan, which represents Alternative 1 (the No Action Alternative), from 2008 on, the Black Thunder Mine would be able to produce coal at an average production level of 135.0 mmtpy for another 10.2 years, compared with an average of 135.0 mmtpy for 12.2 years under the Proposed Action, or an average of 135.0 mmtpy for another 14.6 years under Alternative 2 for the North Hilight Field LBA Tract (Table 2-2). The Black Thunder Mine would be able to produce coal at an average production level of 135.0 mmtpy for another 11.8 years under the Proposed Action, or an average of 135.0 mmtpy for another 12.5 years under Alternative 2 for the South Hilight Field LBA Tract (Table 2-4). The Black Thunder Mine would be able to produce coal at an average production level of 135.0 mmtpy for another 13.0 years under the Proposed Action, or an average of 135.0 mmtpy for another 17.3 years under Alternative 2 for the West Hilight Field LBA Tract (Table 2-6).

As discussed in Chapter 2, from 2008 on, the Jacobs Ranch Mine would be able to produce coal at an average production level of 40.0 mmtpy for another 10.6 years under Alternative 1 (No Action Alternative), compared with an average of 40.0 mmtpy for 27.3 years under the Proposed Action, or an average of 40.0 mmtpy for another 33.4 years under Alternative 2 for the West Jacobs Ranch LBA Tract (Table 2-8).

As discussed in Chapter 2, under the currently approved mining plan, which represents Alternative 1 (No Action Alternative), from 2008 on, the North Antelope Rochelle Mine would be able to produce coal at an average production level of 95.0 mmtpy for another 10.9 years, compared with an average of 95.0 mmtpy for 17.2 years under the Proposed Action, or an average of 95.0 mmtpy for another 18.7 years under Alternative 2 for the North Porcupine LBA Tract (Table 2-10). The North Antelope Rochelle Mine would be able to produce coal at an average production level of 95.0 mmtpy for another 14.2 years under the Proposed Action, or an average of 95.0 mmtpy for another 14.5 years under Alternative 2 for the South Porcupine LBA Tract (Table 2-12).

Section 3.4.5 contains estimates of greenhouse gas emissions resulting from the combined mine operations at the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines from projected operations under the Proposed Actions and alternatives.

4.2.14.1 Global Climate Change and Greenhouse Gas Emissions

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) greenhouse gas (GHG) emissions and changes in biological carbon sequestration due to land management activities on global climate. Through

complex interactions on a regional and global scale, these changes cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused the carbon dioxide equivalent (CO_2e) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. As with any field of scientific study, there are uncertainties associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty, because they are based on well-known physical laws and documents trends (EPA 2008a).

Climatic change analyses are comprised of several factors, including GHG emissions, land use management practices, and the albedo effect. In Chapter 3, the effects of recent global climate change on the environment in the area of the proposed action have been identified. It is assumed that existing land and resource conditions within the analysis area have been and will continue to be affected by climate change under all alternatives. Existing climate prediction models are not at a scale sufficient to estimate potential impacts of climate change within the Powder River Basin. Reference has been made to national and regional data that is available, including the recent comprehensive report, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States* (U.S. Climate Change Science Program, 2008).

Tools necessary to quantify incremental climatic changes associated with those factors for the projected development activities in the PRB are presently unavailable. As a consequence, impact assessments of effects of specific anthropogenic activities cannot be performed. Additionally, specific levels of significance have not yet been established. Therefore climate change analysis in this EIS is limited to accounting for and disclosing of factors that contribute to climate change. To the extent that emission data were available or could be inferred from representative type data, potential GHG emissions that could result from development of the proposed LBAs have been identified, as well as emissions that will result from selection of the no action alternative.

In the following analysis, the contribution of the proposed LBAs to cumulative effects on the environment of historic and projected development activity is evaluated. To do this, it is assumed that coal mining will proceed in accordance with permit conditions. It is further assume that this coal will be sold to coal users in response to forecasts of demand for this coal. Historically these users have been electric utilities in the United States, although there is potential for sales outside the U.S. This coal market is open and competitive and users can buy from the most cost effective suppliers that meet their needs. The BLM does not determine the destination of this coal, and the use of the coal is determined by the coal consumer. The electric utilities where this coal has historically been used are throughout the United States, and have a variety of coal combustion technologies and emission control, but all are licensed by the appropriate

regulatory authorities and operate under necessary permit requirements, and in compliance with regulation.

Assuming that all coal produced would be burned to generate electricity, the amount of GHG emissions that could be attributed to coal production that could result from leasing of the proposed LBAs, as well as from the forecast coal production from all coal mines in the Wyoming PRB has been estimated. This was done by relating the portion of coal mined to the total emission of GHG from all coal mined in the U.S. It is assumed that all PRB coal was used for coal fired electric generation as part of the total U.S. use of coal for electric generation. This gives an upper estimate of the GHG resulting from use of the coal that would be produced from the proposed LBAs, and for forecast total PRB coal production. Specific levels of significance have not yet been established for GHG emissions, and given the state of the science, it is not yet possible to associate specific actions with the specific climate impacts. Since tools necessary to quantify incremental climatic changes associated with these GHG emissions are presently unavailable, the analysis cannot reach conclusions as to the magnitude or significance of the emissions on climate change. The impacts of climate change represent the cumulative aggregation of all worldwide GHG emissions, land use management practices, and the albedo effect. The analysis does provide a meaningful context and measure of the relative significance of coal use from the proposed LBAs and overall projected PRB coal production on total GHG emissions.

The National Assessment of the Potential Consequences of Climate Variability and Change, an interagency effort initiated by Congress under the Global Change Research Act of 1990, Public Law 101-606, has confirmed that climate change is impacting some natural resources that the Department of the Interior has the responsibility to manage and protect (DOI 2001). The Synthesis Report, the final part of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (available online at http://www.ipcc.ch), was released in preliminary form on November 17, 2007. The Synthesis Report (Bernstein et al. 2007) summarizes the results of the assessment carried out by the three working groups of the IPCC. Observations and projections addressed in the report include:

- "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperature, widespread melting of snow and ice, and rising global average sea level."

- "Observational evidence from all continents and most oceans show that many natural systems are being affected by regional climate changes, particularly temperature increases."

From 1850 to present, historic trend data show an increase of 1°C in global mean temperature. The increase is not linear, and there have been extended periods (decades) where temperature has dropped or stayed constant. This historic warming over that same period has caused sea levels to rise by about 20

cm on average, and has also resulted in changes in climate patterns on land. These changes are not uniform. In some areas near the equator, temperatures have cooled by about 5°C, while closer to the poles, temperatures have risen by equal amounts (Hansen and Lebedeff 1987). In northern latitudes (above 24° N), temperature increases of nearly 1.2°C (2.1°F) have been documented since 1900. Temperature changes can result in shifts of weather patterns (rainfall and winds) which may then affect vegetation and habitat.

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildfires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. (EPA 2008a). There has been, and continues to be, considerable scientific investigation and discussion as to the causes of the recent historic rise in global mean temperatures, and whether the warming trend will continue.

Solar variability may play a role in global climate change, though the magnitude of the influence of increased sun activity is not well understood. Physical aspects of the sun, like sunspots and solar radiation output, are known to vary over time. The intensity of energy from the sun has varied through time and has resulted in global temperature variation.

Human population doubled to two billion from the period 1780 to 1930, then doubled again by 1974. The atmospheric concentrations of greenhouse gases have increased as human populations have increased. More land and resources were used to provide for the needs of these populations. As human activities have increased, carbon-based fuels have been used to provide for those additional energy needs. Forests and vegetation were cleared in order to provide for food production and human use.

Carbon dioxide (CO_2), methane, water vapor, ozone, and nitrous oxide (N_2O) are recognized as the major greenhouse gases, although there are other gases that are considered GHGs. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Like glass in a greenhouse, these gases trap radiation from the sun and act as an insulator around the Earth, holding in the planet's heat.

According to the IPCC's synthesis report (Bernstein et al. 2007):

- "Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years."

- "Most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. It is likely there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)."

- "There is high agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global greenhouse gas emission will continue to grow over the next few decades."

- "Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would be very likely to be larger than those observed during the 20th century."

- "There is high confidence that by mid-century, annual river runoff and water availability are projected to increase at high latitudes and in some tropical wet areas and decrease in some dry regions in the mid-latitudes and tropics. There is also high confidence that many semi-arid areas (e.g., Mediterranean Basin, western United States, southern Africa and northeast Brazil) will suffer a decrease in water resources due to climate change."

- "Anthropogenic warming and sea level rise would continue for centuries due to the time scales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilized."

- "Anthropogenic warming and sea level rise could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change."

- "There is high agreement and much evidence that all stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are either currently available or expected to be commercialized in coming decades, assuming appropriate and effective incentives are in place for their development, acquisition, deployment and diffusion and addressing related barriers."

The National Academy of Sciences has confirmed these findings, but also has indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time

enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict (EPA 2008a).

Relatively steep elevation gradients between valley floors and adjacent mountain ranges in the western U.S. produce considerable geographic climate variability. Warm, dry, semiarid conditions are typical on valley floors; moist and cool conditions are typical in higher parts of mountain ranges. Different plant communities occur within specific elevation zones. There also have been patterns of historic climatic variation in these areas for more than 10,000 years, during which plant communities gradually shift to higher or lower elevations depending on the direction of temperature and precipitation changes (Tausch et. al. 2004).

If global warming trends continue into the foreseeable future, Chambers (2006) and the 2008 report by the U.S. Climate Change Science Program (U.S. Climate Change Science Program, 2008) indicate that the following changes may be expected to occur in the West:

- The amount and seasonal variability of precipitation will increase over most areas. IPCC (2001) climate model scenarios indicate that by 2100, precipitation will increase about 10 percent in summer, about 30 percent in fall, and 40 percent in winter. Less snowfall will accumulate in higher elevations, more precipitation will occur as rain, and snowmelt will occur earlier in the spring because of higher temperatures.

- Streamflow patterns will change in response to reduced snowpacks and increasing precipitation. Peak flows in spring are expected to occur earlier and be of lower magnitude because of snowpack changes. Runoff from greater amounts of winter rainfall will cause higher winter flows. Summer flows will be lower, but with higher variability depending on the severity of storm events.

- Some populations of native plants, invasive species, and pests will expand. Increasing amounts of atmospheric carbon dioxide. and precipitation during the growing season will provide favorable growth conditions for native grasses, perennial forbs, woody species, and invasive annuals such as cheatgrass. Insect populations also will likely increase because milder winter temperatures will improve reproduction and survival rates.

- Fire frequency, severity, and extent will increase because of the increased availability of fine fuels (grasses, forbs, and invasives) and accumulation of fuels from previous growing seasons. Higher temperatures will extend the length of fire seasons. Expansion of pinyon-juniper species and increasing tree densities could increase the number of high severity crown fires. Higher rates of insect damage and disease also may increase fuel accumulations.

- Sensitive species and overall biodiversity will be reduced. High-elevation habitats will shrink in area or disappear as lower-elevation plant communities expand. It is probable that some mammalian, avian, and other species that currently inhabit these high-elevation habitats may become extinct. Higher rates of disease and insect damage also may pose threats to other sensitive plant and animal species.

In 2006, transportation sources accounted for approximately 29 percent of total U.S. greenhouse gas emissions (EPA 2008b). Transportation is the fastest growing source of U.S. GHGs, accounting for 47 percent of the net increase in total U.S. emissions since 1990. Transportation is also the largest end-use source of CO_2, which is the most prevalent GHG (EPA 2008b). Transportation is also the largest end-use source of CO_2, which is the most prevalent anthropogenic GHG (EPA 2008b, NOAA 2009).

Historically, the coal mined in the PRB has been used as one of the sources of fuel to generate electricity in power plants located throughout the United States. Coal-fired power plant emissions include CO_2, which has been identified as a principal anthropogenic greenhouse gas. According to the Energy Information Administration (USDOE 2007a):

- CO_2 emissions represent about 84 percent of the total U.S. greenhouse gas emissions.

- Estimated CO_2 emissions in the U.S. totaled 5,934.2 million metric tons in 2006, which was a 1.8 percent decrease from 2005.

- Estimated CO_2 emissions from the electric power sector totaled 2,343.9 million metric tons, or about 39.5 percent of total U.S. energy-related CO_2 emissions in 2006.

- Estimated CO_2 emissions from coal electric power generation in 2005 totaled 1,937.9 million metric tons or about 33 percent of total U.S. energy-related CO_2 emissions in 2006.

- Coal production from the Wyoming PRB represented approximately 42 percent of the coal used for power generation in 2006, which means that Wyoming PRB surface coal mines were responsible for about 13.9 percent of the estimated U.S. CO_2 emissions in 2006.

Wyoming PRB coal is shipped primarily nationwide, although it can also be shipped overseas. The mines in the Powder River Basin have sold, and are expected to sell coal into the open coal market. Each mine's ability to sell coal in this market will determine annual production rates at that mine. Historically, the coal buyers have been domestic electric producers, although the coal could be used in other coal applications and it has been exported.

Relatively little PRB coal, about two percent, is burned in Wyoming. In 2005, Wyoming coal went to 35 states besides Wyoming. As noted above, coal represented 50.2 percent of the fuel mix used by electric generators nationally in 2004. In the NERC power regions where PRB coal is sold, coal use ranges from 74.2 percent in the upper Midwest, to 15.6 percent in the northeast U.S. (EPA 2007e).

There are methods of generating electricity that result in fewer greenhouse gas emissions than burning coal, including natural gas, nuclear, hydroelectric, solar, wind, and geothermal resources. However, coal-burning power plants currently supply about 50 percent of the electric power generated in the U.S. The demand for power is increasing in the U.S. and throughout the world. According to a recent report by the North American Electric Reliability Council, peak demand for electricity in the U.S. is expected to double in the next 22 years (Associated Press 2007). Many developing countries, including China and India, are also relying heavily on coal to meet their rapidly increasing power demands as coal is more economical and more available than other sources of electrical generation.

Coal sales are made on short term contracts, generally to individual power generators, or coal is sold on a spot market. This market is very dynamic and competitive. During the coal leasing EIS process, it is uncertain and speculative to predict who might purchase future PRB coal, how it would be used, and where the coal might be transported to.

Technologies for producing cleaner, more efficient and more reliable power from coal are currently available, although not yet commercially established. These include advanced pulverized coal, circulating fluidized bed, and integrated gasification combined cycle (IGCC) technologies. The FutureGen project proposes to produce electricity by turning coal into gas, remove impurities, extract CO_2 from the waste stream, and then sequester the CO_2 underground. A site in southeastern Illinois was recently selected for the plant, which has a goal of being operational in 2012 (Biello 2007). FutureGen is a public-private partnership between the USDOE and the FutureGen Industrial Alliance, Inc., a non-profit consortium of international energy companies. The Alliance is responsible for design, construction, and operation of the facility, and USDOE is responsible for independent oversight and coordinating participation of international governments. Under a cooperative agreement between USDOE and the Alliance, USDOE was to provide a majority of the project's cost. On January 30, 2008, USDOE proposed a major restructuring of the FutureGen project and that financing part of FutureGen at this time would be inappropriate. However, the full Senate Appropriations Committee passed legislation in July 2008 to protect $134 million of previously appropriated federal funding slated for FutureGen to keep the project moving forward (FutureGen 2008).

At this time, there is no national policy or law in place that regulates GHG emissions. A number of bills were introduced in the U.S. Congress in 2007 related to global climate change. The Lieberman-Warner Climate Security Act,

which was introduced in October, 2007 by Senators Joseph I. Lieberman (ID-CT) and John W. Warner (R-VA), would establish a cap-and-trade within the United States. In short, the "cap" would set a legal limit on the quantity of greenhouse gases that a region can emit each year and "trade" would allow companies to exchange the permission – or permits – to emit greenhouse gases. This program would require a 70 percent reduction in greenhouse gas emissions from covered sources, which represents over 80 percent of total U.S. emissions. It was voted out of the Senate Environment and Public Works Committee in December, 2007 (http://www.pewclimate.org, accessed 12/21/2007). The last action on the bill was on May 20, 2008 when it was placed on the Senate Legislative Calendar under General Orders. Calendar No. 740. President Obama, in an address to Congress in February 2009, advocated congressional action on a cap-and-trade program.

Additionally, in 2007, the U.S. Supreme Court (Massachusetts v. EPA) held that CO_2 qualifies as an air pollutant under the Clean Air Act (CAA) Section 302(g). The case was remanded to EPA to take further action to regulate CO_2 under the CAA unless the EPA determines that CO_2 does not endanger public health or welfare. On April 17, 2009, the Administrator of the EPA signed a proposal with two distinct findings regarding greenhouse gases under section 202(a) of the Clean Air Act. The Administrator is proposing to find that the current and projected concentrations of the mix of six key greenhouse gases—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)—in the atmosphere threaten the public health and welfare of current and future generations. This is referred to as the endangerment finding. The Administrator is further proposing to find that the combined emissions of CO_2, CH_4, N_2O, and HFCs from new motor vehicles and motor vehicle engines contribute to the atmospheric concentrations of these key greenhouse gases and hence to the threat of climate change. This is referred to as the cause or contribute finding. This proposed action, as well as any final action in the future, would not itself impose any requirements on industry or other entities. An endangerment finding under one provision of the Clean Air Act would not by itself automatically trigger regulation under the entire Act. The EPA is accepting comment on this proposed action for 60 days (EPA 2009c).

Federal, state, and local governments are also developing programs and initiatives aimed at reducing energy use and emissions. The 2002 Clear Skies and Global Climate Change Initiative is a voluntary national program to reduce greenhouse gas emissions. There are federal tax incentives for energy efficiency and conservation, and some states have renewable energy and energy efficiency policies. Regional initiatives have been started in the northeast (Northeast Regional Greenhouse Gas Initiative) as well as the Western Climate Initiative in the western states. At this time, it is not possible to predict how all of these programs would be melded into a national regulatory process if one were to be enacted.

A number of U.S. financial and corporate interests have acknowledged that enactment of federal legislation limiting the emissions of CO_2 and other greenhouse gases seems likely (NARUC 2007). There is uncertainty about anticipated CO_2 emission limits and carbon capture/sequestration regulations. This has caused some proponents to cancel or delay their proposed projects that use existing and emerging technologies to produce electricity from coal (Casper Star Tribune 2007b, 2007c, 2007d).

The regulatory mechanisms proposed under the Climate Security Act, as well as the past regulation of other pollutants under the CAA, are imposed at the point when coal is burned and converted to electric energy and by-products like CO_2. Over 95 percent of coal produced in the PRB is sold in an open market where coal is purchased on short term contracts or spot prices based on a coal feed stock that is suitable for each buyer's power generating facility. Coal production at any one mine is not tied in any predictable way over a period of time to any one power plant. Power plant buyers attempt to buy coal from suppliers at the most economical prices that meet their needs. PRB coal has competed well in this market due to its low sulfur content. This makes it valuable in lowering sulfur dioxide pollution, as well as competitive mining costs when compared to delivered costs of coal from other coal producing areas.

U.S. coal production increased from 1,029.1 million tons in 1990, when the Powder River Federal Coal Region was decertified, to 1,161.4 million tons in 2006, an increase of 12.9 percent (USDOE 2007b). Wyoming coal production increased from 184.0 million tons in 1990 to 444.9 million tons in 2006, an increase of 242 percent (Wyoming Department of Employment 1990, 2006). The share of electric power generated by burning coal was consistently around 50 percent during that time frame. Also, the percentage of total U.S. CO_2 emissions related to coal consumption was consistently around 36 percent during that same time frame. The percentage of U.S. CO_2 emissions related to the coal electric power sector increased from about 31 percent in 1990 to about 33 percent in 2006 (USDOE 2007b and 2007c).

In 2006, the Wyoming Powder River Basin coal mines produced approximately 432.0 million tons of coal. Using factors derived from laboratory analyses, it is estimated that approximately 716.9 million metric tons of CO_2 would be generated from the combustion of all of this coal (before CO_2 reduction technologies are applied). This number is based on an average Btu value of 8,600 per pound of Wyoming coal and using a CO_2 emission factor of 212.7 pounds of CO_2 per million Btu (USDOE 1994). The estimated 716.9 million metric tons of CO_2 represents approximately 33.6 percent of the estimated 2,134.1 million metric tons of U.S. CO_2 emission from coal combustion (USDOE 2007a). In 2006, Wyoming PRB mines accounted for approximately 37.2 percent of the coal produced in the U.S (USDOE 2007b).

Table 4-37 shows the estimated cumulative annual CO_2e emissions produced by all mines in the PRB which currently have LBAs pending. The cumulative emissions calculated are those associated with the actual mining operations and

Table 4-37. Estimated Annual Equivalent CO_2 Emissions* from Coal Production at Mines With Pending LBAs.

Source	2007	With LBA Tracts
SGAC Mines/LBA Tracts	0.716	1.182
WAC Mines/LBA Tracts	1.245	2.503
Antelope Mine/West Antelope II Tract	0.225	0.348
Buckskin Mine/Hay Creek II Tract	0.197	0.197
Total	**2.535**	**4.229**

* Equivalent CO_2 in million metric tons
Source: BLM 2008g, J&S 2009, WWC 2009a, WWC 2009b

not from the combustion of the coal produced and sold on the open coal market. The LBAs are addressed individually in the following EISs: The SGAC EIS, the WAC EIS, the West Antelope II EIS, and the Hay Creek II EIS.

Wyoming coal production has increased at a more rapid rate than other domestic coal. Wyoming coal is low in sulfur, providing a way for electric generators to achieve acid rain reduction requirements. Coal coming out of the Wyoming PRB is mined using surface mining methods which are generally safer and less labor intensive than underground mining. Rural rangelands are the areas that are mainly mined; they are reclaimed according to WDEQ/LQD's standards (see Section 3.9.4). PRB coal reserves are in thick seams, resulting in more production from areas of similar land disturbance, and lower mining and reclamation costs.

As discussed earlier in this chapter, future coal mining impacts are estimated based on two forecast scenarios for PRB coal production through 2020. In the low scenario, the percentage of coal use for electric generation would stay about the same, assuming that all forms of electric generation would grow at a proportional rate to meet forecast electric demand. In the high scenario, percentage of coal use would also remain about the same, but with PRB coal displacing coal from other domestic coal regions.

If public sentiment results in changed electric demand, or if GHG emissions are ultimately regulated, the demand forecast for coal for electric generation could change. The U.S. Department of Energy (USDOE) has forecasted that by 2030, the coal share of total energy use will increase from 23 percent in 2006 to 25 percent in 2030, while the share of natural gas will fall from 22 percent to 20 percent, and the liquids share is predicted to fall from 40 percent to 37 percent. The combined share of carbon-neutral renewable and nuclear energy is forecasted to grow from 15 percent in 2006 to 17 percent in 2030.

Taken together, projected growth in the absolute level of primary energy consumption and a shift toward a fuel mix with slightly lower average carbon content will cause projected energy-related emissions of CO_2 to grow by 16 percent from 2006 to 2030. This is slightly lower than the projected 19 percent increase in total energy use. Over the same period, the economy becomes less

carbon-intensive, because the 16 percent increase in CO_2 emissions is about one-fifth of the projected increase in Gross Domestic Product (79 percent), and emissions per capita decline by 5 percent.

In the 2008 study, projected energy-related CO_2 emissions grew from 5,890 million metric tons in 2006 to 6,851 million metric tons in 2030. In the Annual Energy Outlook 2008 study, energy-related CO_2 emissions were projected to grow by about 35 percent, to 7,950 million metric tons in 2030. This reflects both a higher projection of overall energy use and, to a lesser extent, a different mix of energy sources (USDOE 2008b). This forecast is within the range of the high and low scenarios presented in Chapter 4.

The Annual Energy Outlook 2008 report projected that energy-related emissions of CO_2 will grow by 16 percent from 2006 to 2030. In this projection, the mix of sources for this generation include coal, natural gas, nuclear, liquids (petroleum), hydro-power, and non-hydro renewable (wind, solar, etc.). The forecasted generation mix by 2030 as compared to 2007 is included in Table 4-38 (USDOE 2008b).

Table 4-38. Projected Percent of CO_2 Emissions by Source (2007 and 2030).

Source	**2007**	**2030**
Coal	51%	58%
Nuclear	21%	19%
Natural Gas	18%	11%
Petroleum	1%	1%
Hydro Power	7%	6%
Renewables	2%	5%

The Electric Power Research Institute (EPRI) attempted to identify a scenario of how the full portfolio of technologies to provide for electric energy would respond if national policy were to require that CO_2 emissions be reduced to 1990 levels (James 2007). As noted earlier, there is no regulatory structure or CO_2 emission levels or limits that have been set by national policy or law yet. This scenario provides some analysis of the possible effect of regulation as well as decreased demand through energy efficiency at the user end, in transmission, and at the producer end. The forecasted generation mix by 2030 as compared to 2007 is included in Table 4-39.

The EPRI study predicts that national policy that forces a reduction of CO_2 emissions to 1990 levels would promote increased energy efficiency, and the growth of “non carbon” sources such as nuclear and renewable. Renewable sources include wind and solar, as well as emerging technologies like tidal power, river turbines and others reported in the media. Hydropower is limited because most opportunities for hydropower have been used or require large infrastructure. Use of carbon based sources such as gas and petroleum are less

Table 4-39. Projected Percent of CO_2 Emissions by Source (2007 and 2030) Under a Reduced CO_2 Emissions Scenario.

Source	2007	2030
Coal	51%	52%
Nuclear	21%	29%
Natural Gas	18%	5%
Petroleum	1%	0%
Hydro Power	7%	5%
Renewables	2%	9%

than forecasted by the USDOE Energy Information Administration (EIA), while coal use remains about the same in the EPRI forecast, mostly due to forecasted improvement in GHG emission reduction in coal fueled generation. Both EIA and EPRI forecast increases in electricity cost.

The mines in the PRB have sold and are expected to sell coal into the open coal market. In both EIA market projections and market projections that contemplate CO_2 regulation, the coal market supplies half or more of the electric generation mix through 2020. Each mine's ability to sell coal in this market will determine annual production rates at that mine. Historically, the coal buyers have been domestic electric producers, although the coal could be used in other coal applications or be exported.

The three Wright Area coal mines produced 195.8 million tons of coal in 2006, which represents about 45.4 percent of the coal produced in the Wyoming PRB in 2006, or about 6.4 percent of the estimated U.S. CO_2 emissions in 2006. Under the No Action Alternative, CO_2 emissions attributable to burning coal produced by the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines would be extended at about this level for up to approximately 11 years beyond 2008, while the mines recover their remaining estimated 2,691 million tons of currently leased coal reserves. It is likely that, by that time, regulations limiting CO_2 emissions will be in place and, potentially, projects utilizing the emerging technologies to reduce and/or sequester CO_2 emissions would be more established.

Section 3.18.2 contains estimates of greenhouse gas emissions resulting from the specific mine operations at the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines from projected operations under the Proposed Actions and alternatives.

Under the Proposed Action and Alternatives 2 and 3, the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines anticipate producing the coal included in the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts at or less than currently permitted levels using existing production and transportation facilities, which would extend CO_2 emissions related to burning coal from the applicant mines for up to about 23 additional years beyond 2008. It is not possible to project the level of CO_2 emissions that burning the coal from the six Wright Area

Coal LBA Tracts would produce due to the uncertainties about what emission limits will be in place at that time or where and how the coal in these LBA tracts would be used after it is mined. It is not likely that selection of the No Action Alternatives would result in a decrease of U.S. CO_2 emissions attributable to coal-burning power plants in the longer term, because there are multiple other sources of coal that, while not having the cost, environmental, or safety advantages, could supply the demand for coal beyond the time that the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines complete recovery of the coal in their existing leases.

CBNG, which is composed primarily of methane, another greenhouse gas, is released into the atmosphere when coal is mined. According to the EIA (USDOE 2007a and 2007b):

- U.S. anthropogenic methane emissions totaled 605 million metric tons CO_2 equivalent (CO_2e) in 2006.

- U.S. 2006 methane emissions from coal mining were estimated at 64.7 million metric tons CO_2e, which represents approximately 10.7 percent of the U.S. total anthropogenic methane emissions in 2006.

- Surface coal mining operations in the U.S. were estimated to be responsible for methane emissions of about 14.2 million metric tons of CO_2e in 2006, which represents about 2.35 percent of the estimated U.S. anthropogenic methane emissions in 2006, and about 22 percent of the estimated methane emissions attributed to coal mining of all types.

- The Wyoming PRB produced approximately 53.7 percent of the coal mined in the U.S. in 2006 using surface mining techniques, which means that Wyoming PRB surface coal mines were responsible for approximately 1.26 percent of the estimated U.S. anthropomorphic methane emissions in 2006. The three Wright Area coal mines contributed about 52 percent of the Wyoming PRB production in 2006.

Since 1990, when BLM began leasing using the lease by application process, total U.S. anthropogenic methane emissions declined from 708.4 million metric tons CO_2e to 605.1 million metric tons CO_2e in 2006. Total coal mining related emissions declined from 97.7 million metric tons CO_2e to 64.7 million metric tons CO_2e during the same time period. The EIA attributes the overall decrease in coal mine emissions of methane since 1990 to the fact that the coal production increases during that time had been largely from surface coal mines that produce relatively little methane (USDOE 2007a).

CBNG is currently being commercially produced by oil and gas operators from wells within and near the Wright Area Coal LBA Tracts. CBNG that is not recovered prior to mining would be vented to the atmosphere during the mining process. Selection of the No Action Alternatives would potentially allow more complete recovery of the CBNG from the Wright Area Coal LBA Tracts in the

short term (roughly 10 years), during the time that the three applicant mines' currently leased coal is being recovered. However, BLM's analysis suggests that a large portion of the CBNG resources that are currently present on the tract would be recovered prior to mining under the Proposed Action or Alternatives 2 or 3. Selection of the No Action Alternatives would not be likely to directly decrease U.S. methane emissions attributable to coal mining in the long term because there are multiple other sources of coal that could supply the coal demand beyond the time that the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines recover the coal in their existing leases.

4.2.14.2 Mercury, Coal Combustion Residues, and Other By-Products

To meet the nationwide consumer demand and requirement for energy, coal is burned in power plants to produce electricity for the United States. Coal is an important component of the U.S. energy supply partly because it is the most abundant domestically available fossil fuel (USGS 2002b). One-quarter of the world's coal reserves are found within the U.S.; the energy content of U.S. coal resources exceeds that of all the world's known recoverable oil; and coal resources supply more than half of the electricity consumed by Americans (USDOE 2008b and 2009). Many countries are even more reliant on coal for their energy needs than is the United States. More than 70 percent of the electricity generated in China and India comes from coal (USGS 2000). The value of coal is partially offset by the environmental impacts of coal combustion (USGS 2000). As described below, some of these impacts may have direct or indirect effects on human health (USGS 2000).

One of the concerns associated with burning coal for electricity production is the release of elements from coal to the environment (USGS 2000). When coal is burned, carbon dioxide, sulfur dioxide, nitrogen oxides, mercury, and other compounds and elements, including lead and cadmium, are released (EPA 2009d). The principal pollutants generated by coal combustion that can cause health problems are particulates, sulfur and nitrogen oxides, trace elements (including arsenic, fluorine, selenium, and radioactive uranium and thorium), and organic compounds generated by incomplete coal combustion (USGS 2000).

In coal combustion, concentrations of these elements and compounds vary depending on the chemistry of the coal deposits and on the type of air pollution controls in place when the coal is burned. Coal use in developing countries can potentially cause serious human health impacts (USGS 2000). Some coal mined in China is known to have caused severe health problems in several local populations because the coal was mined and burned with little regard to its chemical composition (USGS 2000). Chinese coals that contained high levels of arsenic, fluorine, selenium, and polycyclic aromatic hydrocarbons have caused severe, life-threatening health impacts to some residents that burned the coal in unvented stoves in their homes (USGS 2000).

Coal that is burned in the U.S. generally contains low to modest concentrations of potentially toxic trace elements and sulfur (USGS 2000). Specifically, Powder

River Basin coal is recognized as being a clean burning coal due to its low sulfur and low ash properties. In a 2002 analysis conducted by USGS (2002b), PRB coal was found to contain, on average, approximately 8 times less sulfur than coals being utilized from the Appalachian and Illinois basins to supply U.S. power plants (feed coal). PRB feed coal was also found to contain nearly half as much uranium (8.9 ppm), 7 times less arsenic (17 ppm), 5 times less lead (19 ppm), and 3 times less cadmium (1.1 ppm) as compared to Appalachian and Illinois basin feed coals. When burned, PRB coal produced, on average, 38 percent less fly ash than Appalachian and Illinois basin coals (USGS 2002b). The fly ash resulting from combusted PRB coal contained approximately 39 times less mercury than fly ash that was generated from combusted Appalachian and Illinois basin coal (USGS 2002b).

Additionally, many U.S. coal burning power plants use sophisticated pollution-control systems that efficiently reduce the emission of hazardous elements (USGS 2000). The EPA conducted a detailed study of possible health impacts from exposure to emissions of approximately 20 potentially toxic substances from U.S. coal-burning power plants (USGS 2000). The EPA concluded that, with the exception of possibly mercury, there is no compelling evidence to indicate that emissions from U.S. coal-burning power plants cause human health problems (USGS 2000).

Mercury is a naturally occurring element and enters the environment as a result of natural sources, such as active volcanoes, and through human activities such as industrial combustion and mining (EPA 2006). Natural sources of mercury, such as volcanic eruptions and emissions from the ocean, have been estimated to contribute about 33 percent of the current worldwide mercury air emissions; anthropogenic (human-caused) mercury emissions account for the remaining 67 percent, though these estimates are highly uncertain (EPA 2009e).

When fossil fuels burn, mercury vapor can be released into the atmosphere where it may drift for a year or more, spreading with air currents over vast regions of the globe (USDOE 2006). In 1995, an estimated 5,500 tons of mercury was emitted globally from both natural and human sources, and coal-fired power plants in the U.S. contributed to less than one percent of that total (USDOE 2006).

Mercury is a global problem that knows no national or continental boundaries. It can travel thousands of miles in the atmosphere before it is eventually deposited back to the earth in rainfall or in dry gaseous forms. EPA estimates that about one-third of the U.S. anthropogenic mercury emissions are deposited within the contiguous U.S. and the remainder enters the global cycle (EPA 2009e).

Table 4-40 summarizes how the various continents contributed to the worldwide anthropogenic mercury emissions in 2004. The 2004 U.S. anthropogenic mercury emissions were estimated to account for about three percent of the global total (EPA 2009e). EPA estimates that 83 percent of the mercury

Table 4-40. 2004 Percent Contribution to Worldwide Anthropogenic Mercury Emissions.

Continent	Percent
Asia:	53
Africa:	18
Europe:	11
North America:	9
Australia:	6
South America;	4

Source: EPA 2009e

deposited in the U.S. originates from international sources, with the remaining 17 percent coming from the U.S. and Canada. These figures include mercury from natural and anthropogenic sources (EPA 2006).

In 2006, EPA estimated that 50-70 percent of current global anthropogenic atmospheric emissions came from fuel combustion, and much of it came from China, India, and other Asian countries. Coal consumption in Asia is expected to grow significantly over the next 20 years. This international source of mercury emissions may grow substantially if left unaddressed (EPA 2006).

Over the past decade, addressing environmental and human health mercury risks has been a focus for EPA. Overall U.S. mercury air emissions have been reduced by 45 percent since 1990. EPA is most concerned with methyl mercury, a potent form of mercury and the form to which humans are primarily exposed (EPA 2006).

Atmospheric mercury can settle into water or onto land where it can be washed into the water. Certain microorganisms can transform mercury into methyl mercury, a highly toxic mercury compound that builds up in fish and shellfish when they feed. Methyl mercury is the only form of mercury that biomagnifies in the food web. Concentrations of methyl mercury in fish are generally on the order of a million times the methyl mercury concentration in the water. The primary pathway of human exposure to mercury is through eating fish containing methyl mercury (EPA 2006).

There are adverse health effects to humans and other animals that consume these fish and shellfish. Birds and mammals that eat fish may be more exposed to mercury more than other animals in water ecosystems (EPA 2008c). At high levels of exposure, methyl mercury's harmful effects may include death, reduced reproduction, slower growth and development, and abnormal behavior (EPA 2008c). Research has shown that most people's fish consumption does not cause a health concern, but high levels of methyl mercury in the bloodstream of unborn babies and young children may harm the developing nervous systems of those children (EPA 2006).

The U.S. Department of Energy's (USDOE's) Office of Fossil Energy has been sponsoring studies on mercury emissions from coal-based power generators to

identify effective and economical control options for the past decade. The Office of Fossil Energy manages the largest funded program in the U.S. for developing an understanding of mercury emissions and developing emission control technologies for the coal-fired electric generating industry in the U.S. (USDOE 2006). Research on advanced and improved mercury control technology is ongoing.

In the U.S., coal-burning power plants are the largest human-caused source of mercury emissions being released into the air, accounting for about 40 percent of all domestic human-caused mercury emissions (EPA 2008c). However, these emissions contribute little to the global mercury pool. EPA estimated that mercury emissions from U.S. coal-fired power plants account for about one percent of the global total (EPA 2009e).

Coal production from the Wyoming PRB represented approximately 42 percent of the coal used for power generation in 2006, which would represent about 0.4 percent of the global anthropogenic mercury emissions. The three Wright Area coal mines produced about 45.4 percent of the coal produced in the Wyoming PRB in 2006, which would represent about 0.2 percent of the global mercury emissions. Under the No Action Alternatives, mercury emissions attributable to burning coal produced by the three Wright Area coal mines would be extended at about current levels of up to approximately 11 years beyond 2008, while the mines recover their remaining estimated 2,691 million tons of currently leased coal reserves. Under the Proposed Actions or Alternatives 2 or 3, the three Wright Area coal mines contribution to global mercury emissions would be extended from 1.6 to 22.8 additional years, depending on the tract and alternatives selected. Uncertainties about future regulatory requirements and the use of the coal mined from the six Wright Area Coal LBA Tracts make it difficult to project the impacts of mercury emissions produced by burning coal produced from these tracts.

Additionally, burning coal in electric utility boilers generates residual materials which are referred to as coal combustion residues. These residues include non-combustible materials left in the furnaces and ash that is carried up the smokestacks and collected by air pollution control technologies. As previously referenced, coal and coal combustion residues can contain a variety of compounds, metals, and other elements depending on the coal deposit and upon the site-specific characteristics of where the coal originated from. Coal-fired boilers are required to have control devices to reduce the amount of emissions that are released into the atmosphere (EPA 2007f). The use of air pollution control equipment at power plants has resulted in fewer emissions but has also increased the amount of solid residues.

In the past, coal combustion residues have generally been recycled or disposed of in landfills or surface impoundments. More recently, these residues have been disposed of in mines. There can potentially be risks of contamination of drinking water supplies and surface water bodies by coal combustion residues, particularly when they are disposed of in mines (National Academy of Science

2006, EPA 2002). The EPA is evaluating management options for solid wastes from coal combustion, including whether current management practices pose risks to human health or ecological receptors. A draft report, dated August 6, 2007, prepared for the EPA Office of Solid Waste, and entitled "Human and Ecological Risk Assessment of Coal Combustion Wastes", is available at http://www.earthjustice.org/library; however, the report is labeled as a draft document which is not to be cited or quoted.

As discussed above, the Wright Area coal mines produced about 45.4 percent of the coal produced in the Wyoming PRB in 2006. Under the No Action Alternatives, production of coal combustion residue attributable to burning coal from the three Wright Area coal mines would be extended at about current levels for up to approximately 11 years beyond 2008, while the mines recover their remaining estimated 2,691 million tons of currently leased coal reserves. Under the Proposed Action or Alternatives 2 or 3, coal combustion residue related to burning coal mined at the Wright Area coal mines would be extended from 1.6 to 22.8 additional years, depending on the tract and alternatives selected. Uncertainties about future regulatory requirements and the use of the coal mined from the six Wright Area Coal LBA Tracts make it difficult to project the impacts of disposing coal combustion residues produced by burning coal produced from these tracts.

Depending on the size, shape, and chemical composition, some coal combustion residues can be recycled and beneficially reused as components of building materials or as replacement to raw materials that would ordinarily need to be mined such as sand, gravel, or gypsum (EPA 2007f). Coal combustion products (CCPs) are the materials produced primarily from the combustion of coal in coal-fired power plants and can include the following materials: fly ash, bottom ash, boiler slag, and flue gas desulfurization material (EPA 2007f). Studies and research conducted or supported by the EPA, Electric Power and Research Institute (EPRI), other government agencies, and universities have indicated that the beneficial uses of coal combustion products have not been shown to present significant risks to human health or the environment (EPA 2008d).

Fly ash is a byproduct of burning finely ground coal in a boiler to produce electricity. Physically, fly ash is a fine, powdery material composed mostly of silica and nearly all particles are spherical in shape. Fly ash is a pozzolan—a siliceous material which, in the presence of water, will react with calcium hydroxide at ordinary temperatures to produce cementitious compounds. Because of its spherical shape and pozzolanic properties, fly ash can be useful in cement and concrete applications (EPA 2007g).

Bottom Ash is agglomerated ash particles, formed in pulverized coal furnaces that are too large to be carried in the flue gases. Bottom ash is coarse with grain sizes spanning from fine sand to fine gravel. It can be used as a replacement for aggregate and is usually sufficiently well-graded in size to avoid the need for blending with other fine aggregates to meet gradation requirements (EPA 2007h).

Boiler slag is the molten bottom ash collected at the base of slag tap and cyclone type furnaces. Boiler slag particles are uniform in size, hard, and durable with a resistance to surface wear. The permanent black color of this material is desirable for asphalt applications and aids in the melting of snow (EPA 2007i).

Flue Gas Desulfurization (FGD) material is a product of a process typically used for reducing SO_2 emissions from the exhaust gas system of a coal-fired boiler (EPA 2007j). These materials can be used as embankment and road base material, wallboard manufacturing, and in place of gypsum for the production of cement. Currently, the largest single market for FGD material is in wallboard manufacturing (EPA 2007j).

Utilizing CCPs can generate significant environmental and economic benefits (EPA 2009f). CCPs can be used for raw feed for cement clinker, concrete, grout, flowable fill, structural fill, road base/sub-base, soil modification, mineral filler, snow and ice traction control, blasting grit and abrasives, roofing granules, mining applications, wallboard, waste stabilization/solidification, and soil amendment. Using CCPs can reduce energy consumption and greenhouse gas emissions and can help reduce the need for landfill space. Economic benefits include reduced costs associated with managing coal ash and slag disposal, potential revenue from the sale of CCPs, and savings from using CCPs in place of other more costly raw materials (EPA 2009f).

CCPs offer product-performance benefits as well. Boiler slag is a sought-after replacement for sand in blasting grit because it is free of silica and eliminates the potential health risk of silicosis (EPA 2007i). High coal ash content concrete is used for building long-lived pavements designed to last 50 years—twice the lifetime of conventional pavements. Coal fly ash can create superior products because of its self-cementing properties. Using coal fly ash in concrete can also produce stronger and longer-lasting buildings (EPA 2007g). This not only reduces the costs of maintaining buildings, but provides the additional environmental benefit of reducing the need for new concrete to repair or replace aging buildings. This translates to a significant reduction in future energy consumption and GHG emissions (EPA 2007g).

In 2005, demand had become so strong for coal ash that some power plants were selling all the ash they produced (EPA 2005b). EPA estimated that through the utilization of 15 million tons of coal fly ash, the U.S. reduced their greenhouse gas emissions equivalent to the annual emissions of nearly 2.5 million passenger vehicles (EPA 2008e).

Because of the many potential uses of CCPs, EPA has sponsored the Coal Combustion Products Partnership (C^2P^2) Program to further the beneficial use of these coal combustion by-products (EPA 2003b). With more than 170 private and public partners (EPA 2009g), the C^2P^2 Program is a cooperative effort between EPA and various organizations to help promote the beneficial use of CCPs and the environmental benefits which can result from the proper use of these potentially recyclable materials (EPA 2003b). The C^2P^2 program will help

meet the national waste reduction goals of the Resource Conservation Challenge—an EPA effort to find flexible yet more protective ways to conserve valuable natural resources through waste reduction, energy recovery, and recycling (EPA 2009g).

In 2007, the U.S. used approximately 43 percent of its coal combustion products (EPA 2009f). The C^2P^2 program aims to reduce adverse effects on air and land by increasing the use of coal combustion products to 50 percent in 2011 from 32 percent in 2001 (EPA 2009g). The program also plans to increase the use of CCPs as a supplementary cementitious material in concrete by 50 percent, from 12.4 million tons in 2001 to 18.6 million tons in 2011; this would decrease GHG emissions from avoided cement manufacturing by approximately 5 million tons (EPA 2009g).

5.0 CONSULTATION AND COORDINATION

In addition to this Environmental Impact Statement (EIS)[1], other factors and consultations are considered and play a major role in determining decisions on the proposed lease applications. They are included in the following list below.

Regional Coal Team Consultation

The four coal lease applications included in this EIS were reviewed and discussed at Powder River Regional Coal Team (PRRCT) public meetings held on April 19, 2006, in Casper, Wyoming (North Hilight Field, South Hilight Field, West Hilight Field, and West Jacobs Ranch tracts), and on January 18, 2007, in Casper, Wyoming (North and South Porcupine tracts). The North and South Hilight Field tracts were applied for in a single application, and the North and South Porcupine tracts were applied for in a single application. Each of the applicants presented information about their existing mines and pending lease application to the PRRCT at those meetings. Voting and nonvoting members of the PRRCT include the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, the U.S. Department of Agriculture - Forest Service (USFS), Office of Surface Mining Reclamation and Enforcement (OSM), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and U.S. Geological Survey (USGS). The PRRCT determined that the lands in the four applications met the qualifications for processing as production maintenance tracts. The PRRCT recommended that the Bureau of Land Management (BLM) continue to process all four lease applications.

Governor's Consultation

The Bureau of Land Management (BLM) Wyoming State Director notified the Governor of Wyoming on April 27, 2006, that Ark Land Company (ALC) had filed a lease application with BLM for the North and South Hilight Field Lease by Application (LBA) Tracts. The BLM Wyoming State Director notified the Governor of Wyoming on February 2, 2006, that ALC had filed a lease application with BLM for the West Hilight Field LBA Tract. The BLM Wyoming State Director notified the Governor of Wyoming on September 18, 2006, that Jacobs Ranch Coal Company (JRCC) had filed a lease application with BLM for the West Jacobs Ranch LBA Tract. The BLM Wyoming State Director notified the Governor of Wyoming on March 14, 2007, that BTU Western Resources, Inc. (BTU) had filed a lease application with BLM for the North and South Porcupine LBA Tracts.

Public Notice

BLM published a Notice of Intent (NOI) to prepare an EIS and Notice of Public Meeting in the *Federal Register* on July 3, 2007, in the Gillette News-Record on

[1] Refer to page xxvi for a list of abbreviations and acronyms used in this document.

July 6, 2007, and in the Douglas Budget on July 11, 2007. The publications served as public notice that the Hilight Field, West Hilight Field, West Jacobs Ranch, and Porcupine coal lease applications had been received, announced the time and location of a public scoping meeting, and requested public comment on the four applications. Letters requesting public comment and announcing the time and location of the public scoping meeting were mailed to all parties on the distribution list on July 11, 2007.

At the public scoping meeting, which was held July 24, 2007 in Gillette, Wyoming, the applicants orally presented information about their mines and their need for the coal. The presentations were followed with a question and answer period, during which three oral comments were made. The scoping period extended from July 3 through September 3, 2007, during which time BLM received nine comment letters.

The Environmental Protection Agency (EPA) will publish a Notice of Availability in the *Federal Register* for the Draft Environmental Impact Statement (DEIS). The BLM will publish a Notice of Availability and Notice of Public Hearing in the *Federal Register* for the DEIS. There will be a 60-day comment period on the DEIS. A formal public hearing will be held during the 60-day comment period to solicit public comments on the DEIS, the fair market value, the maximum economic recovery, and the proposed competitive sale of coal from the six LBA tracts. Following the comment period on the DEIS, the Final Environmental Impact Statement (FEIS) will be prepared. Comments received from the public, state, and federal review agencies on the DEIS will be included in the FEIS.

Parties on the distribution list will be sent copies of the FEIS when it is completed, and the EPA will publish a Notice of Availability for the FEIS. After a 30-day availability period, BLM will make a separate decision to hold or not to hold a competitive lease sale for the federal coal in each of these six LBA tracts. A separate Record of Decision (ROD) will be prepared and signed for each of the tracts. Copies of each ROD will be mailed to parties on the mailing list and others who commented on this EIS during the National Environmental Policy Act (NEPA) process. After each ROD is signed, there will be a 30-day appeal period before the ROD is implemented. If lands administered by the USFS are included in the tracts that are offered for lease, the USFS will prepare and sign a separate consent decision for each tract. Applicable Forest Service regulations for appeal will be followed.

Department of Justice Consultation

After each competitive coal lease sale, but prior to issuance of a lease, BLM will solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws. The Department of Justice is allowed 30 days to make this determination. If the

Department of Justice has not responded in writing within the 30 days, BLM can proceed with issuance of the lease.

Other Consultations

Other federal, state, local, and Native American governmental agencies that have been consulted in preparation of this EIS or will be consulted prior to making a decision to hold or not to hold a federal coal lease sale are listed in the following tables.

Contributors, Reviewers, and Preparers

This EIS was prepared by WWC Engineering, a third-party contractor, under the direction of the BLM. Representatives from cooperating agencies reviewed and contributed to the EIS. Tables 5-1 and 5-2 provide listings of the BLM, cooperating agency, and third-party consultant personnel who prepared and reviewed this EIS.

Distribution List

This EIS was distributed to Congressional offices, federal agencies, state governments, local governments, industry representatives, interest groups, and individuals for their review and comment (Table 5-3).

Table 5-1. List of Contributors and Reviewers.

Name	Project Responsibility
BLM High Plains District Office	
Mike Karbs	Project Supervisor
Sarah Bucklin	Wright Area EIS Project Manager, Wildlife, T&E Species
Teresa Johnson	Environmental Protection Specialist
Ginger Vickers	Legal Assistant, Distribution List
Mike Brogan	Water Resources
BLM Wyoming State Office	
Bob Janssen	Coal Program Coordination
Janet Kurman	NEPA Coordination
Mavis Love	Land Adjudication
Larry Jensen	Socioeconomics
Steve Hageman	Minerals Appraiser
Bill Hill	Resources
John Zachariassen	Air Quality and Climate
Rick Schuler	Water Resources
BLM Wyoming Reservoir Management Group	
Dwain McGarry	CBNG Geology
Lee Almasy	CBNG Reservoir Engineering
Dave Chase	Mineral Resources
BLM Buffalo Field Office	
Tom Bills	EIS Liaison
Clint Crago	Cultural Resources, Paleontology
Buck Damone	Cultural Resources
Kay Medders	Rangeland Resources
Jerry Queen	Geology, Mineral Resources, Mining Claims
Chris Durham	Wildlife, T&E Species, BLM Sensitive Species
USDA-Forest Service	
Misty Hays	Deputy District Ranger, FS Representative, Socioeconomics
Mike Fracasso	EIS Liaison, Geology, Mineral Resources, Paleontology
Ian Ritchie	Cultural Resources
Charlie Bradshaw	Vegetation, Range, Weeds
Moriah Shadwick	Vegetation, Range, Weeds
Kathy Roche	Botany, T&E Plants, USFS Sensitive Plant Species
Tim Byer	Wildlife, T&E Animals, Management Indicator Species
Catherine Willard	Fisheries, Amphibians, Reptiles
Dave Gloss	Water Resources, Wetlands
Greg Eaglin	Air Quality
Randy Tepler	Soils
Marcia Rose-Ritchie	Land Use, Recreation
Jeff Tupala	Visual Resources
Amy Ormseth	Hazardous Waste, Transportation

Table 5-1. List of Contributors and Reviewers (Continued).

Name	Project Responsibility
BLM National Science and Technology Center (Powder River Basin Coal Review)	
Craig Nicholls	Air Quality and Climate
Paul Summers	Water Resources
Office of Surface Mining Reclamation and Enforcement Western Regional Coordinating Center	
Foster Kirby	Archaeologist, EIS Cooperating Agency Representative
Board of Converse County Commissioners	
James H. Willox	EIS Cooperating Agency Representative
Wyoming Department of Transportation	
Larry Konetzki	EIS Cooperating Agency Representative
University of Wyoming	
Bonnie Heidel	Wyoming Natural Diversity Database Botanist
Ron Hartman	Rocky Mountain Herbarium Curator
B. Ernie Nelson	Rocky Mountain Herbarium Manager
ENSR International (Powder River Basin Coal Review)	
Valerie Randall	Project Manager
Dolora Koontz	Assistant Project Manager and Task 2 Manager (Existing Development and Reasonably Foreseeable Development)
Eldon Strid, Matt Reilly	Existing and Projected Coal Development and Coal Transportation Scenarios
Doree Dufresne	Database Development
Bruce MacDonald, PhD	Air Quality
Robert Berry, PhD	Water Resources
James Rumbaugh	Ground Water Modeling
Brad Anderson	Surface Water
Ron Dutton, George Blankenship	Socioeconomics
Bernhard Strom	Land Use, Transportation, and Utilities
William Berg	Topography, Geology, and Minerals
James Burrell, James Nyenhuis	Soils and Alluvial Valley Floors
Jon Alstad	Vegetation, Wetlands, and Grazing
Charles Johnson	Wildlife
Rollin Daggett	Fisheries
Kim Munson	Native American Concerns, and Paleontological Resources
Wyoming Department of Environmental Quality (WDEQ) Office of Outreach Services	
Dan Clark	Ombudsman, EIS Liaison

Table 5-1. List of Contributors and Reviewers (Continued).

Name	ProjectResponsibility
	WDEQ Land Quality Division
Don McKenzie	Administrator
Kathy Muller Ogle	CHIA Program Supervisor
Mark Rogaczewski	District Three Supervisor
Anna Waitkus	Senior Analyst
Doug Emme	Blasting Program Principal
	WDEQ Air Quality Division
Kelly Bott	Engineer/EIS Cooperating Agency Division Representative
	WDEQ Water Quality Division
John Wagner	Water Resources
	Wyoming Game and Fish Department
John Emmerich	Deputy Director – External Programs
	Wyoming State Planning Office
Steve Furtney	Coal Issues Coordination/Cooperating Agency Representative

Table 5-2. List of Preparers.

Name	Education/Experience	Responsibility
	BLM High Plains District Office	
Mike Karbs	33 years professional experience, M.S., B.S. Mineral Engineer, Public Policy	EIS Project Supervisor
Sarah Bucklin	M.S. Candidate Zoology, B.S. Biology, Registered Associate Wildlife Biologist, 10 years professional experience	EIS Project Manager
	WWC Engineering Third-Party Contractor	
Ken Collier	B.S. Geology, 32 years professional experience Licensed Wyoming Geologist	Project Management Report Preparation
John Berry	B.S. Wildlife Biology, 32 years professional experience	Report Preparation
Heidi Robinson	17 years professionalexperience	Document Production
Mal McGill	11 years professional experience	CADD/Figures Preparation

Subcontractors

Resource Responsibility	For ALC: North, South and West Hilight Field Tracts
Geology/Mineral Resources	Habitat Management, Inc., Gillette, WY
Air Quality	Knight Technologies, Inc., Gillette, WY
Water Resources	WWC Engineering, Sheridan, WY
Alluvial Valley Floors	Habitat Management, Inc., Gillette, WY
Wetlands	Knight Technologies, Inc., Gillette, WY
Soils	BKS Environmental Associates, Inc., Gillette, WY
Vegetation	Habitat Management, Inc., Gillette, WY
Wildlife	Thunderbird-Jones and Stokes, Gillette, WY
Land Use/Ownership	Habitat Management, Inc., Gillette, WY
Cultural/Paleontology	GCM Services, Inc., Butte, MT
Visual	Knight Technologies, Inc., Gillette, WY
Socioeconomics	WWC Engineering, Laramie, WY

Resource Responsibility	For JRCC: West Jacobs Ranch Tract
Geology/Mineral Resources	Aqua Terra Consultants, Sheridan, WY
Water Resources	Aqua Terra Consultants, Sheridan, WY
Alluvial Valley Floors	Aqua Terra Consultants, Sheridan, WY
Wetlands	Aqua Terra Consultants, Sheridan, WY
Soils	Intermountain Resources, Laramie, WY
Vegetation	Intermountain Resources, Laramie, WY
Wildlife	Intermountain Resources, Laramie, WY
Land Use/Ownership	Aqua Terra Consultants, Sheridan, WY
Cultural/Paleontology	GCM Services, Inc., Butte, MT
Socioeconomics	WWC Engineering, Laramie, WY

Table 5-2. List of Preparers (Continued).

Resource Responsibility	**For BTU: North and South Porcupine Tracts**
Soils	BKS Environmental Associates, Inc., Gillette, WY
Vegetation	BKS Environmental Associates, Inc., Gillette, WY
Wildlife	Thunderbird-Jones and Stokes, Gillette, WY
Cultural/Paleontology	GCM Services, Inc., Butte, MT
Socioeconomics	WWC Engineering, Laramie, WY

Table 5-3. BLM Distribution List for the Wright Area Draft EIS.

Federal and State Officials

Governor of Montana Brian Schweitzer
Governor of Wyoming Dave Freudenthal
Representative Dave Edwards
Representative Erin Mercer
Representative Sue Wallis
Representative Timothy Hallinan
Representative Thomas Lubnau
Senator Jim Anderson
Senator John Hines
Senator Michael Von Flatern
US Congresswoman Cynthia M. Lummis
US Senator John Barrasso
US Senator Mike Enzi

Federal Agencies

BLM Library, Denver, CO
BLM, Buffalo, WY
BLM, Casper, WY
BLM, Cheyenne, WY
BLM, Miles City, MT
BLM, Montana State Office, Billings, MT
BLM, Washington, DC
Bureau of Indian Affairs, Washington, DC
Department of Energy, Casper, WY
Department of Energy, Washington, DC
Department of Interior, Denver, CO
Devils Tower National Monument
Medicine Bow National Forest, Laramie, WY
Mineral Management Bureau, Helena, MT
MMS, Denver, CO
MMS, Herndon, VA
National Park Service, Denver, CO
NPS - Air Resources Division, Denver, CO
NPS, Washington, DC
NRCS, Douglas, WY
OEPC, Denver, CO
OSM - Library, Denver, CO
OSM, Casper, WY
OSM, Denver, CO
OSM, Washington, DC
Rocky Mountain Regional Solicitor
US Army Corps of Engineers, Cheyenne, WY
US EPA, Denver, CO
US EPA, Washington, DC
US Fish & Wildlife Service, Arlington, VA
US Fish & Wildlife Service, Cheyenne, WY
US Geological Survey, Cheyenne, WY
US Geological Survey, Denver, CO
US Geological Survey, Reston, VA
US Government Printing Office, Washington, DC
USDA – FS, Douglas Ranger District, Douglas, WY
USDA Forest Service, Douglas, WY
USDA Forest Service, Golden, CO
USGS Water Resources Division, Cheyenne, WY

Wyoming State Agencies

Economic Analysis Division
Office of State Lands and Investments
Office of the State Treasurer
WDEQ - Air Quality Division
WDEQ - ISD
WDEQ - Land Quality Division, Cheyenne
WDEQ - Land Quality Division, Sheridan
WDEQ - Water Quality Division
Department of Agriculture
Department of Education
Department of Employment Research & Planning
Department of Transportation
Game & Fish Department, Cheyenne
Game & Fish Department, Lander
Game & Fish Department, Sheridan
O & G Conservation Commission
Office of State Lands & Investments
Parks & Cultural Resources Department
Public Service Commission
State Engineer's Office
State Geological Survey
State Historic Preservation Office
State Land Office
State Planning Office
Water Development Commission

Local Government and Agencies

Big Horn County Commission, MT
Campbell County Board of Commissioners, WY
Campbell County Conservation District, WY
Campbell County Department of Public Works, WY
Campbell County School District 1, WY
Carbon County, WY
City of Douglas, WY
City of Gillette, WY
Converse County Commission, WY
Converse County Joint Powers Board, WY
Converse County School District, WY
Converse City Special Projects, WY
Gillette Dept of Comm. Dev, WY
Rosebud County Commission, MT
Town of Wright, WY
Weston County Board of Comm., Newcastle, WY

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

Tribal Organizations and Individuals

Apache Tribe of Oklahoma
Arapahoe Business Council
Cheyenne River Sioux Tribe
Cheyenne-Arapaho Tribes of Oklahoma
Comanche Nation
Comanche Nation Tribe
Crow Creek Sioux Tribe, South Dakota
Crow Tribe, Montana
Eastern Shoshone Tribe
Flandreau Santee Sioux Tribe
Kiowa Business Committee
Lower Brule Sioux Tribe
Northern Arapaho Business Council
Northern Arapaho Tribe
Northern Cheyenne Cultural Commission
Northern Cheyenne Tribe
Oglala Sioux Tribe
Rosebud Sioux Tribe
Santee Sioux Tribe
Shoshone Business Council
Standing Rock Sioux Tribe

Other Organizations and Groups

Advisory Council on Historic Preservation
Biodiversity Conservation Alliance
Campbell City Economic Development Corp
CANDO
Center For Biological Diversity
Defenders of Wildlife
Federation for North American Wild Sheep
John P. Ellbogen Foundation
Medicine Wheel Coalition
National Mining Association
National Wildlife Federation
Natural Resources Defense Council
Petroleum Association of Wyoming
Powder River Basin Resource Council
Sierra Club
Thunder Basin Coalition
Trout Unlimited
WildEarth Guardians
WY Association of Professional Archeologists
WY Business Council/NE Region
Wyoming Bankers Association
Wyoming Business Alliance
Wyoming Mining Association
Wyoming Outdoor Council
Wyoming Stock Growers Association
Wyoming Wildlife Federation
Wyoming Wool Growers Association

Companies/Businesses

ABN Amro Mortgage Group, Inc.
Aceite Energy Corp
AE Investments, Inc.
AG Andrikopoulos Resources, Inc.
All American Equipment
Amax Land Co.
Amerada Hess Corporation
American Colloid Co.
Anadarko Exploration & Production
Anadarko Petroleum Corp
Anderson Investments
Anderson Oil Company
Anderson Oil Ltd.
Antelope Coal Company
APC Operation Partnership, LP
Arch Western Resources, LLC
Ark Land Company
Bandera Energy Company
Bank of America, NA
Barret Resources Corp.
Beard Oil Company
Belle Fourche Pipeline Company
Berenergy Corporation
Bill Barrett CBM LLC
Bill Barrett Corp.
Bjork Lindley Little PC
BKS Environmental
BNSF Railway Company
Boller-Mills Ranch
Bridgeview Coal Company
Bridle Bit Ranch Company
Buckskin Mine
Burlington Northern Santa Fe Railroad
Burlington Resources Oil & Gas Company LP
Burns & McDonnell
C & H Oil & Gas, Inc.
Calvin Petroleum Corp.
Carbon Recovery Technology
Cargoil Oil and Gas LLC
CH Snyder Company
Chaco Energy Company
Chaparral Royalty Company
Chevron USA Inc.
Citation 1994 Investment LP
Citation 2002 Investment LP
Citicorp North America, Inc.
Coleman Oil & Gas, Inc.
CNG Producing Company
Colonial Royalties Limited Partnership
Conoco-Phillips Petroleum Company
CONSOL Inc Exploration & Land
Cordero Rojo Mine
Cosner Minerals Limited Partnership

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

COU Rouge Oil & Gas
Cowry Enterprises, Ltd.
CTV O & G Multi-State LLC
Cucker, Montgomery, Aronstein & Bess, PC
Dakota - TX Oil Company
Daven Corporation
Davis Oil Company
Derby Energy LLC
Devon Energy Production Company LLP
DL Cook Estate
DNR O & G Inc.
Dry Fork Coal Company
Ducker Montgomery et al.
Durham Ranches Inc.
Dymond Resources Limited Partnership
EDE Consultants
El Paso Production Company
Eland Energy, Inc.
Ellbogen Property Management LTD
Energy Operating Company Inc.
ENSR
Environmental Solutions Inc.
EOG Resources Inc.
Explorers Petro Corp.
Exxon Mobil Oil Corporation
Fayette Oil & Gas Corporation
First Interstate Bank
First State Bank of Newcastle
Five Star Energy LLC
Fleischaker Mineral Company, LLC
Flocchini Investment
Flying J Oil & Gas Inc.
Foundation Coal West Inc.
Fulbright Tower, Guggenheim Corp.
Funding, LLC
Future Realty Inc.
Geyer Brothers Equipment
GPM, Inc.
Great Points Energy
Greenbrair Energy LP IV
Guest Petroleum, Inc
Hallador Petroleum, LLP
Hardin & Associates
Harvey E. Yates Company
Headington Investments, Inc
Headington Minerals, Inc.
HEYCO Employees LTD
Hilcorp Energy LLP
HQ-USAF/CEVP
Hunt Petroleum Inc.
Inexco Oil Company
ING (US) capital LLC
Intermountain Resources
Interwest Mining Company
Isaacs Family Ltd Liability Limited Partnership
Jacobs Ranch Coal Company
Jerry J. Dilts Family Ltd. Partnership
Jetta Production Company Inc.
JIREH Exploration and Consulting, LLC
John E. Jacobs Family Company, LLC
Jolen Operating Co.
Journey Properties, LLC
JP Morgan Chase Bank, NA
JPC, LLC
KAB Acquisitions LLP-VI
Kaiser-Francis Oil Company
Kastner Oil Properties, LLC
Kenneth R. Paulsen Consultants
Kerr McGee O & G Onshore LP
Kiewit Mining Company
Kiewit Mining Group, Inc.
Kiewit Mining Properties, Inc.
Kirby Minerals, LLC
Kirkwood Oil & Gas LLC
Klabzuba Oil & Gas Inc
KM Upstream, LLC
KN Gas Gathering, Inc.
Lasmo Oil & Gas, Inc.
LE Peabody & Associates
Levison Partners Corp.
Liberty Petroleum Corp
Louisiana Land & Exploration Co.
M & K Oil Company, Inc.
Malibu Presbyterian Church
Manitowac Mortgage Holding Company
Manx Oil Corporation
Marathon Oil Company
Marshall & Winston Inc.
Marston & Marston
McCulloch Interstate Gas Corp.
McDun Limited Partnership
McGraw-Hill
McMoran Oil & Gas Company
McVehil-Monnett Associates Inc
Meagher Oil & Gas Properties, Inc
Medallion Exploration
Media Maconi
MEG Wyoming Gas Services, LLC
Meineadair Consultants
Merit Energy Company
Merit Energy Partners
Midgard Energy Company
Mills Brothers
Mine Engineers Inc.
Mining Associates of Wyoming
Moon Royalty, LLC
Morse Acquisition LLC
Mountain Fuel Supply Company
Mourne Oil & Gas
Murjo Oil & Royalty Company
Nance Petroleum Corp.

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

Nationsbanc Leasing Corp
Nerco Coal Company
NM Doelger Consulting, LLC
Norwest Corporation
NPC, Inc.
Oilfield Salvage and Service Co.
Olive Oil LLC
Ostlund Investments
OXY USA Inc.
P & M Coal Mining Company
Pacific Power & Light Company
Paribas North America
Passeo Resources LLC
Pathfinder Energy, Inc.
Patina Oklahoma Corp.
Peabody Coal Company
Peabody Energy
Peabody Natural Gas LLC
Perry R. Bass, Inc.
Petro-Canada Resources (USA) Inc.
Petroleum, Inc.
Phillips Petroleum Company
Phoenix Resources Co.
Plains Petroleum Operating Co.
PNC Bank, National Association
Powder River Coal LLC
Powder River Energy Corporation
Powder River Oil & Gas Ventures, LLC
Prima Oil & Gas Company
Primary Natural Resources, Inc.
Providence Energy Corporation
Quest Communications International, Inc.
Questar Exploration and Production Co.
QWEST
RAM Energy Inc.
Raymond T. Duncan Oil Properties LTD
Resolute Wyoming
RIM Offshore, Inc.
Rio Tinto Energy America
Riverside Technology Inc.
RL Zinn, et al, LTD
Robert M. Bass Group
Royalty Repository II, LLC
Ryder Stilwell Oil
San Jan Coal Company
Scorpio Resources, Inc.
Scot Holding Inc., d/b/a Ture Blue Sky Inc.
Shogoil & Gas Co. LLC
Sid R. Bass, Inc.
Sioux Ranch, Inc.
Sonorin III, LLC
Spiral Inc.
Sport Resources, Inc.
Star Investment Corporation
Steveco
Stuart Family Mineral Limited partnership
Swift Energy Company
Talala Corporation
TBI Exploration, Inc.
TC Craighead & Company
Teton Capital Management, Inc.
Tetra Tech EC, Inc.
The Bud & Mary Lou Flocchini Family Partnership
Thru Line, Inc.
Thunder Basin Coal Company
Thunder Creek Gas Services, LLC
Thunderbird-Jones & Stokes
Titan Resources Corporation
Tom Brown, Inc.
Petro-Hunt, LLC
Tonka Oil & Gas Production, Inc.
TRC Environmental
Triton Coal Company, LLC
Tucker Family Investments, LLP
Two Rivers Ranch
Union Bank of California, NA
Union Pacific Railroad
US Bank National Association
US West Communications
Vintage Petroleum, Inc.
Wachovia Bank, National Association
Wells Fargo Bank, NA
Wellstar Corporation
West Roundup Resources, Inc
West Trnet Res. Corp.
Western Energy Company
Western Fuels Association
Western Gas Resources, Inc.
Westland Energy Inc.
Whiting Petroleum Joint Venture 1983-84
Wilbanks Acquisitions I, LLC
Williams Field Service Co.
Williams Production RMT Company
Wold Oil Properties Inc.
WP Properties Corporation
WWC Engineering
Wyotex Oil Company
Yates Petroleum Corp et al
Yates petroleum Corp.
ZAB, Inc.
Zalman Resources, Inc.

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

Press

Associated Press
Casper Star Tribune
Douglas Budget
Gillette News-Record
Platts
Rocky Mountain Oil Journal
Wyoming-Tribune Eagle

Educational Institutions

CSU Library
Northwestern University
NWU Policy Research Institute
University of Wyoming Libraries
URS Greiner Woodward Clyde Library
US Department of the Interior/Natural Resources Library

Individuals

Aronstein, James K.
Awve, Carl
Awve, Delores
Fraley Jr., Thomas
Aylsworth, Gayle
Baalman, Lynne M & Mark I
Baldwin, Katherine
Barbero, Ralph
Bartolone, Carmen
Belden, Scott
Bennage, James
Benson, Scott
Bierman, Sheldon
Birdsall, Jennie
Blacburn, Jannis
Boller, Verne
Bradley Jr., Jack
Brown, Maurice
Buchanan et vir, Patricia
Bunds, Carol
Burroughs, Chap
Cantrick, Joel
Chapa, Nancy
Chittenden, William M. & Lois R.
Collins, Kristina
Collums, James
Cottrell, Elizabeth Ann
Couch, Marion
Couch, Tom
Coulter, Betty
Craft, Lecia
Cupery, Karla
DeGroot, John
Deizell, Larry
Deputy et al, Robert
Dilts et ux, John
Diltz III, Fred
Ditmore, Judy
Dobbs, Kenna
Dorough Jr., Thomas
Dukam, Jennifer Springen
Dunlap, Katherin
Dymond, Michael
Edwards, Dorothy
Edwards, Linda
Edwards, Thomas W. & Leah B.
Ellbogen, John
Erwin, Tanya Lee
Ferguson, Gladys
Fleischman, Barbara
Fliginger, Mark
Flocchini Family, Richard & Patricia
Forbes Jr., Jim
Forbes, Roxie
Forster, Jamie
Glover, Dewey and Ruth
Glustrom, Leslie
Graham, John
Greer, Virginia Lee
Greub, Twyla
Gryneberg, Celeste
Gunnison, Lila Mae
Hardy, Vern R.
Hays, James K.
Hays, Robert D.
Heisner, Bill
Henderson, Misty L.
Hernandez, Beth
Hewit, Betty R.
Hines, Sandra
Holland, J. Read
Holt, David T.
Huckins, Coey
Huckins, Donny
Huckins, Gary P.
Isenberger, James n.
Isenberger, Mathew Lee
Isenberger, Robert E.
Jester, Debra A.
Johnson-Head, Debra
Johnson-Hopson, DeMar
Joslyn, Jerald D.
Joslyn, Ronald J.
Kennedy, George
Kimoski, Stephen
Kinnaman, Dorothy

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

Klabzuba, Robert
Klurfeld, Gregor
Kok, Margaret L.
Kraning, James
Kraning, Jerry W.
Kruse, Douglas G.
Kruse, Gary
Lass, Bonnie
Leadbetter, Cheryl
Leadbetter, Linda
Lee, Vivian E.
Lenhert, Amy L.
Leutwyler, Scott
Levorsen, Sandra
Lieberman, Erin
Litton, Mr & Mrs Gene E.
Loepp, David Q.
Mackey, Robert R.
Masek, John
Matejec, Hazel E.
Maxey, Shirley E.
McAfee, Paul
McMahon Jr., Joe
Meadows, Kelly
Merritt, Linda J.
Merritt, Ruth A.
Migchelbrink, Margaret E.
Mitchell, Brandon S.
Mitchell, Michael S.
Mohrmann, Brad
Moore Dr., Carl
Moore, Larry W.
Moore, Robert D.
Nash, Patsy Shubert
Nelson, Christine M.
Nichols, Jeremy
Nyenhuis, Jim
O'Connell, R.K.
Ogren, Harriet E.
Olson, Kermit G.
Papp, Alex
Paris, Jack W.
Pederson, Kathleen
Penner II, Robert L.
Penner, Wibert H.
Pippin, Robert L.
Powers, Shirley
Price et ux, William
Price, Bennett L.
Pridgeon, William L & P Elaine
Priewe, Doran E.
Richlin, Kory S.
Roarke et vir, Marjie
Rock, Kim
Rockefeller, Mandra
Roderick, Jonathan S.
Roemer, Dr. Lamar B.
Rogers Jr., Richard J.
Rogers, Geri
Sauble, Dennis Mackey
Saulcy, Bill
Schmitt, Debbie S.
Schriner, Frances N.
Schwabauer et vir, Linda M.
Semple, William
Smith, Peter F.
Spangsberg, Shirley
Springen, Phyllis
Stadelman, Joseph & Diana
Stephens, Billie L.
Storey, Bill
Stringer, Luella M.
Stroock, Thomas F.
Stuart, Larry D.
Sye, Rank M.
Tanner, Sandy
Taylor, Janet C.
Terry, Evelyn M.
Terry, mark W.
Tresner, Dean G.
Ukeiley, Robert
Unruh, Dean D.
Unruh, Florence E.
Van Dyke, Jeanne
Walllin, Julia Springen
Walker,Huntington
Wanger, Deena L.
Ward Linda
West, Jennie M.
Wilinson, John Allen
Wilkinson, Jerry & Rhonda
Williams, John
Williams, Keith
Williams, Monica
Wilmot, Roger R.
Wilmot, William W.
Winland, Mark
Wood, Derryl W.
Wright Davis, Mary Ellen & Bobby Gale
Wright, O. Dale
Young, Dennis D.

Trusts

Amy Lynn Lenhert Trust/Gerald T. Tresner Trust
Ann Ireland & Karen Fisher, co-trustees
Anna Louise Wright Carson, Trustee
Barbara Davis, Trustee

Table 5-3. BLM Distribution List for the Wright Area Draft EIS (Continued).

Bennage Family Trust
Boller Trust
Burton Keith Reno, Jr., Trustee
Callies Family Trust
Carole J. Pahl Irrevocable Trust
Coramay Keeline Edelman Irrevocable Trust
D & J Jacobs Family Trust
David L. Herbaly Revocable Trust
Donald L Anderson, Trustee
Doris I Mills Living Trust
Earl & Mildred Boller Living Trust
Fleischman Revocable Trust
Frank Ford, Trustee
Gary P Huckins, Trustee for Jeffery Thompson
George F. Collins, Jr. Trust
George R & Elaine Keeline Trust
Guy W. Edwards Trust
Harry W. Keeline II Trust
Hazel K. Nisselius, Trust
Henderson Living Trust U/A/D
Irene Stuart Living Trust
J.A. Humphrey, Trustee
Jack K. Nisselius, Revocable Trust
John & Shirley Long Revocable Trust
Joseph S. Pollare Living Trust
Keeline Oil & Gas Trust
Kenneth C. Revland Revocable Trust
Larry & Kathryn Dunlap Family Trust
Larry L. Jourgenson, Trustee
LaVern & Bill Stephens Revocable Trust
Leslie W. Flamank, Trustee
Mary Jo Connelly, Trustee
Maurita A. & Patrick M. Meehan, Trustees
Ms. Barbara H. Dilts Living Trust
Northern Trust Bank of Florida
Patsy Sue Shubert Trust
Paul R. Stuart, Trustee
R. Reynared Mills Trust
R. Wesley Savage, Trustee
Reverend Burns Ind. & as Trustee
Robert L. Haynie Revocable Trust
Stuart Living Trust
Stuart Revocable Trust
TFS Trust
Thomas G. Dorough Trust Partnership
Willamas Family Trust (NE)
William E. Reno Revocable Trust
William L. Ferguson Trust
William R. & Dolores P Wright II, Trustees
Willimas Family Trust (CA)
WL Ferguson Testamentary Trust
WTR Revocable Trust

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7.0 GLOSSARY

aboriginal - Related to early or primitive cultures in a region. Being the first or earliest known of its kind in a specific region.

ad valorem tax - A tax paid as a percentage of the assessed value of property.

adverse impact - An apparent direct or indirect detrimental effect.

aliquot - An exact portion.

alkalinity - The degree to which the pH of a substance is greater than 7.

alluvial deposit - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floor (AVF) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

alternative - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient - Surrounding conditions (or environment) in a given place and time.

ANFO – An explosive blasting agent commonly used in open cut mining to aid in the removal of consolidated overburden, composed of ammonium nitrate and fuel oil.

annual precipitation - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

anthropogenic - A direct result of human activities or are the result of natural processes that have been affected by human activities (IPCC/UNEP/OECD/IEA 1997).

approximate original contour - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquatic - Living or growing in or on the water.

aquifer - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use. In hydrology, a rock layer or sequence that contains water and releases it in appreciable amounts. The rocks contain water-filled pores that, when connected, allow water to flow through their matrix. A confined aquifer is overlain by a rock layer that does not transmit water in any appreciable amount or that is impermeable. There probably are few truly confined aquifers. In an unconfined aquifer the upper surface (water table) is open to the atmosphere through permeable overlying material. An aquifer also may be called a water-bearing stratum, lens, or zone.

aquitard - A confining bed that retards but does not totally prevent the flow of water to or from an adjacent aquifer; a leaky confining bed.

area source – A plant site that does not emit any single HAP (Hazardous Air Pollutants) at a rate of 10 tons or greater per year, or any combination of HAPs at a rate of 25 tons or greater per year.

ash - The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

avian - Of, relating to, or derived from birds.

backfill - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact - An apparent direct or indirect advantageous effect.

bentonite – An absorptive and colloidal clay used especially as a sealing agent or suspending agent formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

biogenic – Pertaining to a deposit resulting from the physiological activities of organisms.

bonus - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

buffer zone - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

bypass coal - An isolated part of a coal deposit that is not leased and that can only be economically mined in an environmentally sound manner as a part of continued mining by an existing adjacent operation [see 43 CFR 3400.0.5(d)].

carbon dioxide equivalent (CO_2e) – Measures for describing how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide as the reference. CO_2e is expressed as parts per million by volume.

carbon sink - A natural or manmade reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period.

cast blasting – Commonly used in open cut mining to throw the overburden some distance in a controlled direction using a blasting agent (ANFO).

climate change - A change in long-term weather patterns, i.e. warmer or colder temperatures or an increase or decrease in annual amounts of rainfall or snowfall.

clinker (scoria) - Baked and fused rock resulting from in-place burning of coal deposits.

coal bed natural gas (CBNG) - Natural gas (methane) that is generated during the coal-forming process.

colluvium - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence - The point at which two or more streams meet.

contiguous - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

cooperating agency - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

crucial wildlife habitat - Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins,

works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decibel - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

deciview - A general measure of view impairment (13 deciview equals a view of approximately 60 miles) caused by pollution. A 10 percent change in extinction corresponds to 1.0 dv.

desorb – To remove by the reverse of adsorption or absorption.

dip - The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland - An upland or high area in which a large part of the original surface has been deeply cut into by surface water flow.

dragline - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

eolian – Deposits which are due to the transporting action of the wind.

ephemeral stream - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

erosion - The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration - The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

fair market value - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

floodplain - The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

forage - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

geometric mean - The nth root of the product of the values of n positive numbers.

global warming - An average increase in the Earth's temperature, which in turn causes changes in climate.

greenhouse effect - A theory that certain gases (so-called greenhouse gases) in the atmosphere impede the release of radiation from the earth, trapping heat in the atmosphere like glass over a greenhouse.

groundwater - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat - A place where a plant or animal naturally or normally lives and grows.

habituation - The process of becoming accustomed to, or used to, something; acclimation.

hazardous materials - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

hazardous waste - Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261. A used or discarded material that can damage the environment and be harmful to health. Hazardous wastes include heavy metals and toxic chemicals used in industrial products and processes as well as infectious medical wastes and radioactive materials such as spent nuclear fuel rods.

heterogenous - Made up of dissimilar constituents.

human environment - The natural and physical environment in which humans preside or have an impact and the relationship of people with the surrounding environment (see 30 CFR 1508.14).

hydraulic conductivity - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic - Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrology - The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

impermeable - Not capable of transmitting fluids or gasses in appreciable quantities.

incised - Having a margin that is deeply and sharply notched.

indirect (or secondary) impact - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors that might restrict mining.

in-situ leach mining (ISL) - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock. (ISL), also called **in-situ recovery** (ISR) or **solution mining**, is a process of recovering minerals such as copper and uranium through boreholes drilled into the deposit. The process initially involves drilling of holes into the ore deposit. Explosive or hydraulic fracturing may be used to create open pathways in the deposit for solution to penetrate. Leaching solution is pumped into the deposit where it makes contact with the ore. The solution bearing the dissolved ore content is then pumped to the surface and processed. This process allows the extraction of metals and salts from an ore body without the need for conventional mining involving drill-and-blast, open-cut or underground mining.

interbedded - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden - A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary - Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

laminated - Consolidated or unconsolidated sediment that is characterized by thin (less than 1 cm thick) layers.

land and resource management plan (LRMP) - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

lead agency - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

lek - A traditional breeding area for grouse species where territorial males display and establish dominance.

lenticular - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) - One side of a fold (syncline or anticline).

limestone - A sedimentary rock consisting chiefly of calcium carbonate.

lineament - A linear topographic feature of regional extent that is believed to reflect crustal structure.

loadout facilities - The mine facilities used to load the mined coal for transport out of the mine.

loam - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

maintenance tract - A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

major sources – Those sources that emit more than 10 tons per year of any single hazardous air pollutant, or 25 tons of all hazardous air pollutants combined. The determination of major is based on all sources of hazardous air pollutants at the site, and not just the equipment affected by the MACT standard.

maximum economic recovery - The requirement that, based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined. MER determinations will consider existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations [see 43 CFR 3480.0-5(a)(24)].

meteorological - Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane - A colorless, odorless, and flammable gaseous hydrocarbon; the simplest hydrocarbon; chemical formula = CH_4. It is the product of decomposition of organic matter and of the carbonization of coal, is used as a fuel and as a starting material in chemical synthesis, and is the simplest of the alkanes, constituent of natural gas and is also found associated with crude oil and coal.

mineable coal - Coal that can be economically mined using present day mining technology.

mineral rights - The rights of one who owns the mineral estate (subsurface).

mining permit - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

mudstone - A hardened sedimentary rock consisting of clay. It is similar to shale but lacks distinct layers.

National Register of Historic Places (NRHP) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

native species – Native species refer to wild animals and plants that have evolved in a particular region and environment. Native species are the most adapted to the area and are more disease and drought resistant than non-native species. Native plants provide the greatest benefits to wildlife because the native wildlife evolved with native plants. Often the food provided by native plants is the most nutritious to our native wildlife.

natural gas - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) that are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

no action alternative - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives.

outcrop - A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden - Overburden is the term used in mining to describe material that lies above (excluding topsoil) the area of economic interest, *e.g.*, the rock and soil that lies above the coal seam. Also known as 'waste'. Overburden is distinct from tailings, the material that remains after economically valuable components have been extracted from the generally finely milled ore.

Overburden is removed during surface mining, but is typically not contaminated with toxic components and may be used to restore a mining site to a semblance of its appearance before mining began. Overburden may also be used as a term to describe all soil and ancillary material above the bedrock horizon in a given area.

oxides of nitrogen (NO_X) - The generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts.

ozone - A gas that is created by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight.

paleontological resource - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) - Vegetation that lives over from season to season.

perennial stream - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permeability - The ability of rock or soil to transmit a fluid.

permit application package - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography - Physical geography.

playa - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

pore volume - The amount of fluid necessary to fill the void space in an unsaturated porus medium (i.e., mine backfill).

porosity - The percentage of the bulk volume of rock, sediment or soil that is not occupied by sediment or soil particles; the void space in rock or sediment. It may be isolated or connected.

postmining topography - The relief and contour of the land that remains after mining has been completed.

potentiometric surface - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydraulic head.

predator - An animal that obtains food by killing and consuming other animals.

prime or unique farmland - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

proposed action - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

qualified surface owner - The natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

(1) hold legal or equitable title to the surface of split estate lands;

(2) have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or received directly a significant portion of their income, if any, from such farming and ranching operations; and

(3) have met the conditions of (1) and (2) above for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both (1) and (2) above [see 43 CFR 3400.0-5(gg)].

raptor - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge - The processes by which groundwater is absorbed into a zone of saturation.

reclamation - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation (with native plant life) and other work necessary to restore the disturbed area for post-mining use. In general where viable an attempt to put the terrain back to the pre-mining contours is also of paramount importance.

record of decision - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal - The amount of coal that (is economically feasible to recover) can actually be recovered for sale from the demonstrated coal reserve base.

rental payment - Annual payment from a lessee to a lessor to maintain the lessee's mineral lease rights.

resource management plan - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

right of way - The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, or power lines are built.

riparian - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non-saltwater areas, total dissolved solids is used as an equivalent term.

sandstone - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) - Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

semi-arid - A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

severance tax - A tax on the removal of minerals from the ground.

shale - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

significant impact - A qualitative term used to describe the anticipated importance of impacts to the human and or the environment as a result of an action(s) either direct or indirect.

siltstone - A fine-grained clastic rock consisting predominately of silt-sized particles.

socioeconomics - The social and economic situation that might be affected by a proposed action.

soil survey - The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion – The heating and slow combustion (self-ignition) of coal and coaly material initiated through chemical action (as oxidation (absorption of oxygen)).

stipulations - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

stripping ratio - The unit amount of overburden that must be removed to gain access to a similar unit amount of coal.

subirrigation - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous - A lower rank of coal (35-45 percent carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Sub bituminous coal contains a high percentage of volatile matter and moisture.

surface disturbance - Any disturbance by direct or indirect actions that alters the soil surface.

surface rights - Rights to the surface of the land, does not include rights to oil, gas, or other subsurface minerals or subsurface rights.

suspended solids - The very fine soil particles that remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture - Fractures caused by deformation of the earth's crust.

threatened and endangered species - These species of plants or animals classified as threatened or endangered pursuant to Section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

> ***Category 1*** - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.
>
> ***Category 2*** - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

topography - Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil - The upper portion of a soil, usually dark colored and rich in organic material. It is more or less equivalent to the upper portion of an A horizon in an ABC soil.

total dissolved solids (TDS) - The total quantity in milligrams per liter of dissolved materials in water.

transmissivity - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

transpiration - The discharge of water vapor by plants.

truck & shovel - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

unconfined aquifer - An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

unsuitability criteria - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

uranium - A very hard, heavy, metallic element that is crucial to development of atomic energy.

vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils - The fossilized remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

vesicular - Rock containing many small cavities that were formed by the expansion of a bubble of gas or steam during the solidification of the rock.

visual resources - The physical features of a landscape that can be seen (e.g., land, water, vegetation, structures, and other features).

visual resource management - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

volatile organic compound - Organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.

waterfowl - A bird that frequents water, especially a swimming bird such as a duck or swan.

wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

wild and scenic river - Rivers or sections of rivers designated by Congressional actions under the 1968 Wild and Scenic Rivers Act as wild, scenic, or recreational by an act of the Legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

> **wild river areas** - Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
>
> **scenic river areas** - Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> **recreational river areas** - Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

wilderness - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

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APPENDIX A

FEDERAL AND STATE PERMITTING REQUIREMENTS AND AGENCIES

APPENDIX A: FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS[1]	
Agency	**Lease/Permit/Action**
FEDERAL	
Bureau of Land Management	Coal Lease Resource Recovery & Protection Plan Scoria Sales Contract Exploration Drilling Permit
Office of Surface Mining Reclamation and Enforcement	Preparation of MLA Mining Plan Approval Document SMCRA Oversight
Office of the Secretary of the Interior	Approval of MLA Mining Plan
Mine Safety and Health Administration	Safety Permit and Legal ID Ground Control Plan Major Impoundments Explosives Use and Storage Permit
Bureau of Alcohol, Tobacco, and Firearms	Explosives Manufacturer's License Explosives Use and Storage Permit
Federal Communication Commission	Radio Permit: Ambulance Mobile Relay System Radio License
Nuclear Regulatory Commission	Radioactive By-Products Material License
Army Corps of Engineers	Authorization of Impacts to Wetlands and Other Waters of the U.S.
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Facilities Construction Permits
STATE	
State Land Commission	Coal Lease Scoria Lease
Department of Environmental Quality/Land Quality Division	Permit and License to Mine Permit to Construct Sedimentation Pond
Department of Environmental Quality/Air Quality Division	Air Quality Permit to Operate Air Quality Permit to Construct
Department of Environmental Quality/Water Quality Division	NPDES Water Discharge Permit Authorization to Construct Septic Tank & Leach Field Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality/Solid Waste Management Program	Solid Waste Disposal Permit - Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Ground Water Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction

[1] Individual Lease/Permit Actions listed may not be required at all mines.

APPENDIX B

UNSUITABILITY CRITERIA FOR THE
NORTH HIGHLIGHT FIELD, SOUTH HILIGHT FIELD,
WEST HILIGHT FIELD, WEST JACOBS RANCH,
NORTH PORCUPINE, AND SOUTH PORCUPINE
LBA STUDY AREAS

APPENDIX B. UNSUITABILITY CRITERIA FOR THE NORTH HIGHLIGHT FIELD LBA STUDY AREA

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH HILIGHT FIELD LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. TBNG lands are included in the North Hilight Field LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the North Hilight Field LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROW, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, the I-90 ROW, and the BNSF & UP railroad ROW that were determined to be unsuitable are not located on the North Hilight Field LBA study area. Therefore, there area no unsuitable findings under Criterion 2 for the North Hilight Field LBA study area.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	Highway 450, I-90, and the cemetery are not located on the North Hilight Field LBA study area. No occupied dwellings or schools are located on the study area. Portions of the ROWs of the Shroyer, Hilight, Small, and Jacobs roads, all county roads, are located on the tract as applied for and/or under Alternative 2. The Small and Jacobs roads have been vacated by the Campbell County Commissioners. Therefore, the portions of the North Hilight Field LBA study area within the ROWs of the Shroyer and Hilight roads and the associated 100-ft buffer zones are designated unsuitable and the lease will be stipulated to exclude mining within these areas unless a permit to move the road is approved by Campbell County Board of Commissioners.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the North Hilight Field LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the North Hilight Field LBA study area.
6. **Land Used for Scientific Study.** Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the North Hilight Field LBA study area. There are no unsuitable findings under Criterion 6 for the North Hilight Field LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH HILIGHT FIELD LBA STUDY AREA
7. **Cultural Resources.** All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the North Hilight Field LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. **Natural Areas.** Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the North Hilight Field LBA study area.
9. **Critical Habitat for Threatened or Endangered Plant and Animal Species.** Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the North Hilight Field LBA study area.
10. **State Listed Threatened or Endangered Species.** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the North Hilight Field LBA study area.
11. **Bald or Golden Eagle Nests.** An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald or golden eagle nests (active or inactive) on the North Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. **Bald and Golden Eagle Roost and Concentration Areas.** Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the North Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. **Falcon Nesting Sites and Buffer Zones.** Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the North Hilight Field LBA study area. There are no unsuitable findings under Criterion 13 for the North Hilight Field LBA study area.
14. **Habitat for Migratory Bird Species.** Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH HILIGHT FIELD LBA STUDY AREA
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There is currently one occupied and one unoccupied/abandoned (no activity for 10 consecutive years) sage-grouse lek identified on lands within the North Hilight Field LBA study area. There are currently no other occupied or unoccupied sage-grouse leks within 2 miles of the North Hilight Field LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the North Hilight Field LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the North Hilight Field LBA study area
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and ¼-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the North Hilight Field LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the North Hilight Field LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the North Hilight Field LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the North Hilight Field LBA study area.

APPENDIX B. UNSUITABILITY CRITERIA FOR THE SOUTH HIGHLIGHT FIELD LBA STUDY AREA

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE SOUTH HILIGHT FIELD LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. TBNG lands are included in the South Hilight Field LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the South Hilight Field LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROW, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW that were determined to be unsuitable are not located on the South Hilight Field LBA study area. A portion of the north-south BNSF & UP railroad ROW that was found to be unsuitable for mining is located on the western boundary of tract as applied for and under Alternative 2. Therefore, this portion of the BNSF & UP railroad ROW was designated unsuitable and the lease will be stipulated to exclude mining within the ROW.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	Highway 450, I-90, and the cemetery are not located on the South Hilight Field LBA study area. No occupied dwellings or schools are located on the study area. Portions of the ROWs of the Hilight and Reno roads, both county roads, are located on the tract as applied for and/or under Alternative 2. Therefore, the portions of the South Hilight Field LBA study area within the ROWs of the Hilight and Reno roads and the associated 100-ft buffer zones are designated unsuitable and the lease will be stipulated to exclude mining within these areas unless a permit to move the road is approved by Campbell County Board of Commissioners.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the South Hilight Field LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the South Hilight Field LBA study area.
6. **Land Used for Scientific Study.** Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the South Hilight Field LBA study area. There are no unsuitable findings under Criterion 6 for the South Hilight Field LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR SOUTH HILIGHT FIELD LBA STUDY AREA
7. **Cultural Resources.** All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the South Hilight Field LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. **Natural Areas.** Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the South Hilight Field LBA study area.
9. **Critical Habitat for Threatened or Endangered Plant and Animal Species.** Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the South Hilight Field LBA study area.
10. **State Listed Threatened or Endangered Species.** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the South Hilight Field LBA study area.
11. **Bald or Golden Eagle Nests.** An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald or golden eagle nests (active or inactive) on the South Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. **Bald and Golden Eagle Roost and Concentration Areas.** Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the South Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. **Falcon Nesting Sites and Buffer Zones.** Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the South Hilight Field LBA study area. There are no unsuitable findings under Criterion 13 for the South Hilight Field LBA study area.
14. **Habitat for Migratory Bird Species.** Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR SOUTH HILIGHT FIELD STUDY AREA
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There are currently are no occupied (active within the last 10 years) or unoccupied (destroyed or abandoned) sage-grouse leks indentified on lands within the South Hilight Field LBA study area. There is currently one unoccupied (destroyed) sage-grouse lek located on an existing Black Thunder Mine lease within 2 miles of the South Hilight Field LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the South Hilight Field LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the South Hilight Field LBA study area.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and ¼-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the South Hilight Field LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the South Hilight Field LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the South Hilight Field LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the South Hilight Field LBA study area.

APPENDIX B. UNSUITABILITY CRITERIA FOR THE WEST HILIGHT FIELD LBA STUDY AREA

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR WEST HILIGHT FIELD LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. TBNG lands are included in the West Hilight Field LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the West Hilight Field LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROWs, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW that were determined to be unsuitable are not located on the West Hilight Field LBA study area. A portion of the north-south BNSF & UP railroad ROW that was found to be unsuitable for mining is located on the eastern boundary of the tract configured under Alternative 2. Therefore, this portion of the BNSF & UP railroad ROW was designated unsuitable and the lease will be stipulated to exclude mining within the ROW.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	I-90 and the cemetery are not located on the West Hilight Field LBA study area. No occupied dwellings or schools are located on the study area. The West Hilight Field LBA study area includes a portion of Highway 450 west of the intersection with the north-south main BNSF & UP railroad trunk line, which was not designated unsuitable for mining under Criterion 2. However, a portion of the Highway 450 ROW is located on the tract as applied for and under Alternatives 2 and 3. A portion of the ROW of the Hilight Road, a county road, is also located on the tract configured under Alternatives 2 and 3. Therefore, the portions of the West Hilight Field LBA study area within the ROWs of Highway 450 and Hilight Road and the associated 100-ft buffer zones are designated unsuitable and the lease will be stipulated to exclude mining within these areas unless permits to move the highway and road are approved by Wyoming Department of Transportation and Campbell County Commissioners, respectively.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the West Hilight Field LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the West Hilight Field LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR WEST HILIGHT FIELD LBA STUDY AREA
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the West Hilight Field LBA study area. There are no unsuitable findings under Criterion 6 for the West Hilight Field LBA study area.
7. Cultural Resources. All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the West Hilight Field LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the West Hilight Field LBA study area.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the West Hilight Field LBA study area.
10. State Listed Threatened or Endangered Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the West Hilight Field LBA study area.
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald eagle nests (active or inactive) on the West Hilight Field LBA study area. There is currently one active golden eagle nest within ¼ mile of the West Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the West Hilight Field LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. Falcon Nesting Sites and Buffer Zones. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the West Hilight Field LBA study area. There are no unsuitable findings under Criterion 13 for the West Hilight Field LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR WEST HILIGHT FIELD LBA STUDY AREA
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There is currently one undetermined (no documented activity for the last 10 years, but insufficient information to designate occupied) sage-grouse lek identified on lands within the West Hilight Field LBA study area, and one undetermined sage-grouse lek located within 2 miles of the West Hilight Field LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the West Hilight Field LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the West Hilight Field LBA study area.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and ¼-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the West Hilight Field LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the West Hilight Field LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the West Hilight Field LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the West Hilight Field LBA study area.

APPENDIX B. UNSUITABILITY CRITERIA FOR THE WEST JACOBS RANCH LBA STUDY AREA

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE WEST JACOBS RANCH LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. No TBNG lands are included in the West Jacobs Ranch LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the West Jacobs Ranch LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROWs, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW that were determined to be unsuitable are not located on the West Jacobs Ranch LBA study area. A portion of the north-south BNSF & UP railroad ROW that was found to be unsuitable for mining is located on the eastern boundary of the tract as applied for and under Alternative 2. Therefore, this portion of the BNSF & UP railroad ROW was designated unsuitable and the lease will be stipulated to exclude mining within the ROW.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	I-90 and the cemetery are not located on the West Jacobs Ranch LBA study area. No occupied dwellings or schools are located on the study area. The West Jacobs Ranch LBA study area includes a portion of Highway 450 west of the intersection with the north-south main BNSF & UP railroad trunk line, which was not designated unsuitable for mining under Criterion 2. However, a portion of the Highway 450 ROW is located on the tract as applied for and under Alternative 2. A portion of the ROW of the Hilight Road, a county road, is also located on the tract as applied for and under Alternative 2. Therefore, the portions of the West Jacobs Ranch LBA study area within the ROWs of Highway 450 and Hilight Road and the associated 100-ft buffer zones are designated unsuitable and the lease will be stipulated to exclude mining within these areas unless permits to move the highway and road are approved by Wyoming Department of Transportation and Campbell County Commissioners, respectively.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the West Jacobs Ranch LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the West Jacobs Ranch LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE WEST JACOBS RANCH LBA STUDY AREA
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the West Jacobs Ranch LBA study area. There are no unsuitable findings under Criterion 6 for the West Jacobs Ranch LBA study area.
7. Cultural Resources. All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the West Jacobs Ranch LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the West Jacobs Ranch LBA study area.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the West Jacobs Ranch LBA study area.
10. State Listed Threatened or Endangered Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the West Jacobs Ranch LBA study area.
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald eagle nests (active or inactive) on the West Jacobs Ranch LBA study area. There is currently one active golden eagle nest on lands within the West Jacobs Ranch LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the West Jacobs Ranch LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. Falcon Nesting Sites and Buffer Zones. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the West Jacobs Ranch LBA study area. There are no unsuitable findings under Criterion 13 for the West Jacobs Ranch LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE WEST JACOBS RANCH LBA STUDY AREA
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There are currently are no occupied (active within the last 10 years) or unoccupied (destroyed or abandoned) sage-grouse leks identified on lands within the West Jacobs Ranch LBA study area. There are currently two undetermined (no documented activity for the last 10 years, but insufficient information to designate occupied) sage-grouse leks identified on lands adjacent to the LBA tract: one approximately 1 mile south-southwest and one approximately 1.3 miles south-southwest of the West Jacobs Ranch LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the West Jacobs Ranch LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the West Jacobs Ranch LBA study area.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and ¼-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the West Jacobs Ranch LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the West Jacobs Ranch LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the West Jacobs Ranch LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the West Jacobs Ranch LBA study area.

APPENDIX B. UNSUITABILITY CRITERIA FOR THE NORTH PORCUPINE LBA STUDY AREA

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH PORCUPINE LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. TBNG lands are included in the North Porcupine LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the North Porcupine LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROWs, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW that were determined to be unsuitable are not located on the North Porcupine LBA study area. A portion of the BNSF & UP railroad ROW that was found to be unsuitable for mining crosses the tract as applied for and under Alternative 2. Therefore, this portion of the BNSF & UP railroad ROW was designated unsuitable and the lease will be stipulated to exclude mining within the ROW.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	Highway 450, I-90, and the cemetery are not located on the North Porcupine LBA study area. No occupied dwellings or schools are located on the study area. Portions of the ROWs of the Antelope, Matheson, and Mackey roads, all county roads, are located on the tract as applied for and under Alternative 2. The relocation of the Antelope Road and a portion of the Matheson Road within the LBA study area have been approved by the Campbell County Commissioners. Therefore, the portions of the North Porcupine LBA study area within the ROWs of the Mackey Road and a portion of the Matheson Road and the associated 100-ft buffer zones are designated unsuitable for mining and the lease will be stipulated to exclude mining within these areas unless permits to move the roads are approved by Campbell County Board of Commissioners.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the North Porcupine LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the North Porcupine LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH PORCUPINE LBA STUDY AREA
6. **Land Used for Scientific Study.** Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the North Porcupine LBA study area. There are no unsuitable findings under Criterion 6 for the North Porcupine LBA study area.
7. **Cultural Resources.** All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the North Porcupine LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. **Natural Areas.** Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the North Porcupine LBA study area.
9. **Critical Habitat for Threatened or Endangered Plant and Animal Species.** Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the North Porcupine LBA study area.
10. **State Listed Threatened or Endangered Species.** Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the North Porcupine LBA study area.
11. **Bald or Golden Eagle Nests.** An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald eagle nests (active or inactive) on the North Porcupine LBA study area. There are currently two active golden eagle nests on lands within the North Porcupine LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. **Bald and Golden Eagle Roost and Concentration Areas.** Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the North Porcupine LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. **Falcon Nesting Sites and Buffer Zones.** Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the North Porcupine LBA study area. There are no unsuitable findings under Criterion 13 for the North Porcupine LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE NORTH PORCUPINE LBA STUDY AREA
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There is currently one occupied (active within the last 10 years) sage-grouse lek and no unoccupied (destroyed or abandoned) sage-grouse leks identified on lands within the North Porcupine LBA study area. There are currently two occupied sage-grouse leks identified on lands adjacent to the LBA tract: both are approximately 1.5 miles southeast of the LBA study area. There is also one unoccupied/abandoned (no activity for 10 consecutive years) sage-grouse lek identified on lands adjacent to the LBA tract: approximately 0.5 mile southeast of the LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the North Porcupine LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the North Porcupine LBA study area.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and ¼-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the North Porcupine LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the North Porcupine LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the North Porcupine LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the North Porcupine LBA study area.

APPENDIX B. UNSUITABILITY CRITERIA FOR THE SOUTH PORCUPINE LBA STUDY AREA

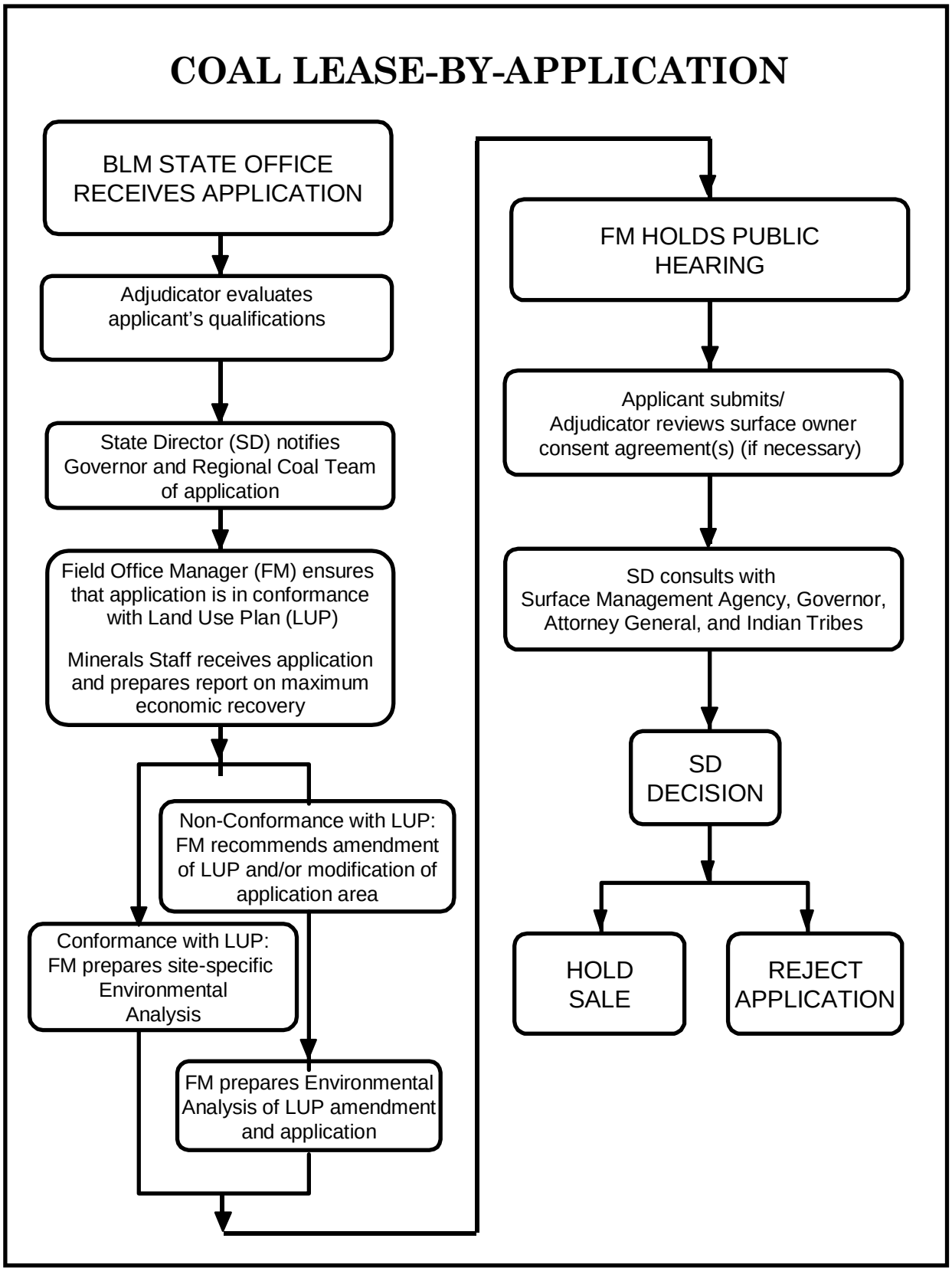
UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE SOUTH PORCUPINE LBA STUDY AREA
1. **Federal Land Systems.** With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands acquired through the Land and Water Conservation Fund, National Forests and Federal lands in incorporated cities, towns and villages.	There are Federal lands located around Gillette, Sheridan, and Wright that were determined to be unsuitable under this criterion. TBNG lands are included in the South Porcupine LBA study area. The TBNG is not a proclaimed National Forest.	None of the federal lands determined to be unsuitable under Criterion 1 are present on the South Porcupine LBA study area. Therefore, there are no unsuitable findings under this criterion.
2. **Rights-Of-Way and Easements.** Federal lands that are within ROWs or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	Portions of the BNSF & UP railroad ROWs, the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW were found to be unsuitable under this criterion within the general review area.	The portions of the Tri-County 230-Kv transmission line ROW, the Wyoming State Highway 450 ROW, and the I-90 ROW that were determined to be unsuitable are not located on the South Porcupine LBA study area. A portion of the BNSF & UP railroad ROW that was found to be unsuitable for mining crosses the tract configured under Alternative 2. Therefore, this portion of the BNSF & UP railroad ROW was designated unsuitable and the lease will be stipulated unsuitable to exclude mining within the ROW.
3. **Buffer Zones for Rights-Of-Way, Communities, and Buildings.** Federal lands within 100 ft of a ROW of a public road or a cemetery; or within 300 ft of any public building, school, church, community or institutional building or public park; or within 300 ft of an occupied dwelling are unsuitable for mining.	Portions of Wyoming State Highway 450, Interstate Highway I-90, and one cemetery were found to be unsuitable under this criterion. Decisions were deferred on other highways/roads, occupied dwellings, and one school until an application to lease is filed.	Highway 450, I-90, and the cemetery are not located on the South Porcupine LBA study area. No occupied dwellings or schools are located on the study area. Portions of the ROW of the Antelope Road, a county road, are located on the tract as applied for and under Alternative 2. The relocation of a portion of the Antelope Road within the LBA study area has been approved by the Campbell County Commissioners. Therefore, the portions of the South Porcupine LBA study area within the ROW of a portion of the Antelope Road and the associated 100-ft buffer zone are designated unsuitable for mining and the lease will be stipulated to exclude mining within these areas unless a permit to move the road is approved by Campbell Co. Board of Commissioners.
4. **Wilderness Study Areas.** Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings under Criterion 4 for the South Porcupine LBA study area.
5. **Scenic Areas.** Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in the general review area meet the scenic criteria as outlined.	There are no unsuitable findings under Criterion 5 for the South Porcupine LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE SOUTH PORCUPINE LBA STUDY AREA
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	Two vegetation monitoring study sites on the TBNG (NE¼ of Sec. 1, T.41N., R.71W. and NW¼ NW¼ of Sec. 30, T.41N., R.69W.), and the Hoe Creek Site (Sec. 7, T.47N., R.72W.) were found to be unsuitable under this criterion.	The vegetation monitoring sites and the Hoe Creek site are not located on the South Porcupine LBA study area. There are no unsuitable findings under Criterion 6 for the South Porcupine LBA study area.
7. Cultural Resources. All publicly or privately owned places which are included in or are eligible for inclusion in the NRHP and an appropriate buffer zone are unsuitable.	On the basis of the consultation with SHPO, there were no unsuitable findings under this criterion in the general review area. Continue using the "Standard Archeological Stipulation" to new leases.	There are no unsuitable findings under Criterion 7 for the South Porcupine LBA study area. The "Standard Archeological Stipulation" should be applied if this tract is leased.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings under Criterion 8 for the South Porcupine LBA study area.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for threatened or endangered plant and animal species, and scientifically documented essential habitat for threatened or endangered species are unsuitable.	There is no federally designated critical habitat for threatened or endangered plant or animal species within the general review area.	There are no unsuitable findings under Criterion 9 for the South Porcupine LBA study area.
10. State Listed Threatened or Endangered Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as threatened or endangered shall be considered unsuitable.	Wyoming does not maintain a state list of threatened or endangered species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings under Criterion 10 for the South Porcupine LBA study area.
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	Defer suitability decisions and evaluate bald and golden eagle nests on a case by case basis at the time of leasing. Establish buffer zones around nests during mining and reclamation planning after consultation with USFWS.	There are currently no bald or golden eagle nests (active or inactive) on the South Porcupine LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	Defer suitability decisions and evaluate bald and golden eagle roost areas on a case by case basis prior to lease issuance. Establish buffer zones after consultation with USFWS.	There are no identified roost sites on the South Porcupine LBA study area. Evaluate suitability prior to lease issuance during consultation with USFWS.
13. Falcon Nesting Sites and Buffer Zones. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to ensure the falcons will not be adversely affected.	Defer suitability decisions on falcon nesting sites and evaluate on a case by case basis prior to lease issuance. Establish buffer zones around nesting sites after consultation with USFWS.	No falcon nesting sites have been identified on the South Porcupine LBA study area. There are no unsuitable findings under Criterion 13 for the South Porcupine LBA study area.

UNSUITABILITY CRITERIA	GENERAL RECOMMENDATIONS FOR BUFFALO RESOURCE AREA (BLM 1985, 2001a)	FINDINGS FOR THE SOUTH PORCUPINE LBA STUDY AREA
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of management concern in Wyoming shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	Defer suitability decisions on high priority habitat for migratory bird species of management concern in Wyoming and evaluate on a case by case basis prior to lease issuance. Establish buffer zones for nesting areas during mining and reclamation planning after consultation with USFWS.	Evaluate suitability during consultation with USFWS.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish, wildlife and plant habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable unless mining can be conducted in such a way as to ensure no long-term impact on the species being provided will occur.	Defer suitability decisions on grouse leks and evaluate on a case by case basis prior to lease issuance. Establish buffer zones after consultation with WGFD.	There are currently are no occupied (active within the last 10 years) or unoccupied (destroyed or abandoned) sage-grouse leks identified on lands within the South Porcupine LBA study area or on lands within 2 miles of the LBA study area. Evaluate this criterion prior to lease issuance. Establish buffer zones during mining and reclamation planning after consultation with WGFD.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	The BLM and USFS have determined that the identified floodplains in the general review area could potentially be mined. Therefore, all lands within the general review area are considered suitable.	Site-specific stipulations and resource protection safeguards will be applied if necessary during mining and reclamation planning. There are no unsuitable findings under Criterion 16 for the South Porcupine LBA study area.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no designated municipal watersheds in the general review area.	There are no unsuitable findings under Criterion 17 for the South Porcupine LBA study area.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	There are no designated national resource waters within the general review area.	There are no unsuitable findings under Criterion 18 for the South Porcupine LBA study area.
19. Alluvial Valley Floors. Federal lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Consider areas determined to contain AVFs significant to farming as unsuitable. Defer decisions on other AVFs and analyze on a case-by-case basis prior to lease issuance.	No AVFs or potential AVFs have been identified on the South Porcupine LBA study area with characteristics indicating potential significance to farming. There are no unsuitable findings under Criterion 19 for the South Porcupine LBA study area.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	There are no criterion proposed by state or Indian tribes that have been approved by the Secretary of the Interior. No tribal lands are located in or near the general review area.	There are no unsuitability findings for this criterion on the South Porcupine LBA study area.

APPENDIX C

COAL LEASE-BY-APPLICATION
FLOW CHART


COAL LEASE-BY-APPLICATION
BLM STATE OFFICE RECEIVES APPLICATION
Adjudicator evaluates applicant's qualifications
State Director (SD) notifies Governor and Regional Coal Team of application
Field Office Manager (FM) ensures that application is in conformance with Land Use Plan (LUP)
Minerals Staff receives application and prepares report on maximum economic recovery
Non-Conformance with LUP: FM recommends amendment of LUP and/or modification of application area
Conformance with LUP: FM prepares site-specific Environmental Analysis
FM prepares Environmental Analysis of LUP amendment and application
FM HOLDS PUBLIC HEARING
Applicant submits/ Adjudicator reviews surface owner consent agreement(s) (if necessary)
SD consults with Surface Management Agency, Governor, Attorney General, and Indian Tribes
SD DECISION
HOLD SALE
REJECT APPLICATION

APPENDIX D

BUREAU OF LAND MANAGEMENT
SPECIAL COAL LEASE STIPULATIONS,
U.S. FOREST SERVICE SPECIAL STIPULATIONS,
AND FORM 3400-12 COAL LEASE

BLM will attach the following special stipulations to each Wright LBA tract that is leased:

SPECIAL STIPULATIONS

In addition to observing the general obligations and standards of performance set out in the current regulations, the lessee shall comply with and be bound by the following special stipulations.

These stipulations are also imposed upon the lessee's agents and employees. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require his agents, contractors and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time to adjust to changed conditions or to correct an oversight.

(a) *CULTURAL RESOURCES*

(1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the Authorized Officer of the BLM or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas, or exploration plan area, that may be adversely affected by lease-related activities and which were not previously inventoried at such a level of intensity. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, historical architect, as appropriate), approved by the Authorized Officer of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Regional Director of the Western Region of the Office of Surface Mining (the Western Regional Director), the Authorized Officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Western Regional Director, or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface disturbing activities until permission to proceed is given by the Western Regional Director or Authorized Officer.

(2) The lessee shall protect all cultural resource properties that have been determined eligible to the National Register of Historic Places within the lease area from lease-related activities until the cultural resource mitigation

measures can be implemented as part of an approved mining and reclamation or exploration plan unless modified by mutual agreement in consultation with the State Historic Preservation Officer.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Western Regional Director or Authorized Officer, or the Authorized Officer of the surface managing agency, if the Western Regional Director is not available. The lessee shall not disturb such resources except as may be subsequently authorized by the Western Regional Director or Authorized Officer.

Within two (2) working days of notification, the Western Regional Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the lessee unless otherwise specified by the Authorized Officer of the BLM or of the surface managing agency, if different.

(5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

(b) *PALEONTOLOGICAL RESOURCES*

If paleontological resources, either large and conspicuous, and/or of significant scientific value are discovered during mining operations, the find will be reported to the Authorized Officer immediately. Mining operations will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operations.

(c) *THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES*

(1) The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*, or that have other

special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.

(2) The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.

(3) Any potential habitat that has not already been surveyed for Ute ladies'-tresses within the project area shall be identified and surveyed prior to surface mining activities.

(d) ***MULTIPLE MINERAL DEVELOPMENT***

Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

(e) ***OIL AND GAS/COAL RESOURCES***

The BLM realizes that coal mining operations conducted on Federal coal leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as Federal oil and gas leases issued in a Federal coal lease area may inhibit coal recovery. BLM retains the authority to alter and/or modify the resource recovery and protection plans for coal operations and/or oil and gas operations on those lands covered by Federal mineral leases so as to obtain maximum resource recovery.

(f) ***RESOURCE RECOVERY AND PROTECTION***

Notwithstanding the approval of a resource recovery and protection plan (R2P2) by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) (as defined at 43 CFR 3480.0-5(21)) of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unmineable by the operation, the operator/lessee shall submit appropriate justification to obtain approval by the Authorized Officer to leave such reserves unmined. Upon approval by the Authorized Officer, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or portion of the lease as authorized by statute and regulation.

In the event the Authorized Officer determines that the R2P2, as approved, will not attain MER as the result of changed conditions, the Authorized Officer will give proper notice to the operator/lessee as required under applicable regulations. The Authorized Officer will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the Authorized Officer that the coal reserves have been rendered unmineable or at such time that the operator/lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the Mineral Management Service demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

(g) ***PUBLIC LAND SURVEY PROTECTION***

The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease areas. If any monuments, corners or accessories are

destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

(h) ***BUFFER ZONES FOR RIGHTS-OF-WAY OF PUBLIC ROADS***

The following special stipulation (h)(1) will be added to the West Hilight Field and West Jacobs Ranch LBA Tracts:

(1) No mining activity of any kind may be conducted within Wyoming State Highway 450 right-of-way and associated 100-feet buffer zone while that public road remains in its current (2009) location. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing right-of-way and associated buffer zone. Provided a permit to move this public highway is approved by the appropriate authority (Wyoming Department of Transportation), the lessee shall recover all legally and economically recoverable coal from all leased lands within the foregoing right-of-way and associated buffer zone. The lessee shall pay all royalties on any legally and economically recoverable coal that it fails to mine without the written permission of the Authorized Officer.

The following special stipulation (h)(2) will be added to each Wright area LBA tract:

(2) No mining activity of any kind may be conducted within Campbell County Road [Shroyer (CR 116), Reno (CR 83), Hilight (CR 52), Mackey (CR 69), Matheson, or Antelope (CR4)] rights-of-way and associated 100-feet buffer zones while those public roads remain in their current (2009) locations. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing rights-of-way and associated buffer zones. Provided a permit to move the respective road(s) is approved by the appropriate authority (Campbell County Board of Commissioners), the lessee shall recover all legally and economically recoverable coal from all leased lands within the foregoing rights-of-way and associated buffer zones. The lessee shall pay all royalties on any legally and economically recoverable coal that it fails to mine without the written permission of the Authorized Officer.

(i) ***RAILROAD RIGHT-OF-WAY***

The following special stipulation will be added to the South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts:

No mining activity of any kind may be conducted on those portions of the Burlington Northern/Santa Fe and Union Pacific Railroad right-of-way that cross federally administered lands. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing right-of-way. Lessee shall pay all royalties on any legally and economically recoverable coal that it fails to mine without the written permission of the Authorized Officer.

The North Hilight Field, South Hilight Field, West Hilight Field, North Porcupine, and South Porcupine LBA Tracts reconfigured under Alternative 2 (the BLM study area, which is BLM's preferred alternative) include National Forest System Lands. U.S. Forest Service will attach the following special stipulations to each Wright LBA tract that is leased:

NOTICE FOR LANDS OF THE NATIONAL FOREST SYSTEM UNDER JURISDICTION OF THE DEPARTMENT OF AGRICULTURE

The permittee must comply with all the rules and regulations of the Secretary of Agriculture set forth in Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the permit. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of an exploration plan by the Secretary of the Interior, (2) uses of all existing improvements, such as forest development roads, within and outside the area permitted by the Secretary of the Interior, and (3) use and occupancy of the NFS not authorized by an exploration plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

District Ranger
2250 East Richards
Douglas, WY 82633
Telephone: 307-358-4690

who is the authorized representative of the Secretary of Agriculture.

NOTICE

CULTURAL AND PALEONTOLOGICAL RESOURCES – The Forest Service (USFS) is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to undertaking the surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the USFS, shall:

1. Contact the USFS to determine if a site specific cultural or paleontological resource inventory is required. If a survey is required, then:

2. Engage the services of a cultural resource specialist and/or paleontologist acceptable to the USFS to conduct a cultural resource or paleontological inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may result from environmental or other

considerations. An acceptable inventory report is to be submitted to the USFS for review and approval at the time a surface disturbing plan of operation is submitted.

3. Implement mitigation measures required by the USFS and BLM to preserve or avoid destruction of cultural paleontological resource or values. Mitigation may include relocation of proposed facilities, testing, salvage, and recordation of other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The discovery of any antiquities or other objects of historic or scientific interest, including but not limited to, historic or prehistoric ruins, fossils, or artifacts as the result of any operation conducted within the lease boundaries on Forest System Land shall immediately be brought to the attention of the District Ranger. The permittee will cease operations in that area until authorized to proceed by the District Ranger.

FOREST SERVICE REGION 2 SENSITIVE SPECIES – The USFS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed as sensitive by the Regional Forester. The findings of this examination may result in some restrictions to the operator's plan or even disallow use and occupancy.

ENDANGERED OR THREATENED SPECIES – The USFS is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restriction to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the USFS that the examination is not necessary, conduct the examination of leased lands at this discretion and cost. This examination must be done by or under the supervision of a qualified resource specialist approved by the USFS. An acceptable report must be provided to the USFS identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats, and the anticipated effects and impacts to USFS Regions 2 Sensitive Species that may occur or have habitat in the area.

Form 3400-12
(February 2005)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE

FORM APPROVED
OMB NO. 1004-0073
Expires: January 31, 2007

Serial Number

PART 1. LEASE RIGHTS GRANTED

This lease, entered into by and between the UNITED STATES OF AMERICA, hereinafter called lessor, through the Bureau of Land Management (BLM), and *(Name and Address)*

hereinafter called lessee, is effective *(date)* / / , for a period of 20 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of the 20th lease year and each 10-year period thereafter.

Sec. 1.This lease is issued pursuant and subject to the terms and provisions of the:
☐ Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;
☐ Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;
and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any bonuses, rents, and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants and leases to lessee the exclusive right and privilege to drill for, mine, extract, remove, or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

containing acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1. (a) RENTAL RATE -Lessee must pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $ for each lease year.

(b) RENTAL CREDITS -Rental will not be credited against either production or advance royalties for any year.

Sec. 2. (a) PRODUCTION ROYALTIES - The royalty will be percent of the value of the coal as set forth in the regulations. Royalties are due to lessor the final day of the month succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the BLM may accept, for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty will be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee must maintain in the proper office a lease bond in the amount of $. The BLM may require an increase in this amount when additional coverage is determined appropriate.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years will terminate the lease. Lessee must submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after lease issuance.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease will become an LMU or part of an LMU, subject to the provisions set forth in the regulations.

The stipulations established in an LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease will then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

(Continued on page 2)

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee must furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee must keep open at all reasonable times for the inspection by BLM the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee must allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section will be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee must comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee must not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area must be submitted to the BLM.

Lessee must carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee must take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but are not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits not covered hereunder and approving easements or rights-of-way. Lessor must condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee must: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years should be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor. Neither lessee nor lessee's subcontractors should maintain segregated facilities.

Sec. 9. (a) TRANSFERS

- ☐ This lease may be transferred in whole or in part to any person, association or corporation qualified to hold such lease interest.
- ☐ This lease may be transferred in whole or in part to another public body or to a person who will mine coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.
- ☐ This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee will be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee must deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee must remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the BLM. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, will become the property of the lessor, but lessee may either remove any or all such property or continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor will waive the requirement for removal, provided the third parties do not object to such waiver. Lessee must, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease will be subject to cancellation by the lessor only by judicial proceedings. This provision will not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver will not prevent later cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS-IN-INTEREST - Each obligation of this lease will extend to and be binding upon, and every benefit hereof will inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION -Lessee must indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Clean Water Act (33 U.S.C. 1252 et seq.), the Clean Air Act (42 U.S.C. 4274 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.).

Sec. 15. SPECIAL STIPULATIONS

(Continued on page 3)

Sec. 15. SPECIAL STIPULATIONS (Cont'd.) -

THE UNITED STATES OF AMERICA

_____ (Company or Lessee Name)	By _____
_____ (Signature of Lessee)	_____ (BLM)
_____ (Title)	_____ (Title)
_____ (Date)	_____ (Date)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NOTICES

The Privacy Act of 1974 and the regulation in 43 CFR 2.48(d) provide that you be furnished with the following information in connection with information required by this application.
AUTHORITY: 30 U.S.C. 181-287 and 30 U.S.C. 351-359.
PRINCIPAL PURPOSE: BLM will use the information you provide to process your application and determine if you are eligible to hold a lease on BLM Land.
ROUTINE USES: BLM will only disclose the information according to the regulations at 43 CFR 2.56(d).
EFFECT OF NOT PROVIDING INFORMATION: Disclosing the information is necessary to receive a benefit. Not disclosing the information may result in BLM's rejecting your request for a lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:
The BLM collects this information to authorize and evaluate proposed exploration and mining operations on public lands.
Response to the provisions of this lease form is mandatory for the types of activities specified.
The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: Public reporting burden for this form is estimated to average one hour per response including the time for reading the instructions and provisions, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0073), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, Mail Stop 401 LS, Washington, D.C. 20240.

(Form 3400-12, page 3)

APPENDIX E

CONVENTIONAL OIL AND GAS AND
COAL BED NATURAL GAS WELLS
CAPABLE OF PRODUCTION
LOCATED WITHIN THE BLM STUDY AREAS
FOR THE:
NORTH HILIGHT FIELD LBA TRACT
SOUTH HILIGHT FIELD LBA TRACT
WEST HILIGHT FIELD LBA TRACT
WEST JACOBS RANCH LBA TRACT
NORTH PORCUPINE LBA TRACT
SOUTH PORCUPINE LBA TRACT

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
521991	M & K Oil Company, Inc.	So Hilight Unit No. 1-41	44N	70W	NWNW Sec. 17	PR	237,029	6,861
521992	M & K Oil Company, Inc.	So Hilight Unit No. 4-41	44N	70W	NWSW Sec. 17	PR	18,459	6,880
522016	Primary Natural Resources, Inc.	Central Hilight Unit No. 227	44N	70W	NWSW Sec 18	PR	221,248	11,732
522106	M & K Oil Company, Inc.	So Hilight Unit No. 11-53	44N	70W	NWNE Sec 19	GL	75,417	3,076
522107	M & K Oil Company, Inc.	So Hilight Unit No. 19-53	44N	70W	NWSE Sec 19	GL	71,076	3,369
522283	M & K Oil Company, Inc.	So Hilight Unit No. 18-20	44N	70W	NWSW Sec 19	GL	458,182	21,197
522148	M & K Oil Company, Inc.	So Hilight Unit No. 12-40	44N	70W	NWNW Sec 20	GL	989,790	42,294
522224	M & K Oil Company, Inc.	So Hilight Unit No. 20-40	44N	70W	NWSW Sec 20	GL	20,914	783
522245	M & K Oil Company, Inc.	So Hilight Unit No. 14-25	44N	70W	NWNE Sec 21	GL	330,822	19,247
522502	M & K Oil Company, Inc.	So Hilight Unit No. 23-12	44N	70W	NWSE Sec 21	GL	443,628	9,904
522160	M & K Oil Company, Inc.	So Hilight Unit No. 22-39	44N	70W	NWSW Sec 21	GL	174,929	10,188
522031	M & K Oil Company, Inc.	So Hilight Unit No. 13-39	44N	70W	NWNW Sec 21	GL	265,769	11,895
523523	M & K Oil Company, Inc.	Royar Fed No. 1	44N	70W	NWSW Sec 22	GL	114,032	18,464
521956	M & K Oil Company, Inc.	Pamela No. 1	44N	71W	NWSW Sec 13	GL	304,134	13,360
521959	Primary Natural Resources, Inc.	Central Hilight Unit No. 226	44N	71W	NWSE Sec 13	PR	232,520	32,256
522568	M & K Oil Company, Inc.	Pamela No. 1-A	44N	71W	NWSW Sec 13	GL	839,971	25,608
521925	M & K Oil Company, Inc	Mills No. 17	44N	71W	NWSE Sec 23	PR	115,489	72,057
525086	C & H Well Service	Springen No. 1	44N	71W	SENW Sec 23	GL	337,257	12,566
521845	M & K Oil Company, Inc	So Hilight Unit No. 8-43	44N	71W	NWNW Sec 24	GL	484,888	8,007
522082	M & K Oil Company, Inc	So Hilight Unit No. 9-17	44N	71W	NWNE Sec 24	GL	81,417	1,702

Status Codes: PR = Pumping Rods, GL = Gas Lift

Conventional oil and gas well data from WOGCC 12/13/07

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE SOUTH HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
525150	M & K Oil Company, Inc	Porcupine Fed W30501 No. 1	42N	71W	NWSW Sec. 2	GL	318,792	18,548

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE WEST HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
527612	M & K Oil Company, Inc	Burton Reno No. 1	43N	71W	NESW Sec. 15	PR	0	1,051

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE WEST JACOBS RANCH LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
521868	M & K Oil Company, Inc	South Hilight Unit No. 34-50	44N	71W	NWSE Sec. 27	GL	70,631	4,631

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE SOUTH PORCUPINE LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
526100	Abraxas Petroleum Corporation	Frazier No. 11-12	41N	71W	NWNW Sec. 12	PR	307,397	14,297

Status Codes: PR = Pumping Rods, GL = Gas Lift

Conventional oil and gas well data from WOGCC 12/13/07

CONVENTIONAL OIL AND GAS WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH PORCUPINE LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Name/No.	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Oil (BBL)
527391	DNR Oil and Gas, Inc.	Fed. W-093721C No. 19-16	42N	70W	SESE Sec. 19	FL	1,161,304	9,720
524326	DNR Oil and Gas, Inc.	Gamberg No. 1	42N	70W	SWNW Sec. 26	PR	58,427	33,412
527941	Berenergy	Janzen Fed 04315 No. 34-26	42N	70W	SWSE Sec. 26	PR	56,191	52,861
521995	Peabody Natural Gas LLC	WYO A 050890 No. 1	42N	70W	SWNE Sec. 27	GL	1,216	23,944
526728	Peabody Natural Gas LLC	Federal No. 29-2	42N	70W	NWNW Sec. 29	FL	791,926	24,745
522962	Peabody Natural Gas LLC	Federal No. 1-29	42N	70W	NWNW Sec. 29	FL	2,802,254	67,697
522996	Chaco Energy Company	Federal No. 1-23	42N	71W	NWSE Sec. 23	FL	726,144	14,958
526471	Chaco Energy Company	Exxon W-67034 No. 1-27	42N	71W	SENW Sec. 23	FL	155,690	10,317
525697	Adair Company LLC	Quillback W-67220 No. 1-34	42N	71W	SWNW Sec. 34	FL	160,820	7,671

Status Codes: FL = Flowing, PR = Pumping Rods, GL = Gas Lift

Conventional oil and gas well data from WOGCC 12/13/07

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
537396	PRIMARY NATURAL RESOURCES INC	No. 22-19	44	70	SE NW Sec. 19	SI	2,082	51,387
537399	PRIMARY NATURAL RESOURCES INC	No. 11-19	44	70	NW NW Sec. 19	FL	16,884	127,775
537400	PRIMARY NATURAL RESOURCES INC	No. 24-19	44	70	SE SW Sec. 19	PS	58,978	402
537861	PRIMARY NATURAL RESOURCES INC	No. 31-19	44	70	NW NE Sec. 19	PS	70,806	4,711
537909	PRIMARY NATURAL RESOURCES INC	No. 13-19	44	70	NW SW Sec. 19	PS	63,766	116,255
537854	PRIMARY NATURAL RESOURCES INC	No. 33-19	44	70	NW SE Sec. 19	FL	36,338	20
542731	PRIMARY NATURAL RESOURCES INC	No. 11-20	44	70	NW NW Sec. 20	PS	112,412	190
542732	PRIMARY NATURAL RESOURCES INC	No. 13-20	44	70	NW SW Sec. 20	PS	104,829	3,434
532169	PRIMARY NATURAL RESOURCES INC	No. 22-13	44	71	SE NW Sec. 13	PS	43,334	90
532170	PRIMARY NATURAL RESOURCES INC	No. 31-13	44	71	NW NE Sec. 13	SI	26,299	416,906
532171	PRIMARY NATURAL RESOURCES INC	No. 42-13	44	71	SE NE Sec. 13	SI	1,178	35,448
532172	PRIMARY NATURAL RESOURCES INC	No. 33-13	44	71	NW SE Sec. 13	SI	15,390	81,940
532174	PRIMARY NATURAL RESOURCES INC	No. 11-13	44	71	NW NW Sec. 13	PS	98,202	819
537397	PRIMARY NATURAL RESOURCES INC	No. 24-13	44	71	SE SW Sec. 13	PS	105,841	147,656
537398	PRIMARY NATURAL RESOURCES INC	No. 13-13	44	71	NW SW Sec. 13	PS	72,283	41,400
540283	PRIMARY NATURAL RESOURCES INC	No. 44-13	44	71	SE SE Sec. 13	PS	68,507	36,346
540273	PRIMARY NATURAL RESOURCES INC	No. 31-14	44	71	NW NE Sec. 14	SI	75,379	29,174
542582	PRIMARY NATURAL RESOURCES INC	No. 42-14 C	44	71	SE NE Sec. 14	PS	102,100	29,231
546007	PRIMARY NATURAL RESOURCES INC	No. 21-14	44	71	NE NW Sec. 14	PS	81,487	12,865
548075	C & H WELL SERVICING INC	No. 14-11	44	71	NE SW Sec. 14	FL	108,211	0
548082	C & H WELL SERVICING INC	No. 14-13	44	71	SW SW Sec. 14	FL	108,222	0
549757	PRIMARY NATURAL RESOURCES INC	No. 33-14	44	71	NW SE Sec. 14	FL	129,649	125,512

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
549758	PRIMARY NATURAL RESOURCES INC	No. 12-14	44	71	SW NW Sec. 14	PS	60,988	353,569
549759	PRIMARY NATURAL RESOURCES INC	No. 44-14	44	71	SE SE Sec. 14	PS	101,965	47,869
537863	PRIMARY NATURAL RESOURCES INC	No. 42-23	44	71	SE NE Sec. 23	PS	118,869	436,101
537864	PRIMARY NATURAL RESOURCES INC	No. 44-23	44	71	SE SE Sec. 23	PS	209,025	118,101
537913	PRIMARY NATURAL RESOURCES INC	No. 31-23	44	71	NW NE Sec. 23	PR	281,455	48,898
537914	PRIMARY NATURAL RESOURCES INC	No. 33-23	44	71	NW SE Sec. 23	FL	327,456	79
548079	C & H WELL SERVICING INC	No. 23-3	44	71	NE NW Sec. 23	FL	108,221	0
548080	C & H WELL SERVICING INC	No. 23-5	44	71	SW NW Sec. 23	FL	108,222	0
537432	PRIMARY NATURAL RESOURCES INC	No. 31-24	44	71	NW NE Sec. 24	PS	103,052	5,570
537433	PRIMARY NATURAL RESOURCES INC	No. 42-24	44	71	SE NE Sec. 24	PS	67,124	54,154
537865	PRIMARY NATURAL RESOURCES INC	No. 11-24	44	71	NW NW Sec. 24	PS	163,687	143,249
537866	PRIMARY NATURAL RESOURCES INC	No. 22-24	44	71	SE NW Sec. 24	PS	115,256	147,133
537867	PRIMARY NATURAL RESOURCES INC	No. 33-24	44	71	NW SE Sec. 24	PS	129,140	135,633
537868	PRIMARY NATURAL RESOURCES INC	No. 44-24	44	71	SE SE Sec. 24	PS	93,209	657,198
540188	PRIMARY NATURAL RESOURCES INC	No. 24-24	44	71	SE SW Sec. 24	PS	580,267	8,428
539749	PRIMARY NATURAL RESOURCES INC	No. 13-24	44	71	NW SW Sec. 24	PS	176,273	47,766
543700	PRIMARY NATURAL RESOURCES INC	No. 23-24	44	71	NE SW Sec. 24	SI	0	1,228
540280	PRIMARY NATURAL RESOURCES INC	No. 44-26	44	71	SE SE Sec. 26	FL	313,785	7,162

Status Codes: FL = Flowing, PR = Pumping Rods, PS = Pumping Submersible, SI = Shut in
CBNG well status from WOGCC database 5/14/08
Cumulative production from WOGCC database 9/25/08

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE SOUTH HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
549558	LANCE OIL & GAS COMPANY INC	No. 21-2-4271	42	71	NE NW Sec. 2	SI	0	0
549559	LANCE OIL & GAS COMPANY INC	No. 23-2-4271	42	71	NE SW Sec. 2	SI	0	0
549560	LANCE OIL & GAS COMPANY INC	No. 12-2-4271	42	71	SW NW Sec. 2	SI	0	0
549561	LANCE OIL & GAS COMPANY INC	No. 14-2-4271	42	71	SW SW Sec. 2	SI	0	0
531964	LANCE OIL & GAS COMPANY INC	No. 14-23	43	71	SW SW Sec. 23	SI	3,249	600,630
532513	LANCE OIL & GAS COMPANY INC	No. 14-26	43	71	SW SW Sec. 26	PS	616,055	272,492
532517	LANCE OIL & GAS COMPANY INC	No. 22-26	43	71	SE NW Sec. 26	PS	176,776	408,343
532598	LANCE OIL & GAS COMPANY INC	No. 44-26	43	71	SE SE Sec. 26	PS	218,395	875,111
533456	LANCE OIL & GAS COMPANY INC	No. 32-26	43	71	SW NE Sec. 26	PS	221,343	642,943
533363	LANCE OIL & GAS COMPANY INC	No. 41-35	43	71	NE NE Sec. 35	PS	447,631	396,015
533368	LANCE OIL & GAS COMPANY INC	No. 32-35	43	71	SW NE Sec. 35	PS	340,328	621,280
532593	LANCE OIL & GAS COMPANY INC	No. 31-35	43	71	NW NE Sec. 35	PS	199,725	566,180
532594	LANCE OIL & GAS COMPANY INC	No. 22-35	43	71	SE NW Sec. 35	PS	303,551	927,640
532596	LANCE OIL & GAS COMPANY INC	No. 12-35	43	71	SW NW Sec. 35	PS	357,528	803,101
532597	LANCE OIL & GAS COMPANY INC	No. 11-35	43	71	NW NW Sec. 35	SI	303,748	320,611
532605	LANCE OIL & GAS COMPANY INC	No. 43-35	43	71	NE SE Sec. 35	SI	268,076	111,517
532606	LANCE OIL & GAS COMPANY INC	No. 42-35	43	71	SE NE Sec. 35	PS	236,807	1,345,069

Status Codes: PS = Pumping Submersible, SI = Shut in
CBNG well status from WOGCC database 5/14/08
Cumulative production from WOGCC database 9/25/08

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
544726	LANCE OIL & GAS COMPANY INC	No. 41-8-4371	43	71	NE NE Sec. 8	SI	139,443	750,268
531544	LANCE OIL & GAS COMPANY INC	No. 1-41-9	43	71	NE NE Sec. 9	PS	382,039	1,261,797
544720	LANCE OIL & GAS COMPANY INC	No. 43-9-4371	43	71	NE SE Sec. 9	PS	263,551	0
544721	LANCE OIL & GAS COMPANY INC	No. 34-9-4371	43	71	SW SE Sec. 9	FL	194,270	0
544723	LANCE OIL & GAS COMPANY INC	No. 23-9-4371	43	71	NE SW Sec. 9	FL	301,841	0
544724	LANCE OIL & GAS COMPANY INC	No. 21-9-4371	43	71	NE NW Sec. 9	FL	327,622	0
544725	LANCE OIL & GAS COMPANY INC	No. 12-9-4371	43	71	SW NW Sec. 9	FL	215,636	0
531545	LANCE OIL & GAS COMPANY INC	No. 1-21-10	43	71	NE NW Sec. 10	FL	361,643	35,203
534488	LANCE OIL & GAS COMPANY INC	No. 23-10	43	71	NE SW Sec. 10	SI	284,569	94
544719	LANCE OIL & GAS COMPANY INC	No. 12-10-4371	43	71	SW NW Sec. 10	FL	247,875	0
547010	COLEMAN OIL & GAS INC	No. 15-23	43	71	NE SW Sec. 15	PS	363,597	817,081
547011	COLEMAN OIL & GAS INC	No. 15-21	43	71	NE NW Sec. 15	PS	628,046	24,307
547012	COLEMAN OIL & GAS INC	No. 15-14	43	71	SW SW Sec. 15	PS	385,379	306,552
547013	COLEMAN OIL & GAS INC	No. 15-12	43	71	SW NW Sec. 15	PS	524,969	939,012
549585	COLEMAN OIL & GAS INC	No. 15-43	43	71	NE SE 1 Sec. 5	PS	200,213	459,197
549586	COLEMAN OIL & GAS INC	No. 15-41	43	71	NE NE Sec. 15	PS	202,748	308,545
549587	COLEMAN OIL & GAS INC	No. 15-34	43	71	SW SE Sec. 15	SI	82,471	800,265
537926	LANCE OIL & GAS COMPANY INC	No. 43-17-4371	43	71	NE SE Sec. 17	PS	482,068	370,211
537927	LANCE OIL & GAS COMPANY INC	No. 34-17-4371	43	71	SW SE Sec. 17	PS	676,559	672,135
537929	LANCE OIL & GAS COMPANY INC	No. 21-17-4371	43	71	NE NW Sec. 17	PS	148,393	202,421
544755	LANCE OIL & GAS COMPANY INC	No. 14-17-4371	43	71	SW SW Sec. 17	PS	241,484	295,553
544756	LANCE OIL & GAS COMPANY INC	No. 12-17-4371	43	71	SW NW Sec. 17	SI	412,204	407,837

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
539634	LANCE OIL & GAS COMPANY INC	No. 11-20-4371	43	71	NW NW Sec. 20	PS	320,736	596,744
540744	LANCE OIL & GAS COMPANY INC	No. 34-21	43	71	SW SE Sec. 21	PS	517,505	0
540745	LANCE OIL & GAS COMPANY INC	No. 43-21	43	71	NE SE Sec. 21	PS	657,924	1,620
532638	LANCE OIL & GAS COMPANY INC	No. 34-22	43	71	SW SE Sec. 22	FL	175,391	1,289,146
534873	LANCE OIL & GAS COMPANY INC	No. 32-22	43	71	SW NE Sec. 22	SI	90,259	1,249,701
534874	LANCE OIL & GAS COMPANY INC	No. 41-22	43	71	NE NE Sec. 22	SI	184,428	1,553,507
540747	LANCE OIL & GAS COMPANY INC	No. 23-22	43	71	NE SW Sec. 22	SI	189,027	1,729,050
532267	LANCE OIL & GAS COMPANY INC	No. 21-27	43	71	NE NW Sec. 27	PS	265,929	1,452,517
532630	LANCE OIL & GAS COMPANY INC	No. 32-27	43	71	SW NE Sec. 27	PS	285,134	549,711
532632	LANCE OIL & GAS COMPANY INC	No. 34-27	43	71	SW SE Sec. 27	PS	417,164	249,697
532633	LANCE OIL & GAS COMPANY INC	No. 42-27	43	71	SE NE Sec. 27	PS	460,243	623,707
532634	LANCE OIL & GAS COMPANY INC	No. 43-27	43	71	NE SE Sec. 27	PS	637,195	376,045
540324	LANCE OIL & GAS COMPANY INC	No. 14-28-4371	43	71	SW SW Sec. 28	PS	403,631	226,929
549926	LANCE OIL & GAS COMPANY INC	No. 12-28-4371	43	71	SW NW Sec. 28	SI	53,920	199,427
549934	LANCE OIL & GAS COMPANY INC	No. 21-28-4371	43	71	NE NW Sec. 28	FL	148,092	68,258
549935	LANCE OIL & GAS COMPANY INC	No. 23-28-4371	43	71	NE SW Sec. 28	FL	114,007	40,252
549936	LANCE OIL & GAS COMPANY INC	No. 32-28-4371	43	71	SW NE Sec. 28	FL	77,960	294,032
549937	LANCE OIL & GAS COMPANY INC	No. 34-28-4371	43	71	SW SE Sec. 28	FL	96,592	2,610
549938	LANCE OIL & GAS COMPANY INC	No. 41-28-4371	43	71	NE NE Sec. 28	FL	133,522	278,454
549939	LANCE OIL & GAS COMPANY INC	No. 43-28-4371	43	71	NE SE Sec. 28	FL	104,009	5,841
532526	LANCE OIL & GAS COMPANY INC	No. 41-34	43	71	NE NE Sec. 34	PS	452,139	797,018
533644	LANCE OIL & GAS COMPANY INC	No. 13-34	43	71	NW SW Sec. 34	SI	157,570	1,636,134

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST HILIGHT FIELD LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
533645	LANCE OIL & GAS COMPANY INC	No. 23-34	43	71	NE SW Sec. 34	FL	591,286	1,348,240
533165	LANCE OIL & GAS COMPANY INC	No. 11-34	43	71	NW NW Sec. 34	PS	757,031	547,344
533166	LANCE OIL & GAS COMPANY INC	No. 21-34	43	71	NE NW Sec. 34	FL	153,682	586,568

Status Codes: FL = Flowing, PS = Pumping Submersible, SI = Shut in
CBNG well status from WOGCC database 5/14/08
Cumulative production from WOGCC database 9/25/08

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST JACOBS RANCH LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
544732	LANCE OIL & GAS COMPANY INC	No. 41-3-4371	43	71	NE NE Sec. 3	FL	69,015	0
544734	LANCE OIL & GAS COMPANY INC	No. 32-3-4371	43	71	SW NE Sec. 3	FL	88,465	0
544735	LANCE OIL & GAS COMPANY INC	No. 23-3-4371	43	71	NE SW Sec. 3	FL	305,019	0
544736	LANCE OIL & GAS COMPANY INC	No. 21-3-4371	43	71	NE NW Sec. 3	FL	85,596	0
544737	LANCE OIL & GAS COMPANY INC	No. 14-3-4371	43	71	SW SW Sec. 3	FL	130,906	0
544738	LANCE OIL & GAS COMPANY INC	No. 12-3-4371	43	71	SW NW Sec. 3	FL	107,823	0
534479	LANCE OIL & GAS COMPANY INC	No. 13-4	43	71	NW SW Sec. 4	PS	276,480	741,724
534480	LANCE OIL & GAS COMPANY INC	No. 24-4	43	71	SE SW Sec. 4	PS	244,175	921,871
534481	LANCE OIL & GAS COMPANY INC	No. 33-4	43	71	NW SE Sec. 4	PS	272,435	428,107
534482	LANCE OIL & GAS COMPANY INC	No. 44-4	43	71	SE SE Sec. 4	PS	389,513	419,575
544727	LANCE OIL & GAS COMPANY INC	No. 41-4-4371	43	71	NE NE Sec. 4	FL	91,385	0
544728	LANCE OIL & GAS COMPANY INC	No. 32-4-4371	43	71	SW NE Sec. 4	FL	150,202	0
544729	LANCE OIL & GAS COMPANY INC	No. 21-4-4371	43	71	NE NW Sec. 4	FL	144,050	0
544730	LANCE OIL & GAS COMPANY INC	No. 12-4-4371	43	71	SW NW Sec. 4	FL	178,124	0
534483	LANCE OIL & GAS COMPANY INC	No. 22-5	43	71	SE NW Sec. 5	PS	160,706	1,279,469
534484	LANCE OIL & GAS COMPANY INC	No. 24-5	43	71	SE SW Sec. 5	PS	342,966	855,108
534485	LANCE OIL & GAS COMPANY INC	No. 33-5	43	71	NW SE Sec. 5	SI	105,879	1,278,400
534486	LANCE OIL & GAS COMPANY INC	No. 42-5	43	71	SE NE Sec. 5	PS	236,036	936,645
534487	LANCE OIL & GAS COMPANY INC	No. 44-5	43	71	SE SE Sec. 5	FL	103,930	1,750,111
536461	LANCE OIL & GAS COMPANY INC	No. 11-5-4371	43	71	NW NW Sec. 5	PS	134,895	895,782
536462	LANCE OIL & GAS COMPANY INC	No. 13-5-4371	43	71	NW SW Sec. 5	PS	207,564	988,172
536463	LANCE OIL & GAS COMPANY INC	No. 31-5-4371	43	71	NW NE Sec. 5	PS	121,352	935,229
536468	LANCE OIL & GAS COMPANY INC	No. 42-6-4371	43	71	SE NE Sec. 6	PS	140,747	1,039,248

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST JACOBS RANCH LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
536469	LANCE OIL & GAS COMPANY INC	No. 44-6-4371	43	71	SE SE Sec. 6	PS	210,541	842,192
546005	LANCE OIL & GAS COMPANY INC	No. 23-15-4471	44	71	NE SW Sec. 15	PS	201,111	286,494
546006	LANCE OIL & GAS COMPANY INC	No. 14-15-4471	44	71	SW SW Sec. 15	FL	129,156	367,593
548076	C & H WELL SERVICING INC	No. 15-15	44	71	SW SE Sec. 15	SI	13,583	0
548081	C & H WELL SERVICING INC	No. 15-9	44	71	NE SE Sec. 15	FL	120,581	0
535949	LANCE OIL & GAS COMPANY INC	No. 34-20-4471	44	71	SW SE Sec. 20	PS	387,655	710,720
535950	LANCE OIL & GAS COMPANY INC	No. 43-20-4471	44	71	NE SE Sec. 20	PS	494,602	476,591
535951	LANCE OIL & GAS COMPANY INC	No. 12-21-4471	44	71	SW NW Sec. 21	PS	379,406	0
535952	LANCE OIL & GAS COMPANY INC	No. 14-21-4471	44	71	SW SW Sec. 21	PS	426,420	496,503
535953	LANCE OIL & GAS COMPANY INC	No. 21-21-4471	44	71	NE NW Sec. 21	PS	354,121	621,485
535954	LANCE OIL & GAS COMPANY INC	No. 23-21-4471	44	71	NE SW Sec. 21	PS	567,605	0
535955	LANCE OIL & GAS COMPANY INC	No. 32-21-4471	44	71	SW NE Sec. 21	PS	364,184	439,626
535957	LANCE OIL & GAS COMPANY INC	No. 41-21-4471	44	71	NE NE Sec. 21	PS	124,471	915,554
535958	LANCE OIL & GAS COMPANY INC	No. 43-21-4471	44	71	NE SE Sec. 21	PS	157,982	683,308
546021	LANCE OIL & GAS COMPANY INC	No. 21-22-4471	44	71	NE NW Sec. 22	PS	151,381	91,398
548077	C & H WELL SERVICING INC	No. 22-1	44	71	NE NE Sec. 22	FL	120,590	0
548078	C & H WELL SERVICING INC	No. 22-7	44	71	SW NE Sec. 22	FL	120,599	0
549578	COLEMAN OIL & GAS INC	No. 14-22	44	71	SW SW Sec. 22	PS	367,647	32,654
549579	COLEMAN OIL & GAS INC	No. 23-22	44	71	NE SW Sec. 22	PS	274,756	247,047
549580	COLEMAN OIL & GAS INC	No. 34-22	44	71	SW SE Sec. 22	PS	255,934	26,215
542192	WILLIAMS PRODUCTION RMT COMPANY	No. 43-27-4471	44	71	NE SE Sec. 27	PS	93,595	1,531,265
542193	WILLIAMS PRODUCTION RMT COMPANY	No. 34-27-4471	44	71	SW SE Sec. 27	PS	89,958	729,731
543423	COLEMAN OIL & GAS INC	No. 12-27	44	71	SW NW Sec. 27	PS	834,425	11,924

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST JACOBS RANCH LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
543424	COLEMAN OIL & GAS INC	No. 21-27	44	71	NE NW Sec. 27	PS	364,271	945,167
534527	LANCE OIL & GAS COMPANY INC	No. 23-27	44	71	NE SW Sec. 27	SI	212,140	954,009
549581	COLEMAN OIL & GAS INC	No. 32-27	44	71	SW NE Sec. 27	PS	123,936	1,717,295
549582	COLEMAN OIL & GAS INC	No. 41-27	44	71	NE NE Sec. 27	PS	187,737	391,852
534528	LANCE OIL & GAS COMPANY INC	No. 23-28	44	71	NE SW Sec. 28	SI	704,547	512,816
534529	LANCE OIL & GAS COMPANY INC	No. 34-28	44	71	SW SE Sec. 28	PS	463,893	433,868
534521	LANCE OIL & GAS COMPANY INC	No. 43-28	44	71	NE SE Sec. 28	PS	342,040	1,794
534525	LANCE OIL & GAS COMPANY INC	No. 14-28	44	71	SW SW Sec. 28	PS	378,924	454,369
535959	LANCE OIL & GAS COMPANY INC	No. 12-28-4471	44	71	SW NW Sec. 28	SI	372,262	575,436
535960	LANCE OIL & GAS COMPANY INC	No. 21-28-4471	44	71	NE NW Sec. 28	PS	372,901	544,767
535961	LANCE OIL & GAS COMPANY INC	No. 32-28-4471	44	71	SW NE Sec. 28	PS	532,859	631,155
535963	LANCE OIL & GAS COMPANY INC	No. 12-29-4471	44	71	SW NW Sec. 29	PS	261,157	1,228,824
535964	LANCE OIL & GAS COMPANY INC	No. 14-29-4471	44	71	SW SW Sec. 29	PS	306,880	1,177,938
535965	LANCE OIL & GAS COMPANY INC	No. 21-29-4471	44	71	NE NW Sec. 29	PS	355,889	883,960
535966	LANCE OIL & GAS COMPANY INC	No. 23-29-4471	44	71	NE SW Sec. 29	PS	297,850	1,015,025
535967	LANCE OIL & GAS COMPANY INC	No. 32-29-4471	44	71	SW NE Sec. 29	PS	619,777	418,818
535968	LANCE OIL & GAS COMPANY INC	No. 41-29-4471	44	71	NE NE Sec. 29	PS	219,136	1,223,387
534522	LANCE OIL & GAS COMPANY INC	No. 34-29	44	71	SW SE Sec. 29	PS	201,310	1,135,249
534523	LANCE OIL & GAS COMPANY INC	No. 43-29	44	71	NE SE Sec. 29	PS	295,813	1,402,139
546026	LANCE OIL & GAS COMPANY INC	No. 43-30-4471	44	71	NE SE Sec. 30	FL	167,907	216,260
546027	LANCE OIL & GAS COMPANY INC	No. 41-30-4471	44	71	NE NE Sec. 30	SI	106,873	736,700
546033	LANCE OIL & GAS COMPANY INC	No. 42-31-4471	44	71	SE NE Sec. 31	PS	181,844	324,556

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE WEST JACOBS RANCH LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
534535	LANCE OIL & GAS COMPANY INC	No. 23-32	44	71	NE SW Sec. 32	SI	290,498	988,703
534536	LANCE OIL & GAS COMPANY INC	No. 32-32	44	71	SW NE Sec. 32	PS	621,996	882,067
534537	LANCE OIL & GAS COMPANY INC	No. 34-32	44	71	SW SE Sec. 32	PS	310,217	1,589,150
534538	LANCE OIL & GAS COMPANY INC	No. 41-32	44	71	NE NE Sec. 32	PS	287,555	626,905
534539	LANCE OIL & GAS COMPANY INC	No. 43-32	44	71	NE SE Sec. 32	PS	388,317	850,984
534875	LANCE OIL & GAS COMPANY INC	No. 14-33	44	71	SW SW Sec. 33	PS	430,396	338,006
534876	LANCE OIL & GAS COMPANY INC	No. 21-33	44	71	NE NW Sec. 33	FL	303,919	800,171
534877	LANCE OIL & GAS COMPANY INC	No. 23-33	44	71	NE SW Sec. 33	SI	593,893	826,723
534878	LANCE OIL & GAS COMPANY INC	No. 32-33	44	71	SW NE Sec. 33	PS	215,367	601,659
534879	LANCE OIL & GAS COMPANY INC	No. 34-33	44	71	SW SE Sec. 33	PS	418,934	342,822
534880	LANCE OIL & GAS COMPANY INC	No. 41-33	44	71	NE NE Sec. 33	PS	200,906	0
534881	LANCE OIL & GAS COMPANY INC	No. 43-33	44	71	NE SE Sec. 33	PS	436,217	570,150
534524	LANCE OIL & GAS COMPANY INC	No. 12-33	44	71	SW NW Sec. 33	PS	206,604	912,817
549583	COLEMAN OIL & GAS INC	No. 32-34	44	71	SW NE Sec. 34	PS	536,090	68,793
549584	COLEMAN OIL & GAS INC	No. 41-34	44	71	NE NE Sec. 34	PS	387,165	14,983
544712	LANCE OIL & GAS COMPANY INC	No. 43-34-4471	44	71	NE SE Sec. 34	FL	349,252	21,277
544713	LANCE OIL & GAS COMPANY INC	No. 34-34-4471	44	71	SW SE Sec. 34	SI	59,208	28,339
544714	LANCE OIL & GAS COMPANY INC	No. 23-34-4471	44	71	NE SW Sec. 34	SI	59,637	299,634
544715	LANCE OIL & GAS COMPANY INC	No. 21-34-4471	44	71	NE NW Sec. 34	PS	332,425	41,665
544716	LANCE OIL & GAS COMPANY INC	No. 14-34-4471	44	71	SW SW Sec. 34	PS	77,875	30,209
544717	LANCE OIL & GAS COMPANY INC	No. 12-34-4471	44	71	SW NW Sec. 34	SI	48,888	67,960

Status Codes: FL = Flowing, PS = Pumping Submersible, SI = Shut in
CBNG well status from WOGCC database 5/14/08
Cumulative production from WOGCC database 9/25/08

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH PORCUPINE LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
553824	BILL BARRETT CORPORATION	No. 14-19-4270	42	70	SW SW Sec. 19	FL	158,844	94,832
553826	BILL BARRETT CORPORATION	No. 43-19-4270	42	70	NE SE Sec. 19	FL	162,640	129,535
553069	BILL BARRETT CORPORATION	No. 23-19-4270	42	70	NE SW Sec. 19	FL	150,317	120,810
553070	BILL BARRETT CORPORATION	No. 32-19-4270	42	70	SW NE Sec. 19	FL	107,068	5,755
553827	BILL BARRETT CORPORATION	No. 12-20-4270	42	70	SW NW Sec. 20	FL	109,341	55,394
553828	BILL BARRETT CORPORATION	No. 14-20-4270	42	70	SW SW Sec. 20	FL	150,425	38,735
553830	BILL BARRETT CORPORATION	No. 23-20-4270	42	70	NE SW Sec. 20	FL	131,326	22,922
553831	BILL BARRETT CORPORATION	No. 34-20-4270	42	70	SW SE Sec. 20	FL	168,747	6,501
554339	BILL BARRETT CORPORATION	No. 12-21-4270	42	70	SW NW Sec. 21	FL	89,236	224,189
554340	BILL BARRETT CORPORATION	No. 14-21-4270	42	70	SW SW Sec. 21	FL	159,249	1,121
554341	BILL BARRETT CORPORATION	No. 23-21-4270	42	70	NE SW Sec. 21	FL	99,629	44,967
546208	PEABODY NATURAL GAS LLC	No. 21-30	42	70	NE NW Sec. 30	FL	98,106	224,138
546595	PEABODY NATURAL GAS LLC	No. 11-30	42	70	NW NW Sec. 30	FL	165,500	129,992
554333	PEABODY NATURAL GAS LLC	No. 41-30-42-70	42	70	NE NE Sec. 30	FL	44,028	0
551233	BILL BARRETT CORPORATION	No. 43-22-42-71	42	71	NE SE Sec. 22	FL	126,879	4,258
551256	BILL BARRETT CORPORATION	No. 32-22-42-71	42	71	SW NE Sec. 22	FL	119,343	86,484
551257	BILL BARRETT CORPORATION	No. 34-22-42-71	42	71	SW SE Sec. 22	FL	132,170	3,171
553799	BILL BARRETT CORPORATION	No. 12-23-4271	42	71	SW NW Sec. 23	FL	91,009	0
553800	BILL BARRETT CORPORATION	No. 14-23-4271	42	71	SW SW Sec. 23	FL	106,161	1,178
553802	BILL BARRETT CORPORATION	No. 23-23-4271	42	71	NE SW Sec. 23	FL	102,721	128
553803	BILL BARRETT CORPORATION	No. 32-23-4271	42	71	SW NE Sec. 23	FL	92,012	174,071
553804	BILL BARRETT CORPORATION	No. 34-23-4271	42	71	SW SE Sec. 23	FL	171,448	2,095

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE NORTH PORCUPINE LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
553806	BILL BARRETT CORPORATION	No. 43-23-4271	42	71	NE SE Sec. 23	FL	119,511	55,932
553066	BILL BARRETT CORPORATION	No. 12-24-4271	42	71	SW NW Sec. 24	FL	89,066	73,802
554344	BILL BARRETT CORPORATION	No. 34-24-4271	42	71	SW SE Sec. 24	FL	203,172	96,245
554302	PEABODY NATURAL GAS LLC	No. 41-25-42-71	42	71	NE NE Sec. 25	FL	36,334	18,985
549603	PEABODY NATURAL GAS LLC	No. 23-26	42	71	NE SW Sec. 26	FL	192,600	399,035
549605	PEABODY NATURAL GAS LLC	No. 12-26	42	71	SW NW Sec. 26	FL	347,164	371,250
549606	PEABODY NATURAL GAS LLC	No. 14-26	42	71	SW SW Sec. 26	FL	301,557	361
554299	PEABODY NATURAL GAS LLC	No. 41-26-42-71	42	71	NE NE Sec. 26	FL	103,061	17,939
554301	PEABODY NATURAL GAS LLC	No. 21-26-42-71	42	71	NE NW Sec. 26	SI	94,838	4,090
551234	BILL BARRETT CORPORATION	No. 12-27-42-71	42	71	SW NW Sec. 27	FL	100,862	217,113
551235	BILL BARRETT CORPORATION	No. 14-27-42-71	42	71	SW SW Sec. 27	FL	128,032	45
551236	BILL BARRETT CORPORATION	No. 21-27-42-71	42	71	NE NW Sec. 27	FL	129,910	39,872
551237	BILL BARRETT CORPORATION	No. 23-27-42-71	42	71	NE SW Sec. 27	FL	120,939	260,318
552018	BILL BARRETT CORPORATION	No. 12-34-42-71	42	71	SW NW Sec. 34	FL	90,190	12,922
552019	BILL BARRETT CORPORATION	No. 21-34-42-71	42	71	NE NW Sec. 34	FL	112,325	146,873
552020	BILL BARRETT CORPORATION	No. 32-34-42-71	42	71	SW NE Sec. 34	FL	104,917	4
552021	BILL BARRETT CORPORATION	No. 41-34-42-71	42	71	NE NE Sec. 34	FL	119,577	203
554295	PEABODY NATURAL GAS LLC	No. 23-35-42-71	42	71	NE SW Sec. 35	FL	71,181	983
554296	PEABODY NATURAL GAS LLC	No. 21-35-42-71	42	71	NE NW Sec. 35	FL	84,036	0
554297	PEABODY NATURAL GAS LLC	No. 14-35-42-71	42	71	SW SW Sec. 35	FL	65,396	35,057
554298	PEABODY NATURAL GAS LLC	No. 12-35-42-71	42	71	SW NW Sec. 35	FL	94,308	0

Status Codes: FL = Flowing, SI = Shut in
CBNG well status from WOGCC database 5/14/08
Cumulative production from WOGCC database 9/25/08

CBNG WELLS CAPABLE OF PRODUCTION WITHIN THE SOUTH PORCUPINE LBA TRACT AS APPLIED FOR AND LANDS ADDED BY BLM'S STUDY AREA (Continued)

API Number (Short)	Company	Well Number	TWP	RNG	Location	WOGCC Status	Cumulative Production Gas (MCF)	Cumulative Production Water (BBL)
554303	PEABODY NATURAL GAS LLC	No. 23-1-41-71	41	71	NE SW Sec. 1	FL	92,735	1,482
554304	PEABODY NATURAL GAS LLC	No. 21-1-41-71	41	71	NE NW Sec. 1	SI	14,027	190,852
554305	PEABODY NATURAL GAS LLC	No. 14-1-41-71	41	71	SW SW Sec. 1	FL	72,611	1,936
554306	PEABODY NATURAL GAS LLC	No. 12-1-41-71	41	71	SW NW Sec. 1	FL	54,434	102,432
554226	YATES PETROLEUM CORPORATION	No. 8	41	71	NE SE Sec. 10	FL	62,256	15,237
554212	YATES PETROLEUM CORPORATION	No. 2	41	71	NE SW Sec. 11	SI	61,213	19,834
551248	BILL BARRETT CORPORATION	No. 34-11-41-71	41	71	SW SE Sec. 11	FL	114,053	331,115
551249	BILL BARRETT CORPORATION	No. 43-11-41-71	41	71	NE SE Sec. 11	FL	148,753	1
553817	BILL BARRETT CORPORATION	No. 12-12-4171	41	71	SW NW Sec. 12	FL	74,985	11,673
553818	BILL BARRETT CORPORATION	No. 14-12-4171	41	71	SW SW Sec. 12	FL	96,934	69
553819	BILL BARRETT CORPORATION	No. 23-12-4171	41	71	NE SW Sec. 12	FL	93,435	45,785
554210	YATES PETROLEUM CORPORATION	No. 1	41	71	SW SW Sec. 13	FL	74,705	16

Status Code: FL = Flowing, SI = Shut-In
CBNG well status from WOGCC 5/14/08
Cumulative production data from WOGCC 9/25/08

APPENDIX F

SUPPLEMENTAL AIR QUALITY INFORMATION

F-1.0 INTRODUCTION

The purpose of this appendix is to provide background information on air quality issues, including the regulatory framework, regional air quality conditions, dispersion model methodologies, and the Best Available Control Technology (BACT) process.

The air quality discussion in Chapter 3 of this EIS focuses on potential air quality impacts specific to the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines and the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts (Figure F-1). Cumulative air quality-related impacts associated with coal leasing in the Powder River Basin (PRB) of Wyoming are addressed in Section 4.2.3 of this EIS, which summarizes the results the Task 1A (Current Air Quality Conditions), Task 3A (Cumulative Air Quality Effects), and Task 3A Supplemental (Cumulative Air Quality Effects for 2015) Reports of the Powder River Basin Coal Review, prepared by the ENSR Corporation for the BLM Wyoming State Office, BLM Wyoming High Plains District Office, and BLM Montana Miles City Field Office, September 2005 (Tasks 1A and 3A) and October 2008 (Task 3A Supplemental).

F-2.0 REGULATORY FRAMEWORK

Ambient air quality and air pollution emissions are regulated under federal and state laws and regulations. In Wyoming, the Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) is responsible for managing air quality through state regulations promulgated in the Wyoming Air Quality Standards and Regulations (WAQSR) and through the Wyoming State Implementation Plan (SIP). WDEQ/AQD has also been delegated authority by the U.S. Environmental Protection Agency (EPA) to implement federal programs of the Clean Air Act Amendment of 1990 (CAAA).

The WDEQ/AQD implements WAQSR and CAAA requirements through various air permitting programs. A proponent initiating a project must undergo new source review and obtain a pre-construction permit or a permit waiver authorizing construction of the project. This process ensures that the project will comply with the air quality requirements at the time of construction. To ensure on-going compliance, WDEQ/AQD also implements an operating permit program that can require on-going monitoring of emissions sources and/or source control systems.

F-2.1 National Ambient Air Quality Standards

The Clean Air Act (CAA) requires EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as “criteria” pollutants, which “...cause or contribute to air pollution which may be reasonably anticipated to

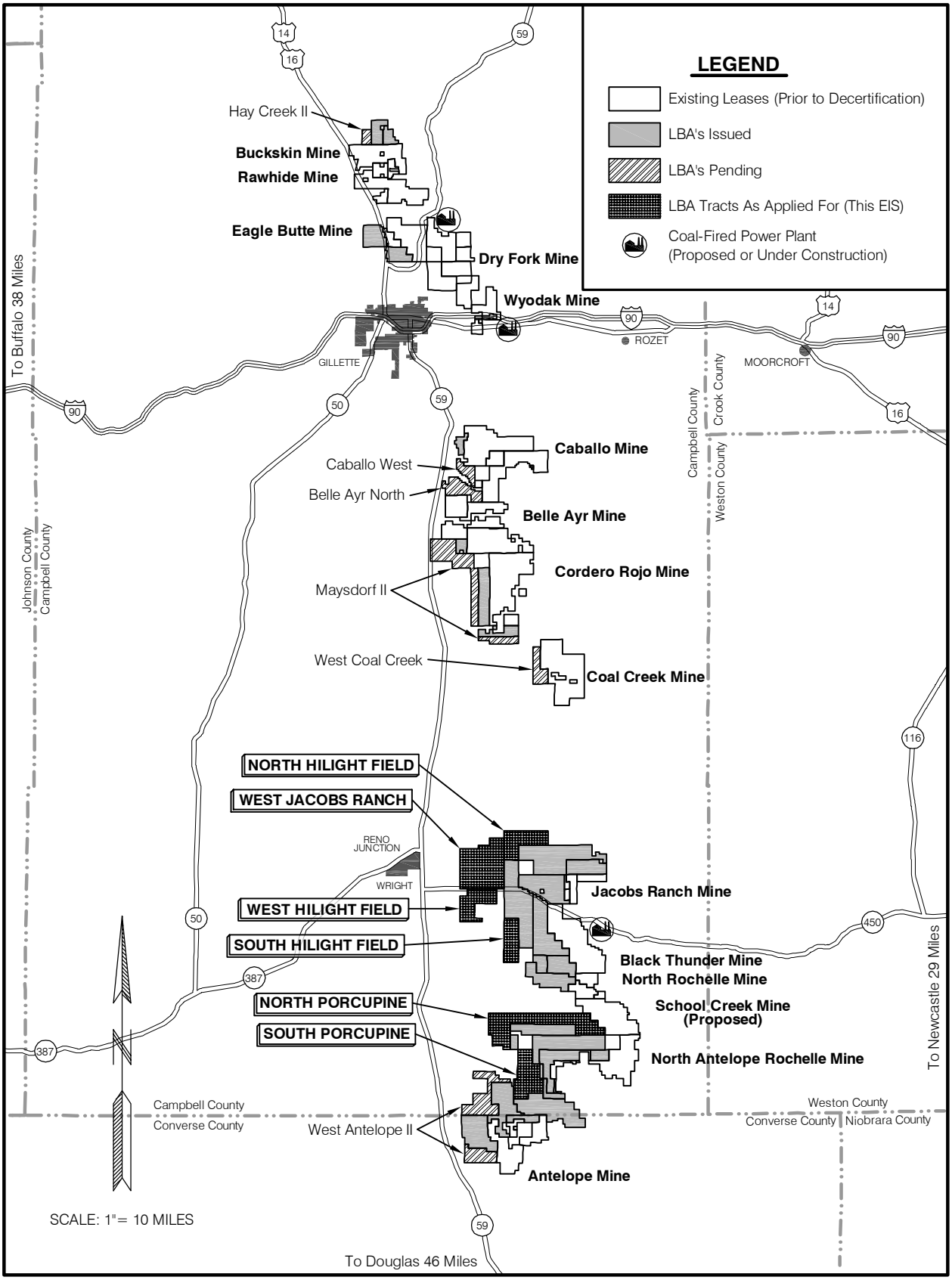


Figure F-1. General Location Map with Federal Coal Leases and LBA Tracts.

endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources." The six, present-day criteria pollutants are lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and particulate matter (PM_{10} and $PM_{2.5}$), where PM_{10} is coarse particulate with mean aerodynamic diameter of 10 microns or less and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less.

The CAA and CAAA allow states to promulgate additional ambient air standards that are at least as stringent, or more stringent, than the NAAQS. A list of the criteria pollutants regulated by the CAA, and the currently applicable NAAQS set by the EPA for each, is presented in Table F-1. The Wyoming Ambient Air Quality Standards, or WAAQS, set by the WDEQ/AQD are also listed in this table. In some instances, the Wyoming standards are more stringent than the NAAQS.

During the new source review process, applicants must demonstrate that the facility will not cause or significantly contribute to exceedance of these standards. These demonstrations are made via atmospheric dispersion modeling or other means, including monitoring data approved by the WDEQ/AQD administrator.

F-2.2 Attainment/Non-Attainment Area Designations

Pursuant to the CAA, EPA has developed a method for classifying existing air quality in distinct geographic regions known as air basins, or air quality control regions, and/or Metropolitan Statistical Areas (MSAs). For each federal criteria pollutant, each air basin (or portion of a basin or MSA) is classified as in "attainment" if the area has "attained" compliance with (that is, not exceeded) the adopted NAAQS for that pollutant, or is classified as in "non-attainment" if the levels of ambient air pollution exceed the NAAQS for that pollutant. Areas for which sufficient ambient monitoring data are not available to define attainment status are designated as "unclassified" for those particular pollutants.

States use the EPA method to designate areas within their borders as being in "attainment" or "non-attainment" with the NAAQS. Existing air quality throughout most of the PRB in Wyoming, including the general Wright analysis area, is designated an attainment area for all pollutants. However, the town of Sheridan, Wyoming, located in Sheridan County about 150 miles northwest of the general Wright analysis area, is a moderate non-attainment area for PM_{10} due to localized sources and activity within the town. There are no other non-attainment areas within 150 miles of the project area.

Table F-1. Assumed Background Air Pollutant Concentrations, Applicable AAQS, and PSD Increment Values (in µg/m³).

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]	WAAQS	PSD Class I Increments[3]	PSD Class II Increments[3]
Carbon monoxide	1-hour	3,336[4]	40,000	40,000	40,000	---	---
	8-hour	1,381	10,000	10,000	10,000	---	---
Nitrogen dioxide	Annual	5[5]	100	100	100	2.5	25
Ozone	8-hour	70[6]	157	157	157	---	---
Sulfur dioxide	3-hour	181[7]	---	1,300	1,300	25	512
	24-hour	62[7]	365	---	260	5	91
	Annual	13[7]	80	---	60	2	20
PM_{10}[8]	24-hour	54[9]	150	150	150	8	30
	Annual	13[9]	--	--	50	4	17
$PM_{2.5}$[8]	24-hour	13[10]	35	35	65	---	---
	Annual	4[10]	15	15	15	---	---

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.
3 All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.
4 Data collected by Amoco at Ryckman Creek for an eight-month period during 1978-1979, summarized in Riley Ridge EIS (BLM 1983).
5 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002.
6 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002-2004 (8-hour 4th high).
7 Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.
8 On October 17, 2006, EPA published final revisions to the NAAQS for particulate matter that took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM_{10} standard of 50 µg/m³. The State of Wyoming will enter into rulemaking to revise the WAAQS.
9 Data collected at the Eagle Butte Mine, Campbell County, Wyoming in 2002.
10 Data collected at the Buckskin Mine in 2002.
Source: (BLM 2005b and WDEQ/AQD)

F-2.3 Prevention of Significant Deterioration

Under requirements of the CAA, EPA has established Prevention of Significant Deterioration (PSD) rules, intended to prevent deterioration of air quality in attainment (and unclassifiable) areas. Increases in ambient concentrations of NO_2, SO_2, and PM_{10} are limited to modest increments above the existing or "baseline" air quality in most attainment areas of the country (Class II areas discussed below), and to very small incremental increases in pristine attainment areas (Class I areas discussed below).

For the purposes of PSD, EPA has categorized each attainment area within the United States into one of three PSD area classifications. PSD Class I is the most restrictive air quality category, and was created by Congress to prevent further deterioration of air quality in national and international parks, national memorial parks and national wilderness areas of a given size threshold which were in existence prior to 1977, or those additional areas which have since been designated Class I under federal regulations (40 CFR 52.21). All remaining areas outside of the designated Class I boundaries were designated Class II areas, which allow a relatively greater deterioration of air quality over that in existence in 1977, although still within the NAAQS. No Class III areas, which would allow further degradation, have been designated.

The federal land managers have also identified certain federal assets with Class II status as "sensitive" Class II areas for which air quality and/or visibility are valued resources.

Table F-2 is a list of mandatory federal Class I areas, tribal Class I areas, and federal Class II areas that are of special interest in the region and their distance from the general Wright analysis area. The closest Class I area to the general Wright analysis area is Wind Cave National Park in South Dakota, located about 91 miles to the east. The next closest Class I area is the Northern Cheyenne Indian Reservation (tribal federal Class I area), located about 132 miles to the north-northwest. The closest sensitive Class II areas are the Devils Tower National Monument and the Jewel Cave National Monument, which are approximately 70 miles north-northeast and 74 miles east of the general Wright analysis area, respectively.

PSD regulations limit the maximum allowable increase (increment) in ambient PM_{10} in a Class I airshed resulting from major stationary sources or major modifications to 4 $\mu g/m^3$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities listed in the PSD rules which emit, or have the potential to emit, 100 tons per year or more of PM_{10} or other criteria air pollutants, or any other facility which emits, or has the potential to emit, 250 tons per year or more of PM_{10} or other criteria air pollutants, are considered major stationary sources and must therefore demonstrate compliance with those incremental standards during the new source permitting process. However, fugitive emissions are not counted against the PSD major source applicability threshold

Table F-2. Approximate Distances and Directions from the General Wright Analysis Area to Mandatory Federal PSD Class I, Tribal Federal PSD Class I, and Federal PSD Class II Areas.

Receptor Area	Distance (miles)	Direction to Receptor
Mandatory Federal PSD Class I Area		
Badlands Wilderness Area[1]	143	E
Bridger Wilderness Area	199	WSW
Fitzpatrick Wilderness Area	207	W
Gates of the Mountain Wilderness Area	382	NW
Grand Teton National Park	254	W
North Absaroka Wilderness Area	213	WNW
Red Rocks Lake Wilderness Area	320	WNW
Scapegoat Wilderness Area	426	NW
Teton Wilderness Area	221	W
Theodore Roosevelt National Park (North Unit)	290	NNE
Theodore Roosevelt National Park (South Unit)	242	NNE
U.L. Bend Wilderness Area	290	NNW
Washakie Wilderness Area	187	W
Wind Cave National Park	91	E
Yellowstone National Park	235	WNW
Tribal Federal PSD Class I		
Fort Peck Indian Reservation	301	N
Northern Cheyenne Indian Reservation	132	NNW
Federal PSD Class II		
Absaroka-Beartooth Wilderness Area	224	WNW
Agate Fossil Beds National Monument	114	SE
Badlands National Park	121	E
Bighorn Canyon National Recreation Area	166	NW
Black Elk Wilderness Area	88	E
Cloud Peak Wilderness Area	93	WNW
Crow Indian Reservation	124	NW
Devils Tower National Monument	70	NNE
Fort Belknap Indian Reservation	327	NNW
Fort Laramie National Historic Site	108	SSE
Jewel Cave National Monument	74	E
Mount Rushmore National Memorial	94	E
Popo Agie Wilderness Area	194	WSW
Soldier Creek Wilderness Area	106	SE

[1] The U.S. Congress designated the Wilderness Area portion of Badlands National Park as a mandatory Federal PSD Class I area. The remainder of Badlands National Park is a PSD Class II area.

unless the source is so designated by federal rule (40 CFR 52.21). As a result, the surface coal mines in the PRB have not been subject to permitting under the PSD regulations because the mine emissions that are subject to PSD applicability levels fall below these thresholds.

F-2.4 Best Available Control Technology

All sources being permitted within Wyoming must meet state-specific best available control technology (BACT) requirements, regardless of whether the source is subject to state/federal PSD review. During new source review, a BACT analysis is developed for the proposed project. The BACT analysis must evaluate all control options on the basis of technical, economic and environmental feasibility. BACT for mining operations in the PRB is largely dictated by categorical control requirements defined in the WAQSR. BACT decisions are mandated through the new source review pre-construction permit.

F-2.5 New Source Performance Standards

The new source performance standards (NSPS) are a program of "end-of-stack" technology-based controls/ approaches required by the CAA and adopted by reference into the WAQSR. These standards, which apply to specific types of new, modified or re-constructed stationary sources, require the sources to achieve some base level of emissions control. For surface coal mining in the PRB, this includes certain activities at coal preparation plants. Specifically, the applicable requirements can be found at 40 CFR Part 60, Subpart Y (Standards of Performance for Coal Preparation Plants), and in the WAQSR. However, in Wyoming these standards are typically less stringent than state-level BACT limits.

F-2.6 Federal Operating Permit Program

The CAAA required the establishment of a facility-wide permitting program for larger sources of pollution. This program, known as the Federal Operating Permit Program, or "Title V" (codified at Title V of the 1990 CAAA), requires that "major sources" of air pollutants obtain a federal operating permit. Under this program, a "major source" is a facility that has the potential to emit more than 100 tons per year (tpy) of any regulated pollutant, 10 tpy of any single hazardous air pollutant (HAP), or 25 tpy or more of any combination of HAPs, from applicable sources. The operating permit is a compilation of all applicable air quality requirements for a facility and requires an ongoing demonstration of compliance through testing, monitoring, reporting and recordkeeping requirements. The potential to emit (PTE) for PM_{10} under the existing air quality permits for the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines were well below the 100 tpy applicability threshold.

F-2.7 Summary of Pre-Construction Permitting Procedures

The WDEQ/AQD administers a permitting program to assist the agency in managing the state's air resources. Under this program, anyone planning to construct, modify, or use a facility capable of emitting designated pollutants into the atmosphere must obtain an air quality permit to construct. Coal mines fall into this category. A new coal mine, or a modification to an existing mine, must be permitted by WDEQ/AQD, pursuant to the provisions of WAQSR Chapter 6, Section 2. Under these provisions, a successful permittee must demonstrate that it will comply with all applicable aspects of the WAQSR including state and federal ambient air standards.

When a permittee decides to construct a new surface coal mine or modify operations at an existing surface coal mine that will cause an increase in pollutant emissions, they must submit an application, which is reviewed by WDEQ/AQD new source review staff and the applicable WDEQ/AQD field office. Typically, a company will meet with the WDEQ/AQD prior to submitting an application to determine issues and details that need to be included in the application. A surface coal mining application will include the standard application, BACT measures that will be implemented, an inventory of point and fugitive sources for the mine in question as well as neighboring mines and other sources, and air quality modeling analyses addressing cumulative impacts in the mining region.

BACT must be employed at all sources permitted/exempted in Wyoming. Per WAQSR Chapter 6, Section 2, BACT at large mining operations typically include but may not be limited to: paving of access roads, treating of haul routes with chemical dust suppressant (and water) and storage of large amounts of materials/coal awaiting shipment in enclosures such as silos, troughs or barns. These (and other) mitigation measures are considered in the development of emission inventories used for modeling/permitting.

For the modeling analyses, an applicant must compile an emission inventory of PM_{10} from their mining operation, neighboring mines and other surrounding sources. For PM_{10} from the applicant mine, both point source and fugitive dust emissions are quantified. The emissions are based on the facility's potential to emit in each year of the life of mine (LOM). The applicant also examines the surrounding coal mining operations and their previous air quality permits to determine their emissions throughout the LOM. Two or more worst-case years (generally with the highest potential emissions) are then modeled in detail. Other surrounding emission sources, such as power plants, compressor stations, paved highways, long-haul railroad lines and municipalities are also considered in the modeling analysis.

Coal mines in the PRB are also required to quantify nitrogen oxides (NO_x) emissions from their operations. Dispersion modeling is required to demonstrate compliance with the ambient NO_2 standard. Potential emissions from diesel powered mining equipment, blasting and locomotive emissions (on

mine property) are considered in the modeling analyses. In a fashion similar to the PM_{10} analysis, neighboring mining operations and other surrounding sources are also included in the NO_x/NO_2 analysis.

Long-term PM_{10} modeling is conducted for the permit application to demonstrate compliance with the annual PM_{10} standard. For both point and area sources, the Industrial Source Complex Long Term model, version 3 (ISCLT3) is typically used.

The WDEQ/AQD has recently required all mines in the PRB to "submit and justify a background PM_{10} concentration with each permit application" (WDEQ/AQD 2006). A site specific PM_{10} background concentration of 14.91 $\mu g/m^3$ was developed in the modeling analysis for the Black Thunder and Jacobs Ranch mines, while a background concentration of 15.0 $\mu g/m^3$ was developed for the North Antelope Rochelle Mine. The modeling results are added to the background and compared to the annual standard. Likewise, compliance with the annual NO_2 standard is verified using ISCLT3 and an NO_2 background concentration of 14.0 $\mu g/m^3$ for the Black Thunder and Jacobs Ranch mines and a NO_2 background concentration of 20.0 $\mu g/m^3$ for the North Antelope Rochelle Mine.

Short-term PM_{10} modeling is not required by WDEQ/AQD, nor does WDEQ/AQD consider it to be an accurate representation of short-term impacts. Section 234 of the 1990 CAAA mandated the administrator of the EPA to analyze the accuracy of short-term modeling of fugitive particulate emissions from surface coal mines. A June 26, 1996 letter from EPA Region VIII to Wyoming State Representative, Ms. Barbara Cubin, detailed the results of an EPA study wherein the short-term model failed to meet evaluation criteria and tended to significantly overpredict 24-hour impacts of surface coal mines. The memorandum of agreement of January 24, 1994 between EPA Region VIII and the State of Wyoming allows WDEQ/AQD to conduct monitoring in lieu of short-term modeling for assessing coal mining-related impacts in the PRB. This agreement remains in effect and ambient particulate monitoring is required of each coal mine through conditions of their respective permits. The 1994 Memorandum of Agreement also required WDEQ/AQD to implement "Best Available Work Practice" mitigation measures at any mine where an exceedance of the PM_{10} air quality standard has occurred.

The permit application is reviewed by WDEQ/AQD to determine compliance with all applicable air quality standards and regulations. This includes review of compliance with emission limitations established by NSPS, review of compliance with ambient standards through modeling analyses, and establishment of control measures to meet BACT requirements. The WDEQ/AQD proposed permit conditions are sent to public notice for a 30-day review period after which a final decision on the permit is made (or a public hearing is held prior to a final permit decision).

The Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines have prepared permit applications and conducted air quality modeling analyses when mine plan changes have dictated and as required by WDEQ/AQD. These applications and analyses demonstrate that mining operations have complied, and will continue to comply, with all applicable aspects of the WAQSR and the federal CAAA.

In conducting an analysis of air quality impacts in the PRB for the Wyoming and Montana BLM, the Task 1A Report for the Powder River Basin Coal Review reports a background concentration of 5 µg/m^3 for NO_x for the entire PRB. The air permit actions for the Black Thunder and Jacobs Ranch mines used a background concentration of 14.0 µg/m^3 for PM_{10} and the North Antelope Rochelle Mine used a background concentration of 20.0 µg/m^3. These concentrations are based on recently monitored values in Gillette, Wyoming and at the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines, and include all sources operating at the time the value was measured, including existing coal mine operations located around Gillette.

F-2.8 Natural Events Action Plan

In response to the measured exceedances of the PM_{10} NAAQS in certain areas of the PRB and in anticipation of possible future exceedances, the WDEQ/AQD has collaborated with the Wyoming Mining Association (WMA) to develop a Natural Events Action Plan (NEAP) for the coal mines of the PRB, based on EPA Natural Event Policy guidance. The plan was submitted to and approved by EPA. A report describing the plan can be accessed on the WDEQ/AQD's website on the Internet (<http://deq.state.wy.us/AQD/NEAP%20Files/1-23-07NEAP.pdf>).

The NEAP recognizes that certain NAAQS exceedances due to natural events are uncontrollable. While all practical mitigation measures need to be implemented during those events, the exceedances should not be considered against the NAAQS attainment designation for the region. Specific NEAP goals include:

- Provide for the protection of public health,
- Develop public information program,
- Provide a mechanism for "flagging" exceedances due to uncontrollable natural events,
- Implement Best Available Control Measures (BACM) and Reactionary Control Measures (RACM) based on the severity of the event, and
- Provide mechanism for excluding flagged data when they meet specific wind speed criteria and BACM and RACM are in place.

The NEAP identifies, in addition to the BACT measures generally included in individual mine air quality permits, two other categories of control measures designed to prevent exceedances during high wind events (WDEQ/AQD 2007). One of these, BACM, is an additional list of control measures that the mines

can implement continuously so that they are in place before a high wind event occurs. These measures are not current requirements in all of the mines' air quality permits. They primarily address the principal mine-controlled sources of fugitive dust, which are large contiguous disturbed areas. These measures include:

1. Stabilizing topsoiled area as soon as practicable following topsoil replacement.
2. Ripping, windrowing, mulching, temporarily seeding or chemically treating areas greater than 300 contiguous acres in size that have been stripped of topsoil but will not be mined in the near future.
3. Ripping, windrowing, temporarily seeding or chemically treating graded backfill areas greater than 300 contiguous acres in size.
4. Ripping, mulching, temporarily seeding or chemically treating long-term out-of-pit overburden and topsoil stockpiles that have been graded.
5. Applying non-vegetative barriers such as gravel or other large-diameter particles to erodible surfaces to reduce surface erosion where appropriate.
6. Cleaning, treating, and maintaining pads in front of truck dumps to prevent accumulations of spilled materials from getting pulverized.
7. Scheduling topsoil removal, backfill grading and topsoil replacements concurrently to minimize open areas when possible.
8. Requiring contractors to apply water and/or chemical dust suppressants in their haulage areas.

The second additional category of control measures discussed in the NEAP includes measures that are not currently required by all individual air quality permits but are actions that can be taken during a high wind event, depending on site specific conditions (WDEQ/AQD 2007). These include:

1. The mine operator will consider relevant information, including NWS forecasts and local meteorological information, to confirm that a high wind event is occurring.
2. The mine operator will visually determine areas of mining activity that are generating excessive visible dust and direct water trucks to those areas.
3. The mine operator should direct overburden operations to the shortest haul distance available during a high wind event.
4. The mine operator will evaluate the practicality of dumping the overburden as low as possible.
5. Mine employees will inspect for and extinguish coal fires.
6. The mine operator will evaluate shutting down scoria crushing operations that appear to be generating excess dust.
7. The mine operator will evaluate shutting down road maintenance activities that are generating dust.
8. The mine operator will evaluate ordering contractors to increase water, reduce operating equipment or shut down haulage.

9. The mine operator will evaluate the need to shut down and/or reduce earthmoving activities as the mine schedule and conditions will allow.

If a NEAP is designed and implemented to minimize PM_{10} concentrations, EPA will exercise its discretion, under Section 107(d)(3) of the CAA, not to redesignate areas as nonattainment, provided that the exeedances are demonstrated to be the result of natural events. Based on the EPA's Natural Events Policy, PM_{10} concentrations due to dust raised by unusually high winds will be treated as uncontrollable natural events under the following conditions: (1) the dust originated from non-anthropogenic sources, or (2) the dust originated from anthropogenic sources controlled with BACM.

The WDEQ/AQD NEAP includes a public education plan, a public notification and health advisory program, and a plan to abate or minimize appropriate contributing controllable sources of PM_{10}, which includes three categories of control measures. The NEAP approved by EPA only includes measures for control of coal mine sources since it is the ambient monitoring systems around the large surface coal mines that have recorded the exceedances of the 24-hour PM_{10} NAAQS. If it is demonstrated that there are non-coal sources contributing to elevated measurements in an area of concern, WDEQ/AQD may address these additional sources separately from the approved NEAP or as a future update of the plan.

F-3.0 EXISTING AIR QUALITY

WDEQ monitors air quality through an extensive network of air quality monitors throughout the state. Particulate matter is generally measured as PM_{10}. The eastern portion of the PRB has an extensive network of PM_{10} monitors operated by the mining industry due to the density of coal mines in the region (Figure F-2). There are also monitors in Sheridan, Gillette, Arvada and Wright, Wyoming.

This network is sited to measure ambient air quality and to infer impacts from specific sources. Source-specific monitors may also be used for developing trends in PM_{10} concentrations. WDEQ uses data from this monitoring network to identify potential air quality problems and to anticipate issues related to air quality. With this information, the WDEQ can stop or reverse trends that negatively affect the ambient air. Part of that effort has resulted in the formation of a coalition involving the counties, coal companies and coal bed methane operators to focus on minimizing dust from roads. The WDEQ may also take enforcement action to remedy a situation where monitoring shows a violation of any standard. If a monitored standard is exceeded at a specific source, the state agency may initiate enforcement against that source. In those instances, the state agency may use a negotiated settlement agreement to seek corrective action.

WDEQ operates two visibility monitoring stations in the PRB, both of which are IMPROVE sites. One of these sites is located north of Gillette. This site

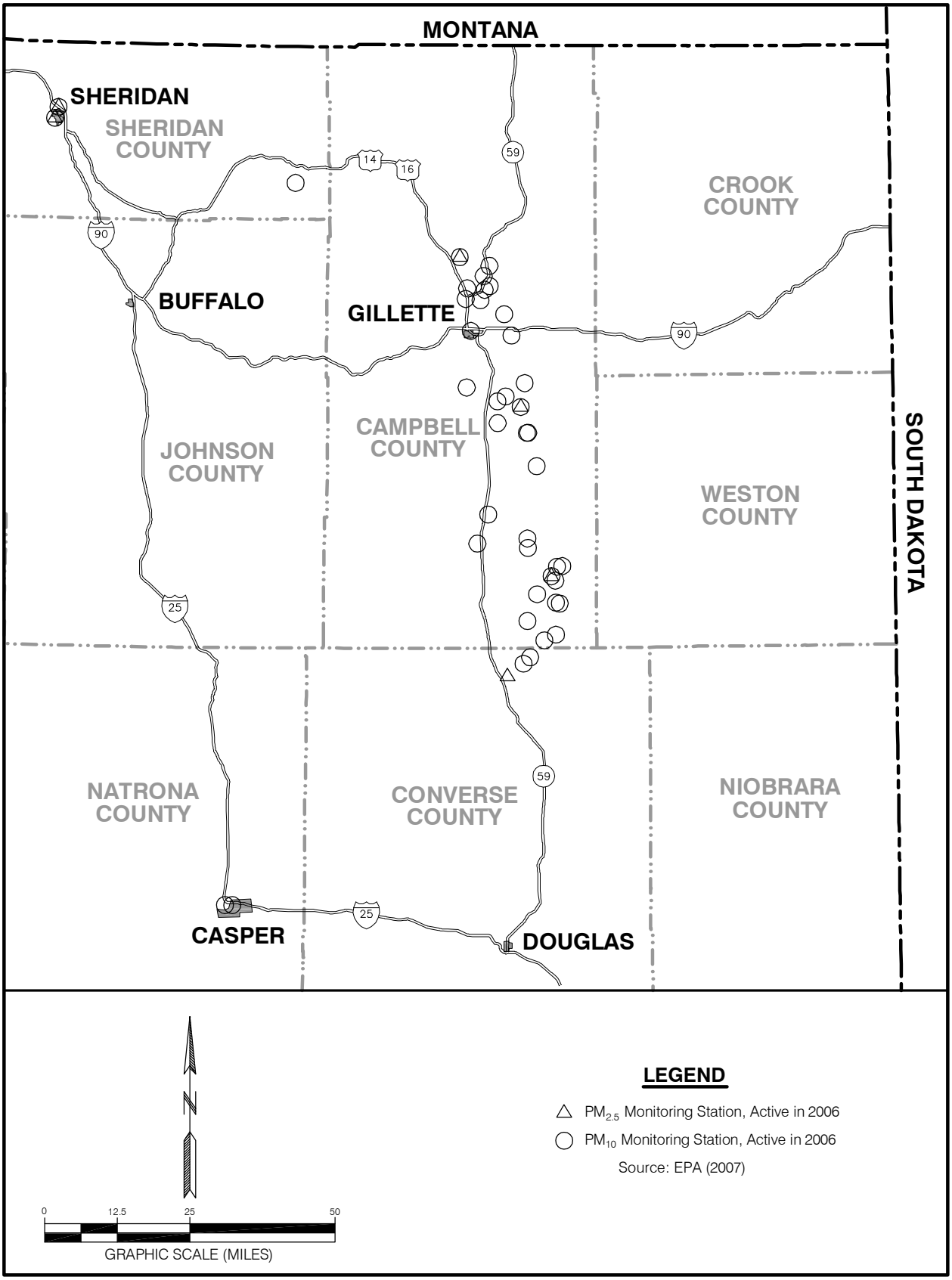


Figure F-2. Active Particulate Monitoring Stations in Northeastern Wyoming.

includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE protocol), and meteorological instruments to measure wind speed, direction, temperature, and relative humidity. The site is also equipped with a digital camera and analyzers for ozone and nitrogen oxides (NO, NO_2, NO_x). The second visibility monitoring station is located west of Buffalo and includes a nephelometer, a transmissometer, an aerosol monitor (IMPROVE), meteorological instruments to measure wind speed, direction, temperature, and relative humidity, plus a digital camera.

Air quality monitoring equipment for NO_2 within the PRB includes a WARMS operated by the BLM to detect sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle and a NADP monitoring system for precipitation chemistry in Newcastle.

F-3.1 Regional Particulate Emissions

The federal and state standards for particulate matter pollutant are discussed in Chapter 3, Section 3.4.2.1 of this EIS.

WDEQ/AQD requires monitoring data to document the air quality at all of the PRB mines. Each mine monitored PM_{10} for a 24-hour period every 6 days at multiple monitoring sites through the end of 2001. This frequency was increased by the WDEQ/AQD to a 24-hour period every 3 days beginning in 2002. Available monitoring data for total suspended particles (TSP) began in 1980 and data for PM_{10} began in 1989. Through 2004, approximately 57,000 TSP samples had been collected and approximately 47,555 PM_{10} samples had been collected through 2007, making the eastern PRB one of the most intensely monitored areas for particulates in the county. Table F-3 summarizes the annual arithmetic average of data from 1980 through 2007 for sites located at Campbell and Converse County mining operations.

As indicated in Table F-3, the long-term trend in particulate emissions remained relatively flat through 1998. The overall average annual TSP concentration was 37.7 $\mu g/m^3$ from 1980 through 2003, with annual averages ranging between 27.8 $\mu g/m^3$ and 57.5 $\mu g/m^3$. There were increases in 1988 and 1996, which may have been the result of fires in the region during those years. Increases from 1999 to 2003 may be related to drought conditions as well as increases in coal and overburden production and increases in other natural resource development activities, including CBNG, during that period. Annual average PM_{10} concentrations from 1989 through 1998 were relatively flat, ranging from 12.9 $\mu g/m^3$ to 16.5 $\mu g/m^3$, with an overall average of 15.4 $\mu g/m^3$. Annual average PM_{10} concentrations from 1999 through 2007 were increased slightly, but were similarly relatively flat, ranging from 20.0 $\mu g/m^3$ to 27.2 $\mu g/m^3$, with an overall average of 23.2 $\mu g/m^3$.

The 1980-1998 time period was associated with significant growth in the surface coal mining industry in the eastern PRB. Coal production increased from about 59 million tons per year (mmtpy) to over 293 mmtpy (an increase of

Table F-3. Summary of WDEQ/AQD Reports on Air Quality Monitoring for Surface Coal Mines[1] in Wyoming's PRB, 1980-2007.

Year	Coal Produced (mmtpy)	Overburden Moved (mmbcy)	Number of Mines Operating/ Monitoring TSP/ Monitoring PM_{10}[1]	Number of TSP/PM_{10} Monitoring Sites[2]	TSP Average ($\mu g/m^3$)	PM_{10} Average ($\mu g/m^3$)
1980	58.7	105.3	10/14/0	34/0	35.5	na[3]
1981	71.0	133.4	11/13/0	35/0	39.4	na
1982	76.1	141.1	11/14/0	40/0	31.2	na
1983	84.9	150.9	13/14/1	41/1	32.6	11.2
1984	105.3	169.5	14/16/1	42/1	33.9	11.1
1985	113.0	203.4	16/17/0	49/0	32.3	na
1986	111.2	165.7	16/17/0	45/0	29.3	na
1987	120.7	174.6	16/17/0	43/0	31.7	na
1988	138.8	209.7	16/17/0	43/0	37.7	na
1989	147.5	215.6	15/17/3	40/3	32.1	15.9
1990	160.7	220.1	17/17/5	47/5	34.3	14.8
1991	171.4	242.3	17/17/5	46/6	32.7	16.5
1992	166.1	296.0	17/17/7	41/7	31.7	15.9
1993	188.8	389.5	17/17/8	40/11	27.8	14.5
1994	213.6	483.9	17/18/8	44/11	31.7	15.5
1995	242.6	512.7	16/18/8	41/12	29.6	12.9
1996	257.0	605.4	17/18/8	41/12	35.4	16.0
1997	259.7	622.0	16/17/10	39/15	33.3	15.9
1998	293.5	669.0	16/17/12	36/17	33.9	15.9
1999	317.1	762.9	15/17/12	36/18	55.3	21.6
2000	322.6	868.9	15/15/12	31/17	56.1	23.4
2001	354.1	927.7	12/11/12	29/29	57.5	27.2
2002	359.7	1,032.1	13/11/13	23/38	56.0	23.3
2003	363.6	1,044.2	13/10/13	16/34	51.9	20.8
2004	381.6	1,184.4	13/6/13	7/33	--[4]	20.3
2005	390.3	1,147.6	12/6/12	7/33	--[4]	21.5
2006	431.9	1,256.7	13/5/13	6/33	--[4]	24.2
2007	436.5	1,268.5	14/4/14	4/33	--[4]	25.2

1 Mines include Buckskin, Rawhide, Eagle Butte, Dry Fork, Fort Union (acquired by Dry Fork), Clovis Point (acquired by Wyodak), Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero (Caballo Rojo now combined with Cordero), Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope, Rochelle (North Antelope now combined with Rochelle), and Antelope.

2 Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

3 Not applicable because no monitoring for PM_{10} was done.

4 Data no longer pertinent due to paucity of monitoring sites.

Sources: 1980 through 1996 emissions and production data from April 1997 report prepared by Wyoming Mining Association for WDEQ/AQD. 1997 through 2007 PM_{10} emissions data from EPA AirData database (EPA 2009b). 1997 through 2003 TSP emissions data from WDEQ/AQD (available upon request). 1997 through 2007 production data from WDEQ/AQD (Shamley 2008a) and Wyoming Department of Employment/State Inspector of Mines (1997-2007).

almost 400 percent), and associated overburden production increased from 105 million bank cubic yards (mmbcy) to 669 mmbcy per year (an increase of over 537 percent). From 1990 through 2007, the average annual increase in coal production was 6.3 percent, while annual overburden production increased an average of 11.3 percent over the same time period. The proportionately larger annual increase in overburden production is due to the fact that the mines are gradually moving into areas of higher stripping ratios as the shallower reserves are mined out.

The relatively flat trend in particulate emissions from 1980 through 1998 is due in large part to the Wyoming Air Quality Program that requires BACT at all permitted facilities. BACT control measures, which include watering and chemical treatment of roads, limiting the amount of area disturbed, temporary revegetation of disturbed areas to reduce wind erosion, and timely final reclamation, are discussed in Section 3.4.2.3 of this EIS.

The average annual TSP concentration increased from 33.9 $\mu g/m^3$ in 1998 to 55.3 $\mu g/m^3$ in 1999, and remained greater than 50.0 $\mu g/m^3$ through 2003. The average annual PM_{10} concentration increased from 15.9 $\mu g/m^3$ in 1998 to 21.6 $\mu g/m^3$ in 1999 and peaked in 2001 at 27.2 $\mu g/m^3$. The monitored concentrations have decreased since 2001; in 2004, the average annual concentration was 20.0 $\mu g/ m^3$. The increases in coal production over the last 5 years (an average of 4.0 percent per year and 15.4 mmtpy per year over the 5-year period) and associated overburden production (an average of 6.6 percent per year and 68.8 mmbcy per year over the 5-year period) were less than a majority of the previous 20 5-year running average periods, but the particulate concentrations remained relatively constant. There were no major fires in the region between 1998 and 2005 but major fires were experienced in the region in 2006 and 2007. There was an increase in CBNG development in the PRB between 1998 and 2005 and northeastern Wyoming has experienced extreme drought conditions as well as a dramatic increase in surface disturbance activities associated with CBNG development since 1999. All of these factors have exacerbated particulate emissions.

There were no monitored exceedances of the 24-hour PM_{10} standards anywhere in the Wyoming PRB through year 2000. From 2001 through 2006, there were 29 monitored exceedances of the 24-hour PM_{10} standard, at seven operating mines and in 2007 a total of 11 exceedances were reported at six mines. A majority of the 29 exceedances reported between 2001 and 2006 were associated with elevated winds exceeding 20 miles per hour, which could have qualified as a high wind event under the NEAP. Of the 11 exceedances reported within the PRB in 2007, five have been flagged as exceptional events by EPA under the NEAP and will be treated as uncontrollable natural events (not considered when determining the region's air quality designation). Five of the remaining six exceedances are currently under review by EPA and may be flagged as an exceptional event under the NEAP (Shamley 2008b). Within the PRB, 27 of 30 of the valid exceedances (not considered exceptional events under NEAP) took place in the group of mines located south and east of the

town of Wright; the remaining three valid exceedances occurred in the group of mines located north of Gillette (Figure F-1).

Emissions control measures that are used to control particulate emissions at the PRB mines, including the Black Thunder, Jacobs Ranch and North Antelope Rochelle mines, are discussed in Chapter 3, Section 3.4.2.3 of this EIS.

County roads are also responsible for some portion of the fugitive dust related to transportation. To help address this problem, the Campbell County Commissioners, oil and gas production companies, and coal mine operators have formed a coalition to implement the most effective dust control measures on a number of county roads. Measures taken have ranged from the implementation of speed limits to paving of heavily traveled roads. The coalition has utilized chemical treatments to control dust as well as closing roads where appropriate or necessary and rebuilding existing roads to higher specifications. The coalition requested money from the Wyoming State Legislature to fund acquisition of Rotomill (ground up asphalt) to be mixed with gravel for use in treating some of the roads in the PRB. The Rotomill/gravel mixture has been demonstrated to be effective in reducing dust; the life of the mixture on treated roads is estimated to be from 5 to 6 years (Bott 2006).

F-3.2 Regional NO_2 Concentrations

The federal and state standards for NO_2 are discussed in Chapter 3, Section 3.4.3.1 of this EIS.

Nitrogen oxides (NO_x) form when fuel is burned at high temperatures. They can be formed naturally or by human activities. The primary manmade sources are motor vehicles, electric utilities, and other fuel-burning sources. According to the EPA, motor vehicles produce about 55 percent of the manmade NO_x emissions, utilities and industrial/commercial/residential activities each produce about 22 percent of the manmade NO_x emissions, and other sources account for the remaining 1 percent of the manmade emissions (EPA 2009a). The primary direct source of emissions of NO_x during coal mining operations is tailpipe emissions from large mining equipment and other vehicle traffic inside the mine permit area.

Blasting that is done to remove the material overlying the coal (the overburden) can result in emissions of several products, including NO_2, as a result of the incomplete combustion of nitrogen-based explosives used in the blasting process. When this occurs, gaseous, orange-colored clouds may be formed and they can drift or be blown off mine permit areas.

NO_2 is a product of incomplete combustion of sources such as gasoline- and diesel-burning engines or from mine blasting activities. Incomplete combustion during blasting may be caused by wet conditions in the overburden, incompetent or fractured geological formations, deformation of bore holes, and

blasting agent factors. Generally, blasting-related NO_x emissions are more prevalent at operations that use the blasting technique referred to as cast blasting (Chancellor 2003). Cast blasting refers to a type of direct blasting in which the blast is designed to cast the overburden from on top of the coal into the previously mined area.

In the mid-to late-1990s, the Office of Surface Mining Reclamation and Enforcement (OSM) received complaints from several citizens about blasting clouds from several mines in the PRB. EPA expressed concerns that NO_2 levels in some of those blasting clouds may have been sufficiently high at times to cause human health effects. In response to those concerns, several studies have been conducted, the mines have modified their blasting techniques, and the WDEQ has imposed blasting restrictions on several mines. More information about these studies and restrictions is presented in the following discussion.

On the order of the Director of the WDEQ, members of the mining industry in the PRB conducted a comprehensive, multi-year monitoring and modeling study of NO_2 exposures from blast clouds. Results of the study (TBCC 2002), conducted pursuant to protocols reviewed and approved by the WDEQ, were provided to the WDEQ and the public in July 2002.

Using a combination of NO_2 measurements collected near 91 blast sites (78 valid runs) and a conservative modeling/extrapolation approach, the authors developed a series of "safe" setback curves for coal, overburden and cast shots for various wind speed classes. The curves were derived from the sampled data, conservative projections of concentrations at greater/lesser distances than measured and an assumed safe level (based on a comprehensive review of available health effects data) of 5.0 ppm for 10 minutes.

Subsequently, the data in the 2002 report (collected at the Black Thunder Mine) were augmented with monitored data/analyses from an additional 45 validated blast events at the Eagle Butte, North Antelope Rochelle, Buckskin and Cordero Rojo mines. New curves, based on the entire basin-wide data set encompassing 123 valid tests, were developed but differed only slightly from the original Black Thunder curves.

Measures that are used by the mines to control NO_2 emissions related to blasting by the PRB mines are discussed in Chapter 3, Section 3.4.3.3 of the EIS.

F-4.0 REFERENCES CITED

All references cited within this appendix are included within Section 6.0 of this EIS.

APPENDIX G

BIOLOGICAL ASSESSMENT
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SOUTH HILIGHT FIELD LBA TRACT
WEST HILIGHT FIELD LBA TRACT
WEST JACOBS RANCH LBA TRACT
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G-1.0 INTRODUCTION

Between October 2005 and September 2006, operators of three existing coal mines in Campbell County, Wyoming filed applications with the BLM for federal coal reserves in six separate tracts as maintenance leases under the Leasing on Application regulations at 43 CFD 3425. The environmental impacts of leasing these six lease by application (LBA) tracts are being evaluated in one environmental impact statement (EIS), the Wright Area Coal (WAC) Lease Applications EIS. The six tracts, which are shown on Figure G-1, and the respective applicant mines are:

- North Hilight Field LBA Tract adjacent to and north of the Black Thunder Mine;
- South Hilight Field LBA Tract adjacent to and southwest of the Black Thunder Mine;
- West Hilight Field LBA Tract west of the Black Thunder Mine;
- West Jacobs Ranch LBA Tract west of the Jacobs Ranch Mine;
- North Porcupine LBA Tract adjacent to and north of the North Antelope Rochelle Mine; and
- South Porcupine LBA Tract adjacent to and southwest of the North Antelope Rochelle Mine.

The purpose of this Biological Assessment is to provide information about the potential effects that leasing these six LBA tracts would have on federally listed threatened and endangered (T&E) species. T&E species are managed under the authority of the Endangered Species Act of 1973 (PL 93-205, as amended). The Endangered Species Act (ESA) requires Federal agencies to ensure that all actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any federally listed species or result in the destruction or adverse modification of their critical habitat. BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered at the leasing stage because they are a logical consequence of issuing a lease.

This Biological Assessment was prepared to disclose the possible effects to federally listed species (plant and animal) that are known to be present or that may be present within the area influenced by the Proposed Actions and the Alternatives to the Proposed Actions being evaluated by the BLM. This Biological Assessment was prepared in accordance with Section 7 of the ESA.

Biological Assessment objectives are:

1. To comply with the requirements of the ESA that actions of federal agencies not jeopardize or adversely modify critical habitat of federally listed species.

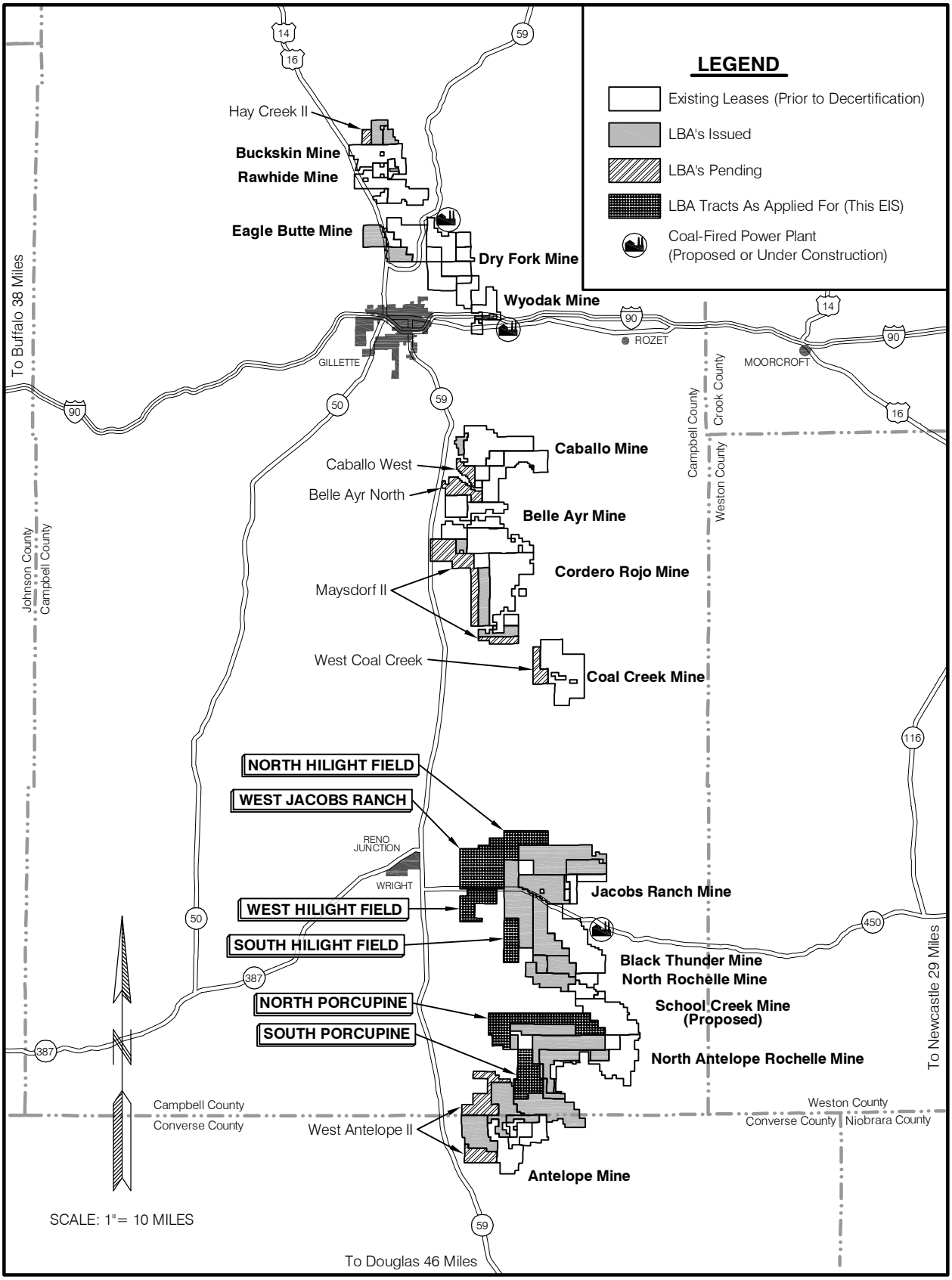

Figure G-1. General Location Map with Federal Coal Leases and LBA Tracts.

2. To provide a process and standard by which to ensure that threatened or endangered species receive full consideration in the decision making process.

If a decision is made to hold separate competitive lease sales for the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, or South Porcupine LBA Tracts, and if there is a successful bidder at a sale, a lease would be issued for the tract of federal coal as applied for. The tracts offered for lease would be subject to standard and special lease stipulations developed for the Wyoming Powder River Basin (PRB). The stipulations that would be attached to a lease for each of the six LBA tracts are listed in Appendix D of this EIS document. The following stipulation relating to T&E species is one of the special stipulations developed for the Wyoming PRB:

> ***THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES –*** *The lease area may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq., or that have other special status. The Authorized Officer may recommend modifications to exploration and development proposals to further conservation and management objectives or to avoid activity that will contribute to a need to list such species or their habitat or to comply with any biological opinion issued by the Fish and Wildlife Service for the Proposed Action. The Authorized Officer will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act. The Authorized Officer may require modifications to, or disapprove a proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species, or result in the destruction or adverse modification of designated or proposed critical habitat.*
>
> *The lessee shall comply with instructions from the Authorized Officer of the surface managing agency (BLM, if the surface is private) for ground disturbing activities associated with coal exploration on federal coal leases prior to approval of a mining and reclamation permit or outside an approved mining and reclamation permit area. The lessee shall comply with instructions from the Authorized Officer of the Office of Surface Mining Reclamation and Enforcement, or his designated representative, for all ground disturbing activities taking place within an approved mining and reclamation permit area or associated with such a permit.*

It is assumed that an area larger than the tract would have to be disturbed in order to recover all of the coal in a tract. The disturbances outside of a tract would be due to activities like overstripping, matching undisturbed topography, and construction of flood control and sediment control structures.

The coal mining unsuitability criteria listed in the federal coal management regulations at 43 CFR 3461.5 were applied to high to moderate coal

development potential lands in the Wyoming PRB. As indicated in Sections 1.1 and 1.5, some of the coal in the six tracts is overlain by rights of way (ROWs) for a state highway or county roads, or portions of the BNSF and UP railroad ROW and has been determined to be unsuitable for mining under Unsuitability Criterion 2 and/or Unsuitability Criterion 3 (43 CFR 3461.5). The Surface Mining Control and Reclamation Act of 1977 (SMCRA) prohibits surface mining operations on lands within 100 feet of the outside line of the ROW for a public road (SMCRA Section 522(e)(4) and 30 CFR 761.11(d)). There is an exception to this prohibition in the regulations at SMCRA Section 522(e)(4) and 30 CFR 761.11(d)(2), which can be applied if the appropriate road authority (Wyoming Department of Transportation (WYDOT) for state highways and Campbell County Board of Commissioners for county roads) allows a public road to be relocated or closed after public notice, an opportunity for a public hearing, and a finding that the interests of the affected public and landowners will be protected. Although the federal coal underlying the railroad and road ROWs and associated buffer zones may not be mined, it is included in a tract because it would allow maximum recovery of the mineable coal adjacent to but outside of the railroad and road ROWs and associated buffer zones and comply with the coal leasing regulations that do not allow leasing of less than 10-acre aliquot parts.

Under the Proposed Action for each tract, it is assumed that the LBA tract would be developed as maintenance lease to extend the life of the adjacent existing applicant mine. As a result, under the Proposed Action, the coal included in the tract would be mined by existing employees using existing facilities and roads.

G-1.1 Description of General Analysis Areas

The BLM study area for each of these six LBA tracts is defined as the original tract as applied for, plus all lands that BLM is considering adding to the tract. The general analysis area for each of these six LBA tracts is defined as the BLM study area plus surrounding lands within a ¼-mile perimeter that could be disturbed by mining the coal within the BLM study area where future mining disturbance could occur. The general analysis areas for the North and West Hilight Field LBA Tracts do not include lands within Black Thunder Mine's current mine permit area, although the general analysis area for the South Hilight Field LBA Tract does include some lands within Black Thunder Mine's current mine permit area. The general analysis area for the West Jacobs Ranch LBA Tract does not include lands within Jacobs Ranch Mine's current mine permit area. The general analysis areas for both the North and South Porcupine LBA Tracts are almost entirely within North Antelope Rochelle Mine's current mine permit area. The general Wright analysis area is defined as the area encompassing all six of these LBA tract general analysis areas.

SECTION G1

NORTH HILIGHT FIELD LBA TRACT

G1-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On October 7, 2005, Ark Land Company (ALC) filed an application with the BLM for federal coal reserves in two separate tracts located north and southwest of and immediately adjacent to the Black Thunder Mine in Campbell County, Wyoming (Figure G-1). The tracts, which are referred to as the North Hilight Field and South Hilight Field LBA Tracts, were assigned case file numbers WYW164812 and WYW174596, respectively. The federal coal reserves were applied for as maintenance tracts for the Black Thunder Mine. BLM determined that the two tracts in the application would be processed separately and, if the decision is made to conduct a lease sale, would be offered for sale separately.

G1-1.1 The Proposed Action

Under the Proposed Action for the North Hilight Field LBA Tract, the tract as applied for by ALC would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the North Hilight Field lease application (Figure G1-1). The Proposed Action assumes that ALC would be the successful bidder on the North Hilight Field LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed North Hilight Field LBA Tract coal lease lands as applied for by ALC under the Proposed Action is as follows:

T.44N., R.70W., 6th PM, Campbell County, Wyoming		
Section 19:	Lots 5 through 20;	656.88 acres
T.44N., R.71W., 6th PM, Campbell County, Wyoming		
Section 23:	Lots 1 through 16;	653.11 acres
Section 24:	Lots 1 through 16;	653.44 acres
Section 26:	Lots 1 through 16;	650.07 acres
Total:		2,613.50 acres

The coal estate included in the tract described above is federally owned and administered by the BLM. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G1-2.

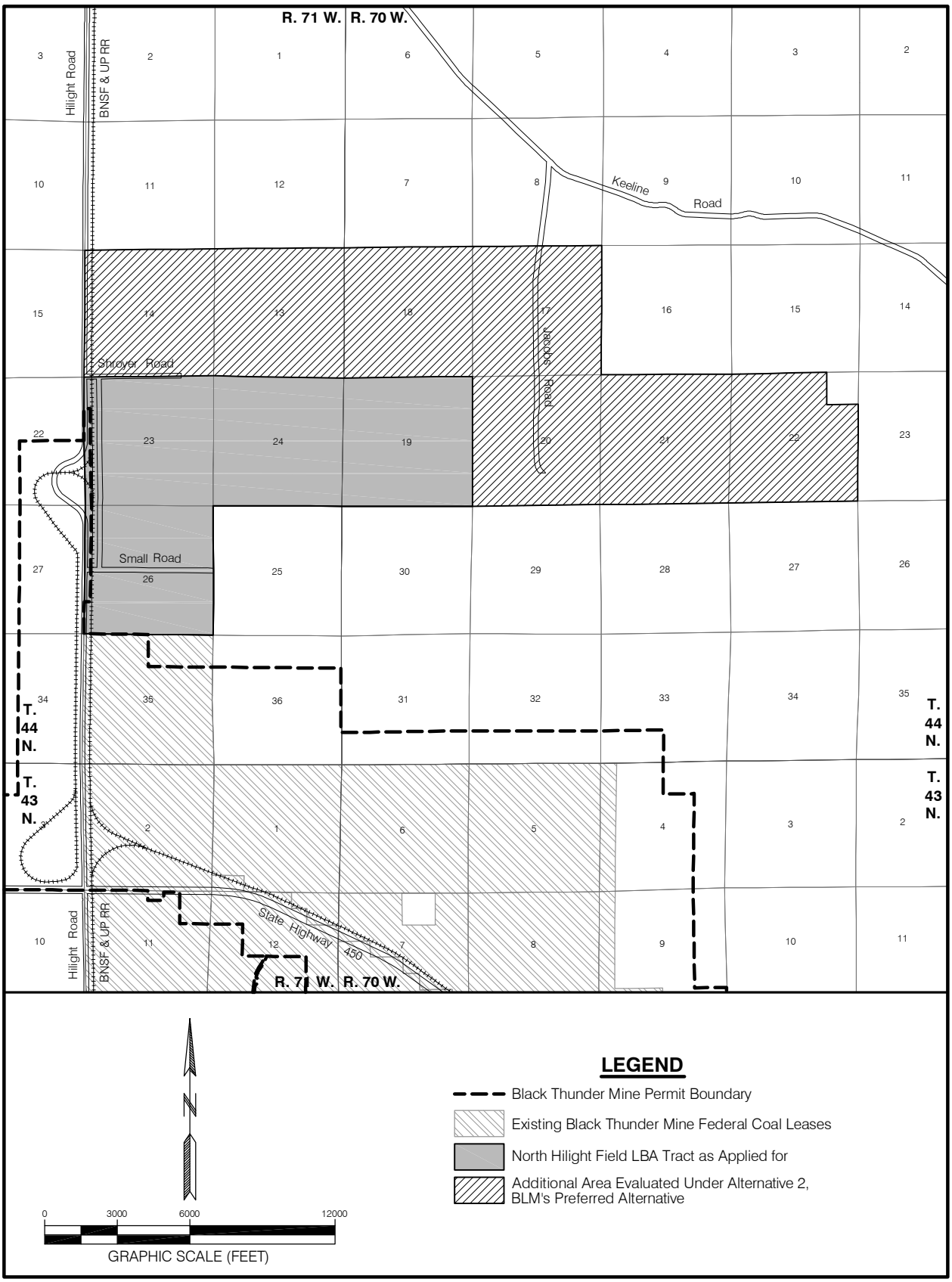

Figure G1-1. North Hilight Field LBA Tract Alternatives.

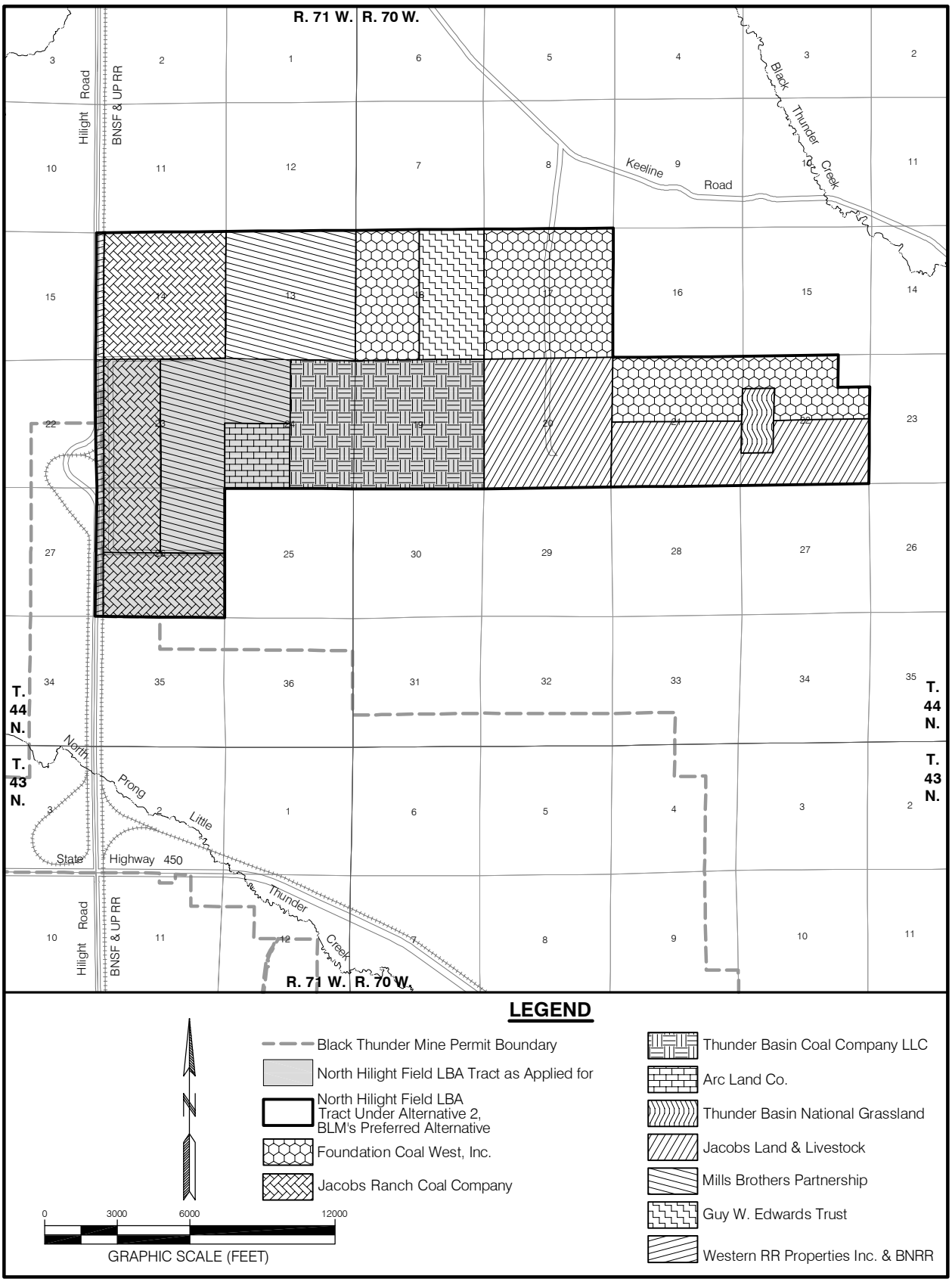

Figure G1-2. Surface Ownership Within the North Hilight Field LBA Tract Alternatives.

G1-1.2 Alternatives to the Proposed Action

G1-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, ALC's application to lease the coal included in the North Hilight Field LBA Tract would be rejected. The tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities or employment on the existing leases at the Black Thunder Mine. Portions of the surface of the LBA tract would probably be disturbed by both the Black Thunder and Jacobs Ranch mines due to overstripping to allow coal to be removed from existing contiguous leases.

G1-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the North Hilight Field LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the Powder River Basin (PRB) and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the North Hilight Field LBA Tract assumes that ALC would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the adjacent existing Black Thunder Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the North Hilight Field coal lease application, BLM identified a study area that includes unleased federal coal adjacent to the northern and eastern edges of the tract as applied for (Figure G1-1). BLM is evaluating the potential that some or all of these lands could be added to the area to be offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the North Hilight Field LBA Tract, and/or reduce the potential that some potentially mineable federal coal in this area would be bypassed if it is not included in the North Hilight Field LBA Tract.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.44N., R.70W., 6th PM, Campbell County, Wyoming

Section 17:	Lots 1 through 16;	654.17 acres
Section 18:	Lots 5 through 20;	655.14 acres
Section 20:	Lots 1 through 16;	651.07 acres
Section 21:	Lots 1 through 16;	658.37 acres
Section 22:	Lots 1 through 15;	606.85 acres

T.44N., R.71W., 6th PM, Campbell County, Wyoming

Section 13:	Lots 1 through 16;	655.53 acres
Section 14:	Lots 1 through 16;	644.74 acres
Total:		4,525.87 acres

The legal description of BLM's preferred configuration of the North Hilight Field LBA Tract under Alternative 2 (Figure G1-1) is as follows:

T.44N., R.70W., 6th PM, Campbell County, Wyoming

Section 17:	Lots 1 through 16;	654.17 acres
Section 18:	Lots 5 through 20;	655.14 acres
Section 19:	Lots 5 through 20;	656.88 acres
Section 20:	Lots 1 through 16;	651.07 acres
Section 21:	Lots 1 through 16;	658.37 acres
Section 22:	Lots 1 through 15;	606.85 acres

T.44N., R.71W., 6th PM, Campbell County, Wyoming

Section 13:	Lots 1 through 16;	655.53 acres
Section 14:	Lots 1 through 16;	644.74 acres
Section 23:	Lots 1 through 16;	653.11 acres
Section 24:	Lots 1 through 16;	653.44 acres
Section 26:	Lots 1 through 16;	650.07 acres
Total:		7,139.37 acres

The BLM study area includes lands (approximately 80.8 acres) on the Thunder Basin National Grassland (TBNG), which is administered by the U.S. Department of Agriculture – Forest Service (USFS).

G1-2.0 CONSULTATION TO DATE

The locations of the existing Black Thunder Mine coal leases, the existing approved mine permit area, and the North Hilight Field LBA Tract are shown in Figure G1-1.

The Black Thunder Mine and North Hilight Field LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The North Hilight Field LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this

analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. This analysis is referenced in the *Final Environmental Impact Statement (FEIS) for the Northern Great Plains Management Plans Revision* (USFS 2001a) and adopted in the *Land and Resource Management Plan (LRMP) for the Thunder Basin National Grassland* (USFS 2001b). The Record of Decision for the Thunder Basin National Grassland FEIS and LRMP was signed on July 31, 2002 (USFS 2002a). The North Hilight Field LBA Tract is located within Management Area 8.4, as identified in the 2002 Thunder Basin National Grassland LRMP, which is to be managed for mineral production and development. Consultation with USFWS was conducted as part of the 2002 LRMP. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the North Hilight Field LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the Black Thunder Mine's existing approved mine permit area, shown in Figure G1-1, as part of the mine and reclamation plan approval process. This process began when the Black Thunder Mine was initially permitted in 1974 and has continued through 2008. The most recent Migratory Bird Species of Management Concern and Raptor Monitoring and Mitigation Plan for the Black Thunder Mine was approved by the USFWS in 2007.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with NEPA, the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G1-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife monitoring has been conducted annually for the Black Thunder Mine since 1983. This wildlife monitoring was designed to meet the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD), WGFD, and federal (USFWS) requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The annual wildlife monitoring program has been consistent since it began in 1983, with minor modifications in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations. Areas covered by the wildlife surveys included the

mine's permit area and a large perimeter around the permit boundary; therefore, the North Hilight Field LBA Tract has also received extensive coverage during baseline and annual wildlife monitoring surveys for over 25 years. All but the northern quarter of the tract as applied for has been included in the mine's annual surveys since 2002. The Black Thunder Mine initiated baseline investigations expressly for the North Hilight Field LBA Tract in 2006, with annual monitoring continued in subsequent years. All or portions of the tract's associated general analysis area (described in Section G-1.1), plus the additional "wildlife survey area" (described as a two-mile perimeter beyond the tract's general analysis area) was included in these wildlife monitoring areas at the Black Thunder Mine and/or the neighboring Jacobs Ranch Mine. Black Thunder Mine initiated targeted surveys specifically for the West Hilight Field LBA Tract and its wildlife survey area in 2006 and 2007. Additional survey areas focusing on the North and South Hilight Field LBA Tracts were added in 2007 and 2008. Figure G1-3 depicts the North Hilight Field LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

The approved Black Thunder Mine Permit 233-T7 (TBCC 2005) includes monitoring and mitigation measures that are required by SMCRA and Wyoming State Law. If the North Hilight Field LBA Tract is acquired by ALC, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the Black Thunder Mine's mining permit is amended to include the tract. This amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the North Hilight Field LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), records from the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies. Site-specific data for the general analysis area for the North Hilight Field tract were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant and the neighboring (Jacobs Ranch) mines, which are on file with the WDEQ/LQD in Cheyenne and Sheridan, Wyoming.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mines' existing permit areas, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest

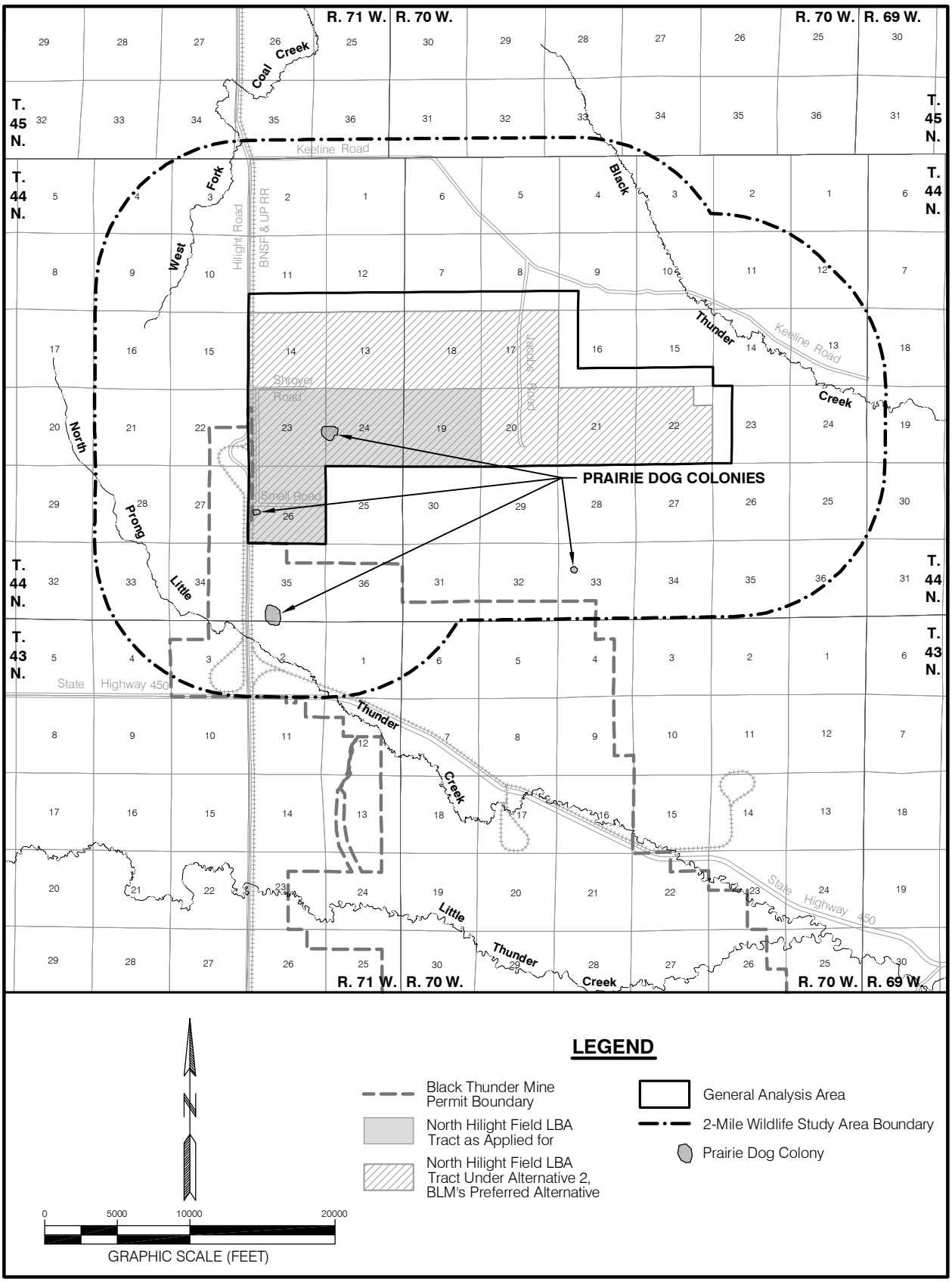

Figure G1-3. T&E Species Survey Area for the North Hilight Field LBA Tract.

portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides and along the drainages, where channel incision has created some gullying. The average land surface slope over the entire general analysis area for the North Hilight Field tract is approximately 3.4 percent. Surface mine lands, both active and reclaimed, dominate the landscape south and east of the North Hilight Field tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Minor vegetation types, including saline grassland, rough breaks, disturbed lands and bottomlands account for approximately 10 percent of the six combined general analysis areas. Disturbed lands include road and utility rights-of-way, areas surrounding active construction sites and mining facilities, oil and gas facilities, and occupied and abandoned homesteads. Few trees occur in the general Wright analysis area due to the lack of water and suitable habitats; most trees are found primarily in windbreaks planted adjacent to ranching facilities. Reclaimed lands include areas that were recently disturbed for road construction, installation of oil and gas development-related facilities, and mining-associated activities.

The North Hilight Field general analysis area and the existing Black Thunder Mine permit area are located in the Little Thunder Creek watershed. Typical of this semi-arid area, Little Thunder Creek and its tributaries are all ephemeral streams. Black Thunder Mine's approved WDEQ/LQD mine permit allows disturbance of Little Thunder Creek and several of its tributaries, including North Prong Little Thunder Creek. Approximately 43 percent (3,031 acres) of the 7,139-acre BLM study area for the North Hilight Field tract drains toward playas that are formed by natural topographic depressions; the largest of which are the Hansen Lakes; and Springen Draw, an internally drained closed basin, drains the entire western portion of the tract's general analysis area.

Numerous in-channel stock reservoirs are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. There are also a number of playas within the area. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable, and often dry, during other seasons.

A preliminary wetland inventory of the general analysis area for the North Hilight Field LBA Tract, based on USFWS National Wetland Inventory (NWI) mapping (1980), review of color infrared aerial photographs (WGCS 2002), and a field survey reconnaissance, was conducted in 2007. Some wetland areas previously mapped by the USFWS NWI have been recently altered due to coal bed natural gas (CBNG)-related water production within and upstream of the tract's general analysis area. The NWI maps were consulted prior to the initiation of the preliminary wetland field survey; however, the boundaries of the existing potential wetlands vary to a greater or lesser extent from the boundaries shown on the NWI maps. Due to the ephemeral nature of CBNG dewatering activities, the boundaries, and therefore wetland areas, are likewise ephemeral. A formal jurisdictional wetland delineation survey for the North Hilight Field LBA Tract would be conducted and submitted to the U.S. Army Corps of Engineers (COE) for verification as part of the mine permitting process, if the LBA tract is leased.

Within the entire general analysis area for the North Hilight Field LBA Tract (8,476.4 acres), the preliminary wetland inventory identified a total of 177.5 acres of wetlands and other waters of the U.S. (OWUS). These wetlands and OWUS were found within five general land categories: ephemeral streams, playas, ponds/reservoirs, isolated depressions, and excavated upland areas. These 177.5 acres are vegetated wetlands that consist of approximately 172.0 acres of palustrine emergent herbaceous wet meadow or marsh and approximately 5.5 acres of palustrine aquatic beds located along ephemeral stream channels and around ponds, playas and depressions. No areas of open water (pond or channel OWUS) were observed during this preliminary wetland inventory.

At this time, a distinction has not been made between jurisdictional and non-jurisdictional acreages of wetlands and OWUS since only the COE has the authorization to make such determination following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the North Hilight Field LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 1 and 2 on federally listed species.

G1-3.1 Threatened Species

G1-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS 2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their 1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).

This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

<u>Existing Environment:</u> Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County. The nearest population to the North Hilight Field LBA Tract is located on a tributary of Antelope Creek in northern Converse County.

Areas of Ute ladies'-tresses potential habitat within the general analysis area for the North Hilight Field LBA Tract were surveyed by Habitat Management Inc. on August 11-15, 2008, and no Ute ladies'-tresses orchids were found. Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. In order to adequately determine the presence of the species, an additional survey by Habitat Management Inc. is scheduled during the known populations' flowering period (mid-August to early September) in 2009.

Previous surveys have been conducted during the flowering period within the existing Black Thunder Mine permit area (e.g., for each of BLM's EISs analyzing the environmental impacts of leasing the LBA tracts obtained by the mine since 1992, as listed in Table 1-1 of this EIS) and no Ute ladies'-tresses orchids were found during any of those surveys.

Topographical and wetland delineation maps for the tract's general analysis area were reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat was traversed on foot during the time of actual flowering of the known population, and involved walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

Most of the suitable habitat within the North Hilight Field tract's general analysis area and adjacent areas is found along the ephemeral stream channels that drain south toward North Prong Little Thunder Creek, north toward Black Thunder Creek, or toward internally drained playas. Limited portions of these drainages may receive recharge from bank storage making them locally intermittent. In response to surface discharge of groundwater associated with CBNG development on or upstream of the North Hilight Field LBA Tract, which is a relatively recent phenomenon, streamflow occurrence is now more persistent and the duration of time that some playas and in-channel reservoirs hold water may be extended before going completely dry.

Within the entire general analysis area for the North Hilight Field LBA Tract, the preliminary wetland inventory conducted in 2007 identified a total of 177.5 acres of wetlands and OWUS, which were all vegetated wetlands, and no areas of open water (pond or channel OWUS) were observed.

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project analysis work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service was moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the North Hilight Field tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

Potential habitat for this species is marginal and currently present on the tract along several ephemeral drainages. Outside of these drainages, potential habitat is rare within the tract's general analysis area. The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 28 miles southwest of the project area. As described above, Black Thunder Mine has conducted multiple orchid surveys of suitable habitat over multiple years during the known time of flowering using USFWS accepted techniques. All surveys at the Black Thunder Mine and other mines in this area have resulted in negative findings.

Individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year. Single season surveys that meet the current USFWS survey guidelines may not detect this species due to its ability to persist below ground level or above ground without flowering. Areas of suitable habitat within the general analysis area for the North Hilight Field tract were surveyed in August 2008 and no orchids were found. An additional survey of the tract's general analysis area is scheduled during the flowering period (mid-August to early September) in 2009. It is unlikely that Ute ladies'-tresses populations would remain undetected during multiple surveys over multiple years, if they are present in the area. Nonetheless, if undetected populations are present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the North Hilight Field LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act (CWA), as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of

water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G1-3.2 Endangered Species

G1-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse, Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The Black Thunder Mine and North Hilight Field LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the North Hilight Field LBA Tract and its 2-mile wildlife study area (Figure G1-3) harbor some

small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, four black-tailed prairie dog colonies encompassing a total of approximately 53.8 non-contiguous acres are located within 2 miles of the North Hilight Field tract (Figure G1-3). Of which, two colonies occur within the general analysis area itself and are approximately 3.4 and 19.5 acres in size. The other two colonies located in the surrounding 2-mile survey area are approximately 3.7 and 27.2 acres in size. All of these colonies were occupied during 2007. None of these four colonies within the 2-mile wildlife study area meet the 120-acre minimum threshold for supporting a breeding female ferret and her litter (Forrest et al. 1985) and none meet the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989).

Effects of the Proposed Project: **Mining the federal coal included in the North Hilight Field LBA Tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.**

Given the documented absence of black-footed ferrets in the region, including the North Hilight Field LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed prairie dog colonies throughout the entire state, and the distance of the LBA area from future reintroduction sites, mining the general analysis area for the North Hilight Field LBA Tract would not result in any direct or indirect effects on black-footed ferrets.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the North Hilight Field tract general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in North Hilight Field tract's general analysis area would not contribute to cumulative adverse effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G1-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat,

coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The North Hilight Field LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No suitable sand dunes (whether stable or active) are currently present in the North Hilight Field tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the North Hilight Field LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G1-4.0 SUMMARY OF DETERMINATIONS

Table G1-1 summarizes the determinations for federally listed T&E species in the area of the North Hilight Field LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G1-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the North Hilight Field LBA Tract.

Status	**Species Common Name**	**Potential Effects**
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G2

SOUTH HILIGHT FIELD LBA TRACT

G2-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On October 7, 2005, ALC filed an application with the BLM for federal coal reserves in two separate tracts located north and southwest of and immediately adjacent to the Black Thunder Mine in Campbell County, Wyoming (Figure G-1). The tracts, which are referred to as the North Hilight Field and South Hilight Field LBA Tracts, were assigned case file numbers WYW164812 and WYW174596, respectively. The federal coal reserves were applied for as maintenance tracts for the Black Thunder Mine. BLM determined that the two tracts in the application would be processed separately and, if the decision is made to conduct a lease sale, would be offered for sale separately.

G2-1.1 The Proposed Action

Under the Proposed Action for the South Hilight Field LBA Tract, the tract as applied for by ALC would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the South Hilight Field lease application (Figure G2-1). The Proposed Action assumes that ALC would be the successful bidder on the South Hilight Field LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed South Hilight Field LBA Tract coal lease lands as applied for by ALC under the Proposed Action is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming		
Section 23:	Lots 1 through 16;	649.36 acres
Section 26:	Lots 1 through 16;	667.69 acres
Section 35:	Lots 1 through 16;	659.64 acres
Total:		1,976.69 acres

The coal estate included in the tract described above is federally owned and administered by the BLM. Much of the surface (approximately 83 percent) of the tract as applied for includes lands on the TBNG, which is administered by the USFS. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G2-2.

G2-1.2 Alternatives to the Proposed Action

G2-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, ALC's application to lease the coal included in the South Hilight Field LBA Tract would be rejected. The tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities or employment on the existing leases at the Black

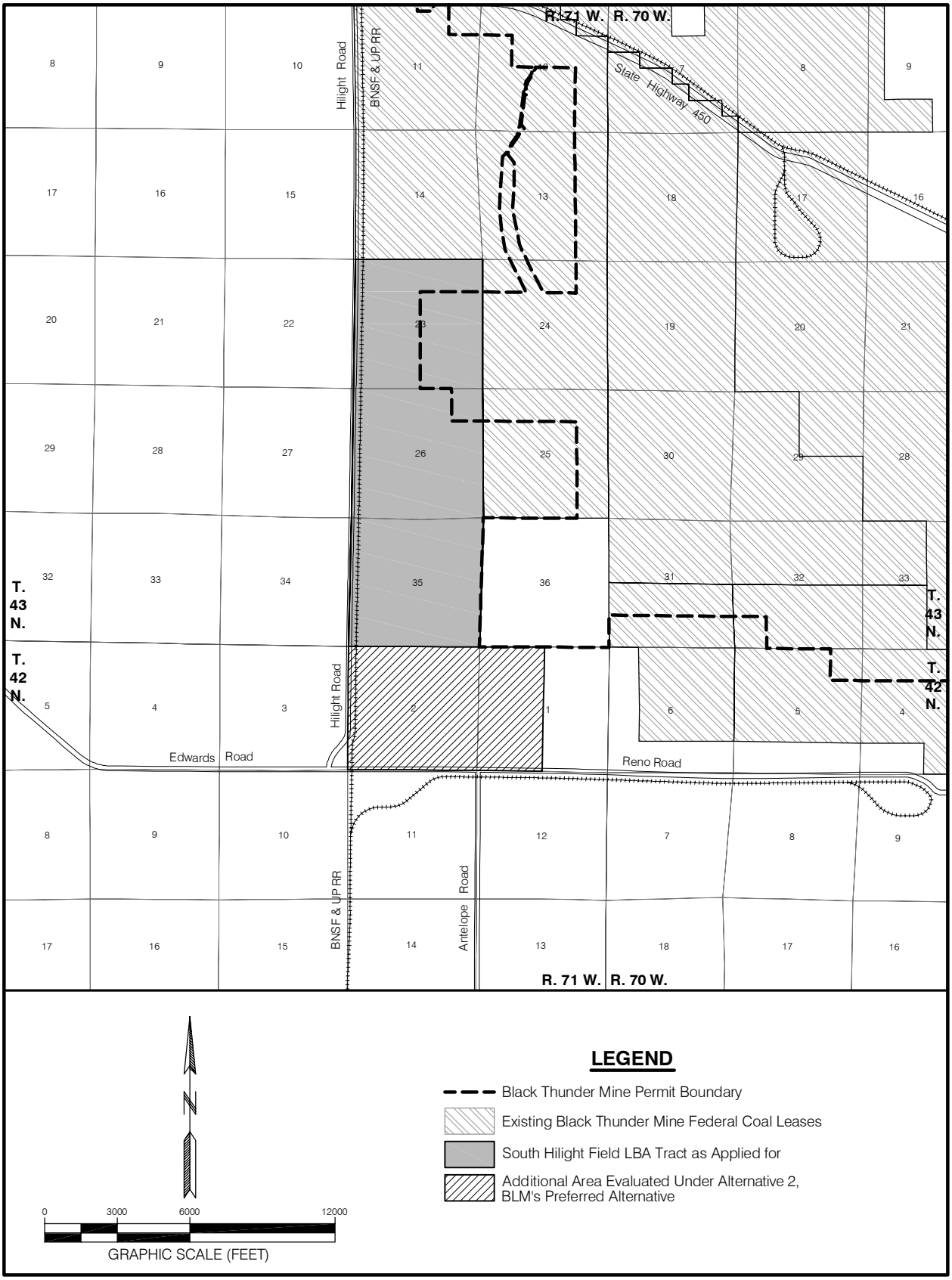

Figure G2-1. South Hilight Field LBA Tract Alternatives.

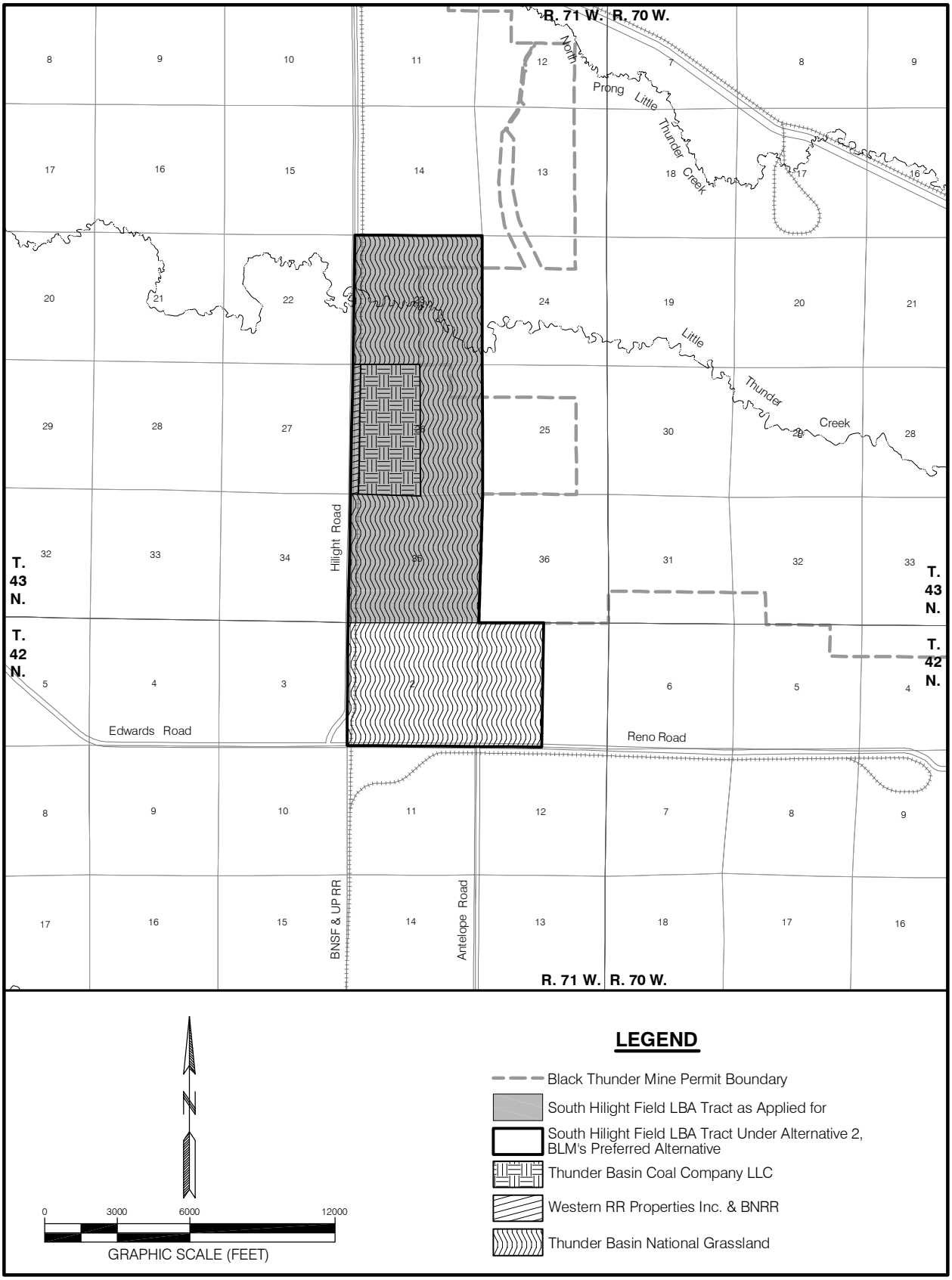

Figure G2-2. Surface Ownership Within the South Hilight Field LBA Tract Alternatives.

Thunder Mine. Portions of the surface of the LBA tract would probably be disturbed by the Black Thunder Mine due to overstripping to allow coal to be removed from existing contiguous leases.

G2-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the South Hilight Field LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the South Hilight Field LBA Tract assumes that ALC would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the adjacent existing Black Thunder Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the South Hilight Field coal lease application, BLM identified a study area that includes unleased federal coal adjacent to the southern edge of the tract as applied for (Figure G2-1). BLM is evaluating the potential that some or all of these lands could be added to the area to be offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the South Hilight Field LBA Tract, and/or reduce the potential that some potentially mineable federal coal in this area would be bypassed if it is not included in the South Hilight Field LBA Tract.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.42N., R.71W., 6th PM, Campbell County, Wyoming

Section 1:	Lots 7 through 10 and 15 through 18;	316.43 acres
Section 2:	Lots 5 through 20;	629.26 acres
Total:		945.69 acres

The legal description of BLM's preferred configuration of the South Hilight Field LBA Tract under Alternative 2 (Figure G2-1) is as follows:

T.42N., R.71W., 6th PM, Campbell County, Wyoming

Section 1:	Lots 7 through 10 and 15 through 18;	316.43 acres
Section 2:	Lots 5 through 20;	629.26 acres

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 23:	Lots 1 through 16;	649.36 acres
Section 26:	Lots 1 through 16;	667.69 acres
Section 35:	Lots 1 through 16;	659.64 acres

Total: 2,922.38 acres

Much of the surface (approximately 89 percent) of the BLM study area includes lands on the TBNG, which is administered by the USFS.

G2-2.0 CONSULTATION TO DATE

The locations of the existing Black Thunder Mine coal leases, the existing approved mine permit area, and the South Hilight Field LBA Tract are shown in Figure G2-1.

The Black Thunder Mine and South Hilight Field LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The South Hilight Field LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. This analysis is referenced in the *Final Environmental Impact Statement (FEIS) for the Northern Great Plains Management Plans Revision* (USFS 2001a) and adopted in the *Land and Resource Management Plan (LRMP) for the Thunder Basin National Grassland* (USFS 2001b). The Record of Decision for the Thunder Basin National Grassland FEIS and LRMP was signed on July 31, 2002 (USFS 2002a). The South Hilight Field LBA Tract fall within Management Area 8.4, as identified in the 2002 Thunder Basin National Grassland LRMP, which is to be managed for mineral production and development. Consultation with USFWS was conducted as part of the 2002 LRMP. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the South Hilight Field LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the Black Thunder Mine's existing approved mine permit area, shown in Figure G2-1, as part of the mine and reclamation plan approval process. This process began when the Black Thunder Mine was initially permitted in 1974 and has continued through 2008. The most recent Migratory Bird Species of Management Concern and Raptor Monitoring and Mitigation Plan for the Black Thunder Mine was approved by the USFWS in 2007.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with the National Environmental Policy

Act (NEPA), the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G2-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife monitoring has been conducted annually for the Black Thunder Mine since 1983. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal (USFWS) requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The annual wildlife monitoring program has been consistent since it began in 1983, with minor modifications in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations. Areas covered by the wildlife surveys included the mine's permit area and a large perimeter around the permit boundary; therefore, the South Hilight Field LBA Tract has also received extensive coverage during baseline and annual wildlife monitoring surveys for over 25 years. All but approximately 160 acres located in the southwestern corner of BLM's study area for the South Hilight Field tract has been included in baseline inventories and annual wildlife surveys conducted for the Black Thunder Mine since 1983. Black Thunder Mine initiated targeted surveys specifically for the West Hilight Field LBA Tract and its wildlife survey area in 2006 and 2007. Additional surveys focusing on the wildlife survey areas for the North and South Hilight Field LBA Tracts were added in 2007 and 2008. Figure G2-3 depicts the South Hilight Field LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

The approved Black Thunder Mine Permit 233-T7 (TBCC 2005) includes monitoring and mitigation measures that are required by SMCRA and Wyoming State Law. If the South Hilight Field LBA Tract is acquired by ALC, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the Black Thunder Mine's mining permit is amended to include the tract. This amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed

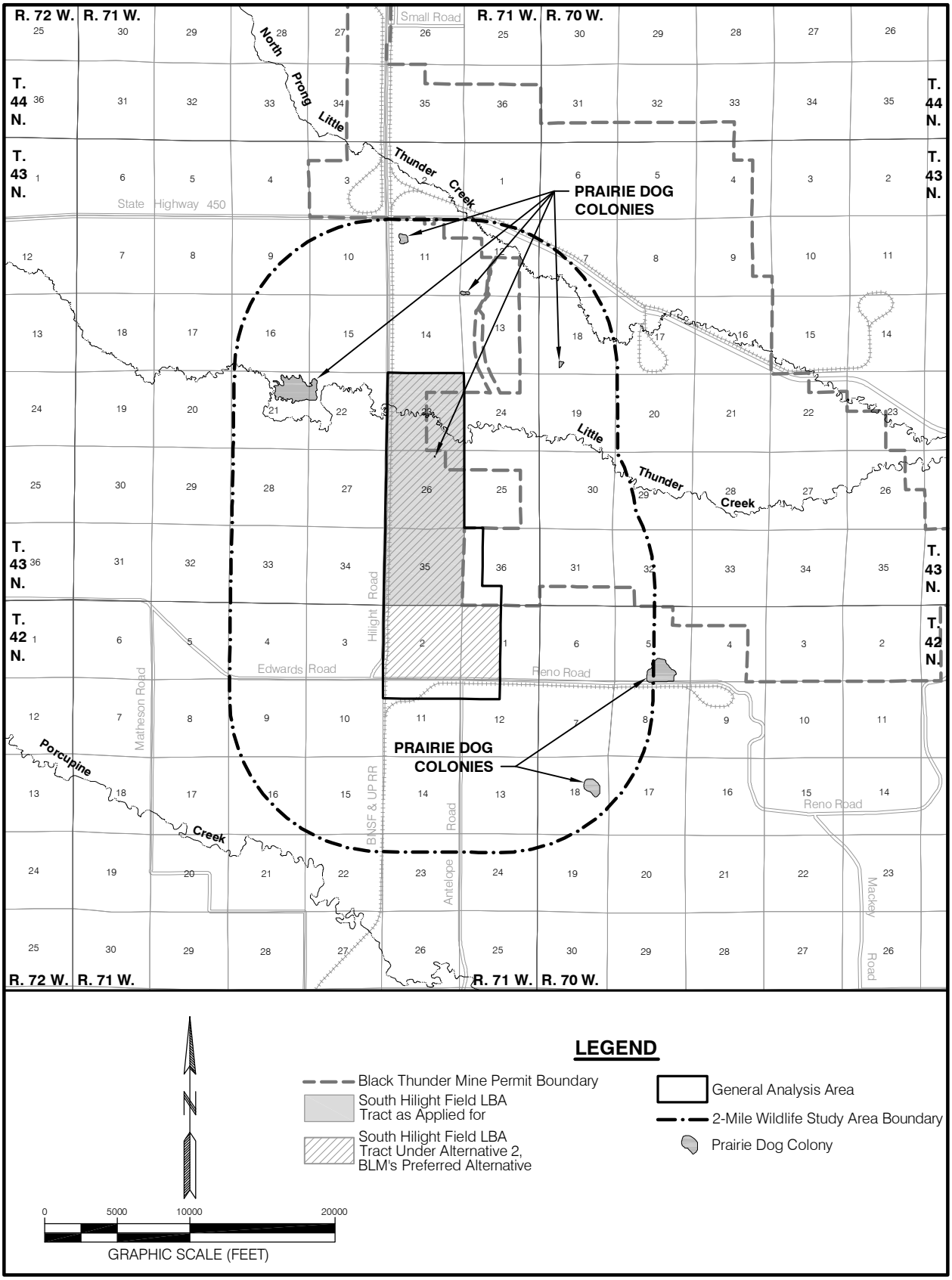

Figure G2-3. T&E Species Survey Area for the South Hilight Field LBA Tract.

Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the South Hilight Field LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), records from the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies. Site-specific data for the general analysis area for the South Hilight Field tract were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant and the neighboring (Jacobs Ranch and North Antelope Rochelle) mines, which are on file with the WDEQ/LQD in Cheyenne and Sheridan, Wyoming.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mine's existing permit area, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides and along the drainages, where channel incision has created some gullying. The average land surface slope over the entire general analysis area for the South Hilight Field tract is approximately 2.5 percent. Surface mine lands, both active and reclaimed, dominate the landscape northeast, east, and southeast of the South Hilight Field LBA Tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Minor vegetation types, including saline grassland, rough breaks, disturbed lands and bottomlands account for approximately 10 percent of the six combined general analysis areas. Disturbed lands include road and utility rights-of-way, areas surrounding active construction sites and mining facilities, oil and gas facilities, and occupied and abandoned homesteads. Few trees occur in the general Wright analysis area due to the lack of water and suitable habitats; most trees are found primarily in windbreaks planted adjacent to ranching facilities. Reclaimed lands include areas that were recently disturbed

for road construction, installation of oil and gas development-related facilities, and mining-associated activities.

The South Hilight Field general analysis area and the existing Black Thunder Mine permit area are located in the Little Thunder Creek watershed. Typical of this semi-arid area, Little Thunder Creek and its tributaries are all ephemeral streams. Little Thunder Creek flows easterly through and drains the northern portion of the BLM study area for the South Hilight Field LBA Tract. Approximately 47 percent (1,364 acres) of the 2,922-acre BLM study area for the South Hilight Field tract drains toward playas that are formed by natural topographic depressions. The southwestern corner of the tract's general analysis area is drained by Briggs Draw, an ephemeral tributary of Little Thunder Creek. Black Thunder Mine's approved WDEQ/LQD mine permit allows disturbance of Little Thunder Creek and several of its tributaries.

Numerous in-channel stock reservoirs are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. There are also a number of playas within the area. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable, and often dry, during other seasons.

A preliminary wetland inventory of the general analysis area for the South Hilight Field LBA Tract, based on USFWS NWI mapping (1980), review of color infrared aerial photographs (WGCS 2002), and a field survey reconnaissance, was conducted in 2007. Some wetland areas previously mapped by the USFWS NWI have been recently altered due to CBNG-related water production within and upstream of the general analysis area. The NWI maps were consulted prior to the initiation of the preliminary wetland field survey; however, the boundaries of the existing potential wetlands vary to a greater or lesser extent from the boundaries shown on the NWI maps. Due to the ephemeral nature of CBNG dewatering activities, the boundaries, and therefore wetland areas, are likewise ephemeral. A formal jurisdictional wetland delineation survey for the South Hilight Field LBA Tract would be conducted and submitted to the COE for verification as part of the mine permitting process, if the LBA tract is leased.

Within the entire general analysis area for the South Hilight Field LBA Tract (3,367.9 acres), the preliminary wetland inventory identified a total of 55.1 acres of wetlands and OWUS. These wetlands and OWUS were found within five general land categories: ephemeral streams, playas, ponds/reservoirs, isolated depressions, and excavated upland areas. Of these 55.1 acres, approximately 52.3 acres are vegetated wetlands that consist of approximately 51.2 acres of palustrine emergent herbaceous wet meadow or marsh and approximately 1.1 acres of palustrine aquatic beds located along ephemeral stream channels and around ponds, playas and depressions. The remaining 2.8 acres are channel OWUS (open water in Little Thunder Creek). Little

Thunder Creek was initially classified as a palustrine wetland by NWI, but currently meets the classification of a riverine, streambed system and is heavily influenced by CBNG discharge water.

At this time, a distinction has not been made between jurisdictional and non-jurisdictional acreages of wetlands and OWUS since only the COE has the authorization to make such determination following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the South Hilight Field LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 1 and 2 on federally listed species.

G2-3.1 Threatened Species

G2-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS

2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their 1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).

This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

<u>Existing Environment:</u> Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one

additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County. The nearest population to the South Hilight Field LBA Tract is located on a tributary of Antelope Creek in northern Converse County.

Areas of Ute ladies'-tresses potential habitat within the general analysis area for the South Hilight Field LBA Tract were surveyed by Habitat Management Inc. on August 11-15, 2008, and no Ute ladies'-tresses orchids were found. Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. In order to adequately determine the presence of the species, an additional survey by Habitat Management Inc. is scheduled during the known populations' flowering period (mid-August to early September) in 2009. Previous surveys have been conducted during the flowering period within the existing Black Thunder Mine permit area (e.g., for each of BLM's EISs analyzing the environmental impacts of leasing the LBA tracts obtained by the mine since 1992, as listed in Table 1-1 of this EIS) and no Ute ladies'-tresses orchids were found during any of those surveys.

Topographical and wetland delineation maps for the tract's general analysis area were reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat was traversed on foot during the time of actual flowering of the known population, and involved walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

Most of the suitable habitat within the South Hilight Field tract's general analysis area and adjacent areas is found along Little Thunder Creek, which flows from west to east through the northern portion of the tract. Nearly half of the study area drains toward playas that are formed by natural topographic depressions. All drainages within and around this area, including Little Thunder Creek, are ephemeral. Limited portions of these drainages may receive recharge from bank storage making them locally intermittent. In response to surface discharge of groundwater associated with CBNG development on or upstream of the South Hilight Field tract, which is a relatively recent phenomenon, streamflow occurrence in Little Thunder Creek is now more persistent, and the duration of time that some playas and in-channel reservoirs hold water may be extended before going completely dry.

Within the entire general analysis area for the South Hilight Field LBA Tract, the preliminary wetland inventory conducted in 2007 identified a total of 55.1 acres of wetlands and OWUS, including 52.3 acres of vegetated wetlands and 2.8 acres of channel OWUS (open water in Little Thunder Creek).

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project analysis work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service was moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the South Hilight Field tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

Potential habitat for this species is marginal and currently present on the tract along a few ephemeral drainages, particularly Little Thunder Creek. Outside of these drainages, potential habitat is rare within the tract's general analysis area. The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 23 miles southwest of the project area. As described above, Black Thunder Mine has conducted multiple orchid surveys of suitable habitat over multiple years during the known time of flowering using USFWS accepted techniques. All surveys at the Black Thunder Mine and other mines in this area have resulted in negative findings.

Individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year. Single season surveys that meet the current USFWS survey guidelines may not detect this species due to its ability to persist below ground level or above ground without flowering. Areas of suitable habitat within the general analysis area for the South Hilight Field tract were surveyed in August 2008 and no orchids were found. An additional survey of the tract's general analysis area is scheduled during the flowering period (mid-August to early September) in 2009. It is unlikely that Ute ladies'-tresses populations would remain undetected during multiple surveys over multiple years, if they are present in the area. Nonetheless, if undetected populations are present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the South Hilight Field LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act (CWA), as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G2-3.2 Endangered Species

G2-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse, Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has

been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The Black Thunder Mine and South Hilight Field LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the South Hilight Field LBA Tract and its 2-mile wildlife study area (Figure G2-3) harbor some small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, seven black-tailed prairie dog colonies encompassing a total of approximately 177.2 non-contiguous acres are located within 2 miles of the South Hilight Field tract (Figure G2-3). Of which, just one colony occurs within the general analysis area itself and it is less than 1 acre in size. The other six colonies are located within or partially within the surrounding 2-mile survey area and range in size from approximately 2.0 to 89.1 acres. All of these colonies were occupied during 2007. None of these seven colonies within the 2-mile wildlife study area meet the 120-acre minimum threshold for supporting a breeding female ferret and her litter (Forrest et al. 1985), and one colony does meet the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989).

Effects of the Proposed Project: **Mining the federal coal included in the South Hilight Field LBA Tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.**

Given the documented absence of black-footed ferrets in the region, including the South Hilight Field LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed

prairie dog colonies throughout the entire state, and the distance of the LBA area from future reintroduction sites, mining the general analysis area for the South Hilight Field LBA Tract would not result in any direct or indirect effects on black-footed ferrets.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the South Hilight Field tract's general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in South Hilight Field tract's general analysis area would not contribute to cumulative adverse

effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G2-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The South Hilight Field LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No suitable sand dunes (whether stable or active) are currently present in the South Hilight Field tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the South Hilight Field LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G2-4.0 SUMMARY OF DETERMINATIONS

Table G2-1 summarizes the determinations for federally listed T&E species in the area of the South Hilight Field LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G2-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the South Hilight Field LBA Tract.

Status	Species Common Name	Potential Effects
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G3

WEST HILIGHT FIELD LBA TRACT

G3-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On January 17, 2006, ALC filed an application with the BLM for federal coal reserves in a tract located west of the Black Thunder Mine in Campbell County, Wyoming (Figure G-1). The tract, which is referred to as the West Hilight Field LBA Tract, was assigned case file number WYW172388. The federal coal reserves were applied for as a maintenance tract for the Black Thunder Mine.

G3-1.1 The Proposed Action

Under the Proposed Action for the West Hilight Field LBA Tract, the tract as applied for by ALC would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the West Hilight Field lease application (Figure G3-1). The Proposed Action assumes that ALC would be the successful bidder on the West Hilight Field LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed West Hilight Field LBA Tract coal lease lands as applied for by ALC under the Proposed Action is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 8:	Lots 1, 2, and 7 through 16;	493.00 acres
Section 9:	Lots 1 through 16;	655.31 acres
Section 10:	Lots 3 through 6, and 11 through 14;	327.85 acres
Section 17:	Lots 1 through 16;	650.17 acres
Section 20:	Lots 1 through 4;	162.54 acres
Section 21:	Lots 3 and 4	81.65 acres
Total:		2,370.52 acres

The coal estate included in the tract described above is federally owned and administered by the BLM. A portion of the surface of the tract as applied for (approximately 30 percent) includes lands on the TBNG, which is administered by the USFS. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G3-2.

G3-1.2 Alternatives to the Proposed Action

G3-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, ALC's application to lease the coal included in the West Hilight Field LBA Tract would be rejected. The tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities or employment on the existing leases at the Black

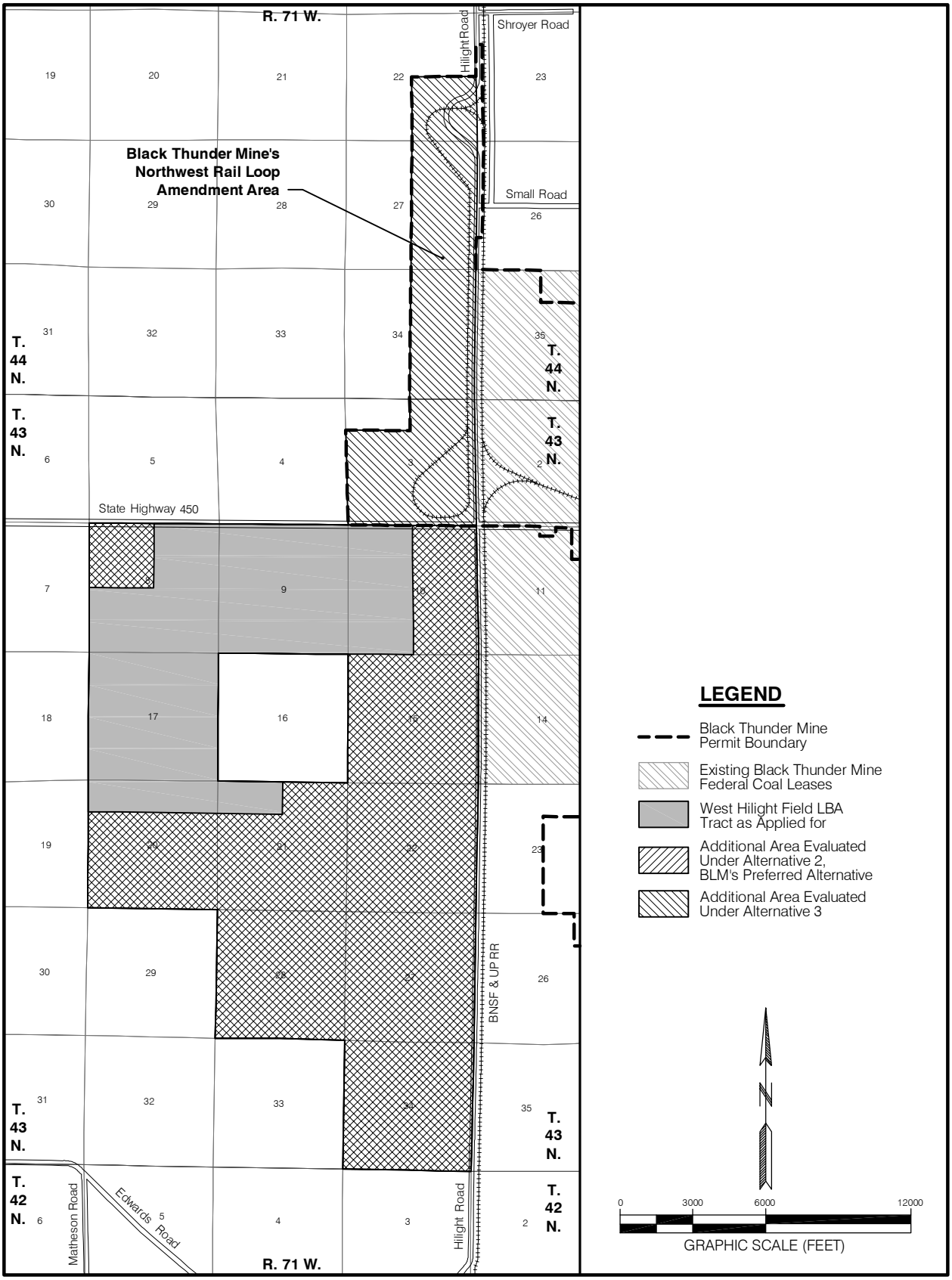

Figure G3-1. West Hilight Field LBA Tract Alternatives.

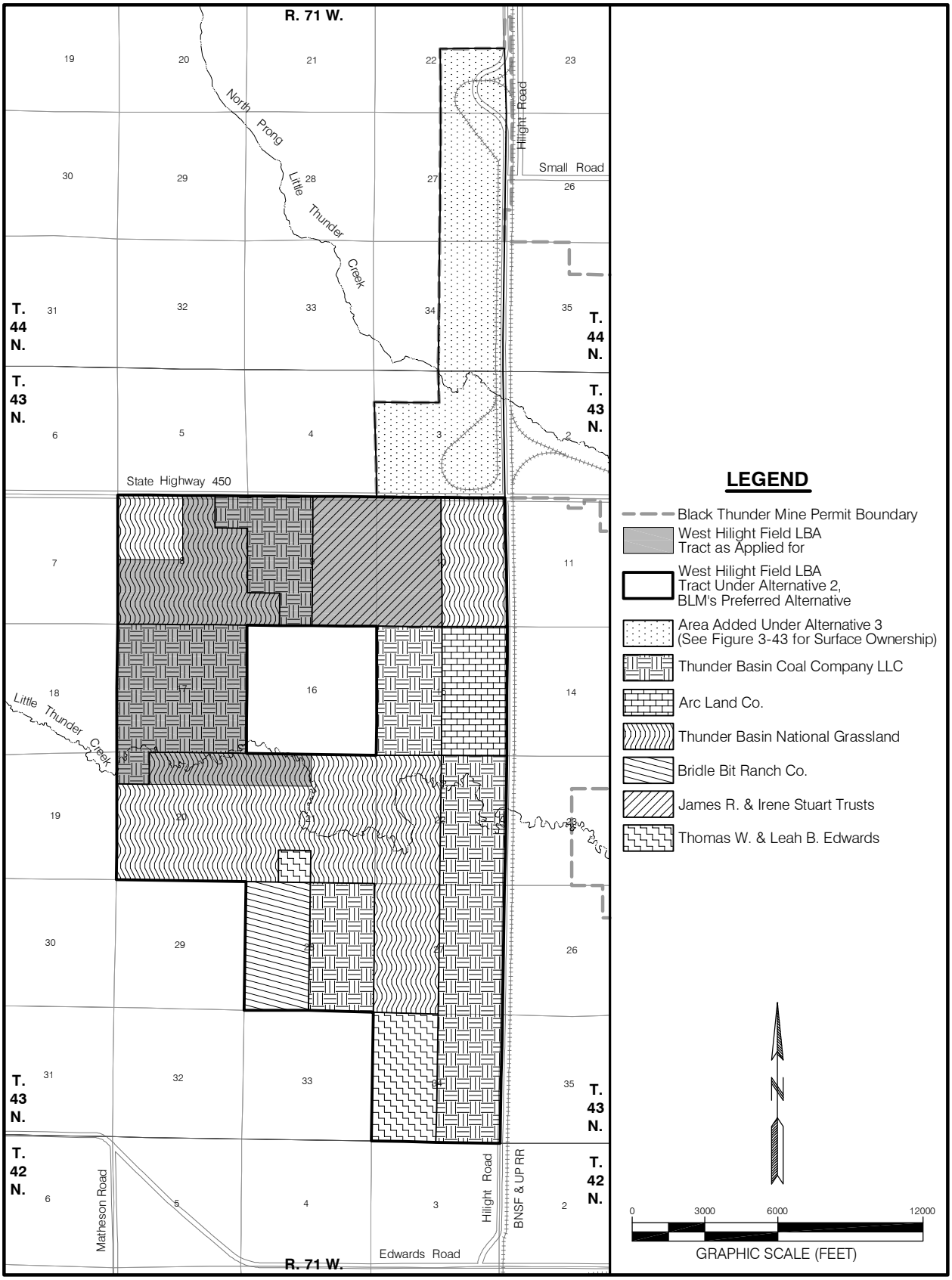

Figure G3-2. Surface Ownership Within the West Hilight Field LBA Tract Alternatives.

Thunder Mine. The surface of the LBA tract as applied for does not lie within any mine's current permit area and would therefore not likely be disturbed by mining activities.

G3-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the West Hilight Field LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the West Hilight Field LBA Tract assumes that ALC would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the existing Black Thunder Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the West Hilight Field coal lease application, BLM identified a study area that includes unleased federal coal adjacent to the eastern, southern, northeastern, and northwestern edges of the tract as applied for (Figure G3-1). BLM is evaluating the potential that some or all of these lands could be added to the area to be offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the West Hilight Field LBA Tract, and/or reduce the potential that some potentially mineable federal coal in this area would be bypassed if it is not included in the West Hilight Field LBA Tract.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 8:	Lots 3 through 6;	164.33 acres
Section 10:	Lots 1, 2, 7 through 10, 15, and 16;	326.18 acres
Section 15:	Lots 1 through 16;	659.26 acres
Section 20:	Lots 5 through 16;	488.50 acres
Section 21:	Lots 1, 2, and 5 through 16;	569.73 acres
Section 22:	Lots 1 through 16;	657.89 acres
Section 27:	Lots 1 through 16;	656.87 acres
Section 28:	Lots 1 through 16;	648.02 acres
Section 34:	Lots 1 through 16;	649.98 acres
Total:		4,820.76 acres

The legal description of BLM's preferred configuration of the West Hilight Field LBA Tract under Alternative 2 (Figure G3-1) is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 8:	Lots 1 through 16;	654.33 acres
Section 9:	Lots 1 through 16;	655.31 acres
Section 10:	Lots 1 through 16;	654.03 acres
Section 15:	Lots 1 through 16;	659.26 acres
Section 17:	Lots 1 through 16;	650.17 acres
Section 20:	Lots 1 through 16;	651.04 acres
Section 21:	Lots 1 through 16;	651.38 acres
Section 22:	Lots 1 through 16;	657.89 acres
Section 27:	Lots 1 through 16;	656.87 acres
Section 28:	Lots 1 through 16;	648.02 acres
Section 34:	Lots 1 through 16;	649.98 acres
Total:		7,191.28 acres

Approximately 40 percent of the West Hilight Field LBA Tract under Alternative 2 includes lands on the TBNG, which is administered by the USFS.

G3-1.2.3 Alternative 3

Under Alternative 3 for the West Hilight Field LBA Tract, BLM is considering adding some or all of the BLM study area, as discussed under Alternative 2 and some or all of Thunder Basin Coal Company's (TBCC's) Northwest Rail Loop Amendment Area (Figure G3-1). Under Alternative 3, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS).

Alternative 3 for the West Hilight Field LBA Tract assumes that ALC would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease for the existing Black Thunder Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the West Hilight Field coal lease application, BLM identified a study area that includes unleased federal coal adjacent to the eastern, southern, northeastern, and northwestern edges of the tract as applied for (Figure G3-1). BLM is evaluating the potential that some or all of these lands could be added to the area to be offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the West Hilight Field LBA Tract, and/or reduce the potential that some potentially mineable federal coal in this area would be bypassed if it is not included in the West Hilight Field LBA Tract.

Under Alternative 3, BLM is considering adding some or all of Black Thunder Mine's Northwest Rail Loop Amendment Area, which is entirely within Black Thunder Mine's current permit area. Black Thunder Mine completed the construction of a new train loadout facility within their Northwest Rail Loop

Amendment Area in 2008. This area is also entirely within the West Jacobs Ranch LBA Tract; therefore, BLM has not included it within the study area for the West Hilight Field LBA Tract. However, this alternate tract configuration will preserve the option of delineating some or all of TBCC's Northwest Rail Loop Amendment Area into the West Hilight Field, and West Jacobs Ranch, or both LBA tracts.

Under Alternative 3, the lands within TBCC's Northwest Rail Loop Amendment Area that BLM is evaluating adding to the Alternative 2 reconfiguration of the West Hilight Field LBA Tract are as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming		
Section 3:	Lots 2, 5, and 8 through 19;	557.99 acres
T.44N., R.71W., 6th PM, Campbell County, Wyoming		
Section 22:	Lots 9, 10, 15, and 16;	164.25 acres
Section 27:	Lots 1, 2, 7 through 10, 15, and 16;	327.88 acres
Section 34:	Lots 1, 2, 7 through 10, 15, and 16;	328.73 acres
Total:		1,378.85 acres

The legal description of the Alternative 3 reconfiguration of the West Hilight Field LBA Tract is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming		
Section 3:	Lots 2, 5, and 8 through 19;	557.99 acres
Section 8:	Lots 1 through 16;	654.33 acres
Section 9:	Lots 1 through 16;	655.31 acres
Section 10:	Lots 1 through 16;	654.03 acres
Section 15:	Lots 1 through 16;	659.26 acres
Section 17:	Lots 1 through 16;	650.17 acres
Section 20:	Lots 1 through 16;	651.04 acres
Section 21:	Lots 1 through 16;	651.38 acres
Section 22:	Lots 1 through 16;	657.89 acres
Section 27:	Lots 1 through 16;	656.87 acres
Section 28:	Lots 1 through 16;	648.02 acres
Section 34:	Lots 1 through 16;	649.98 acres
T.44N., R.71W., 6th PM, Campbell County, Wyoming		
Section 22:	Lots 9, 10, 15, and 16;	164.25 acres
Section 27:	Lots 1, 2, 7 through 10, 15, and 16;	327.88 acres
Section 34:	Lots 1, 2, 7 through 10, 15, and 16;	328.73 acres
Total:		8,570.13 acres

Approximately 35 percent of the West Hilight Field LBA Tract under Alternative 3 includes lands on the TBNG, which is administered by the USFS.

G3-2.0 CONSULTATION TO DATE

The locations of the existing Black Thunder Mine coal leases, the existing approved mine permit area, and the West Hilight Field LBA Tract are shown in Figure G3-1.

The Black Thunder Mine and West Hilight Field LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The West Hilight Field LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. This analysis is referenced in the *Final Environmental Impact Statement (FEIS) for the Northern Great Plains Management Plans Revision* (USFS 2001a) and adopted in the *Land and Resource Management Plan (LRMP) for the Thunder Basin National Grassland* (USFS 2001b). The Record of Decision for the Thunder Basin National Grassland FEIS and LRMP was signed on July 31, 2002 (USFS 2002a). The West Hilight Field LBA Tract fall within Management Area 8.4, as identified in the 2002 Thunder Basin National Grassland LRMP, which is to be managed for mineral production and development. Consultation with USFWS was conducted as part of the 2002 LRMP. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the West Hilight Field LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the Black Thunder Mine's existing approved mine permit area, shown in Figure G3-1, as part of the mine and reclamation plan approval process. This process began when the Black Thunder Mine was initially permitted in 1974 and has continued through 2008. The most recent Migratory Bird Species of

Management Concern and Raptor Monitoring and Mitigation Plan for the Black Thunder Mine was approved by the USFWS in 2007.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with the National Environmental Policy Act (NEPA), the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G3-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife monitoring has been conducted annually for the Black Thunder Mine since 1983. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal (USFWS) requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The annual wildlife monitoring program has been consistent since it began in 1983, with minor modifications in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations. Areas covered by the wildlife surveys included the mine's permit area and a large perimeter around the permit boundary; therefore, the West Hilight Field LBA Tract has also received extensive coverage during baseline and annual wildlife monitoring surveys for over 25 years. The eastern half of BLM's study area for the West Hilight Field tract has been included in baseline inventories and annual wildlife surveys conducted for the Black Thunder Mine since 1983. The balance of the BLM study area and the lands included under Alternative 3 were included in monitoring efforts beginning in 2002, and targeted surveys specifically for this LBA Tract and its wildlife survey area were conducted in 2006 and 2007. Figure G3-3 depicts the West Hilight Field LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

The approved Black Thunder Mine Permit 233-T7 (TBCC 2005) includes monitoring and mitigation measures that are required by SMCRA and Wyoming State Law. If the West Hilight Field LBA Tract is acquired by ALC, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the Black Thunder Mine's mining permit is amended to include the tract. This amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the West Hilight Field LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), records from

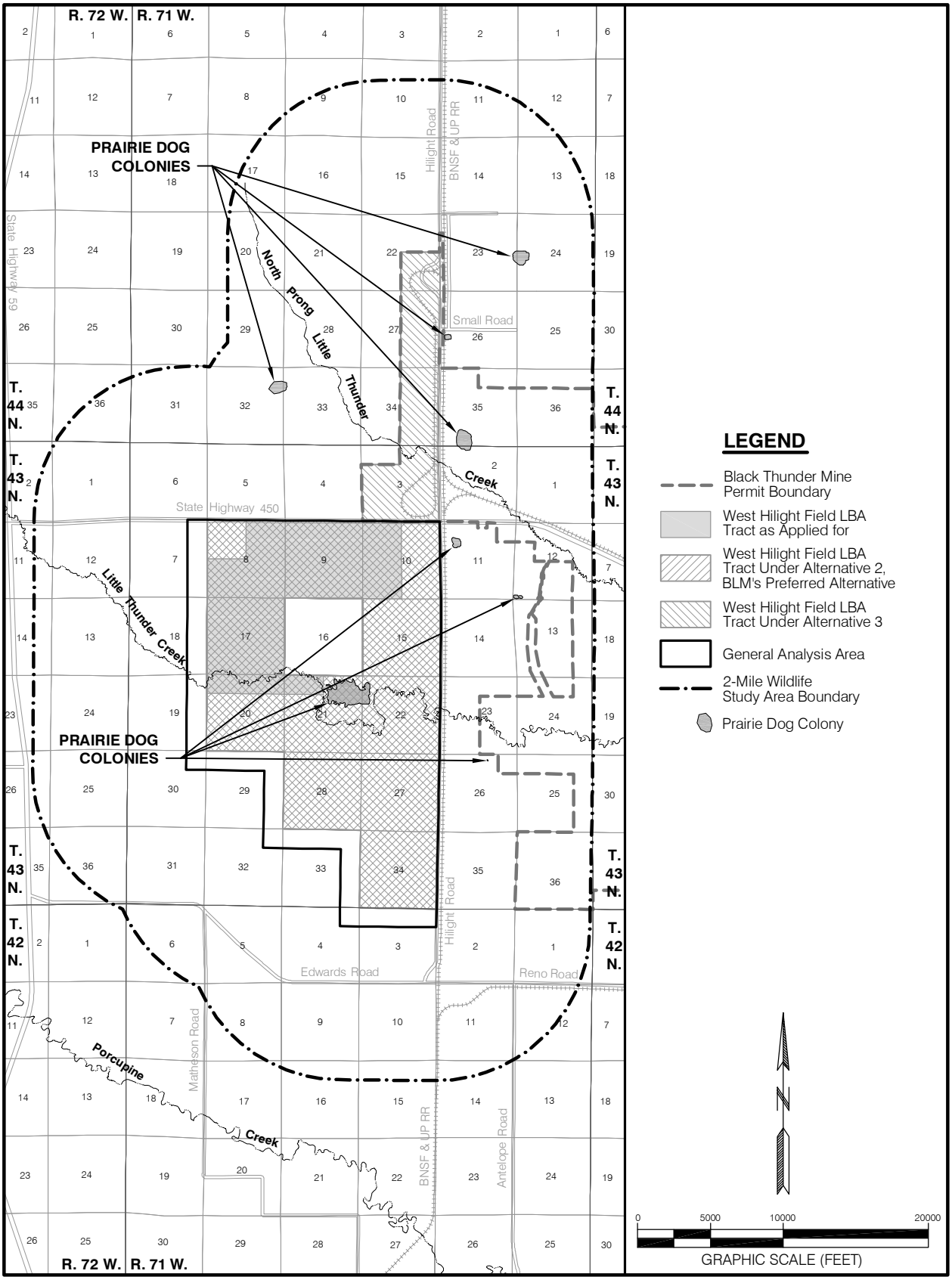

Figure G3-3. T&E Species Survey Area for the West Hilight Field LBA Tract.

the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies. Site-specific data for the general analysis area for the West Hilight Field tract were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant mine, which is on file with the WDEQ/LQD in Cheyenne and Sheridan, Wyoming.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mines' existing permit areas, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides and along the drainages, where channel incision has created some gullying. The average land surface slope over the entire general analysis area for the West Hilight Field tract is approximately 2.2 percent. Surface mine lands, both active and reclaimed, dominate the landscape northeast, east and southeast of the West Hilight Field tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Minor vegetation types, including saline grassland, rough breaks, disturbed lands and bottomlands account for approximately 10 percent of the six combined general analysis areas. Disturbed lands include road and utility rights-of-way, areas surrounding active construction sites and mining facilities, oil and gas facilities, and occupied and abandoned homesteads. Few trees occur in the general Wright analysis area due to the lack of water and suitable habitats; most trees are found primarily in windbreaks planted adjacent to ranching facilities. Reclaimed lands include areas that were recently disturbed for road construction, installation of oil and gas development-related facilities, and mining-associated activities.

The West Hilight Field general analysis area and the existing Black Thunder Mine permit area are located in the Little Thunder Creek watershed. Typical of this semi-arid area, Little Thunder Creek and its tributaries are all ephemeral streams. Black Thunder Mine's approved WDEQ/LQD mine permit allows

disturbance of Little Thunder Creek and several of its tributaries. Approximately 24 percent (1,708 acres) of the 9,189-acre BLM study area for the West Hilight Field tract drains toward playas that are formed by natural topographic depressions; the largest of which is called Rochelle Lake. Most of the internally-drained areas located within the West Hilight Field general analysis area occur north of Little Thunder Creek. Little Thunder Creek flows easterly through the central portion of the West Hilight Field general analysis area, and its ephemeral tributaries, Briggs Draw and Black Butte Draw, drain the southern portion of the general analysis area.

Numerous in-channel stock reservoirs are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. There are also a number of playas within the area. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable, and often dry, during other seasons.

A preliminary wetland inventory of the general analysis area for the West Hilight Field LBA Tract, based on USFWS NWI mapping (1980), review of color infrared aerial photographs (WGCS 2002), and a field survey reconnaissance, was conducted in 2007. Some wetland areas previously mapped by the USFWS NWI have been recently altered due to CBNG-related water production within and upstream of the general analysis area. The NWI maps were consulted prior to the initiation of the preliminary wetland field survey; however, the boundaries of the existing potential wetlands vary to a greater or lesser extent from the boundaries shown on the NWI maps. Due to the ephemeral nature of CBNG dewatering activities, the boundaries, and therefore wetland areas, are likewise ephemeral. A formal jurisdictional wetland delineation survey for the West Hilight Field LBA Tract would be conducted and submitted to the COE for verification as part of the mine permitting process, if the LBA tract is leased.

Within the entire general analysis area for the West Hilight Field LBA Tract (9,188.6 acres), the preliminary wetland inventory identified a total of 262.7 acres of wetlands and OWUS. These wetlands and OWUS were found within five general land categories: ephemeral streams, playas, ponds/reservoirs, isolated depressions, and excavated upland areas. Of these 262.7 acres, approximately 252.8 acres are vegetated wetlands that consist of approximately 240.6 acres of palustrine emergent herbaceous wet meadow or marsh and approximately 12.2 acres of palustrine aquatic beds located along ephemeral stream channels and around ponds, playas and depressions. The remaining 9.9 acres are channel and pond OWUS (open water in Little Thunder Creek and Little Thunder Reservoir). Little Thunder Creek was initially classified as a palustrine wetland by NWI, but currently meets the classification of a riverine, streambed system and is heavily influenced by CBNG discharge water.

At this time, a distinction has not been made between jurisdictional and non-jurisdictional acreages of wetlands and OWUS since only the COE has the authorization to make such determination following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the West Hilight Field LBA Tract and evaluates the potential environmental effects of the Proposed Action and alternatives on federally listed species.

G3-3.1 Threatened Species

G3-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS 2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to

range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their 1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).
This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

<u>Existing Environment:</u> Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in

Niobrara County. No occurrences have been recorded in Campbell County. The nearest population to the West Hilight Field LBA Tract is located on a tributary of Antelope Creek in northern Converse County.

Areas of Ute ladies'-tresses potential habitat within the general analysis area for the West Hilight Field LBA Tract were surveyed by Habitat Management Inc. on August 11-15, 2008, and no Ute ladies'-tresses orchids were found. Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. In order to adequately determine the presence of the species, an additional survey by Habitat Management Inc. is scheduled during the known populations' flowering period (mid-August to early September) in 2009. Previous surveys have been conducted during the flowering period within the existing Black Thunder Mine permit area (e.g., for each of BLM's EIS analyzing the environmental impacts of leasing the LBA tracts obtained by the mine since 1992, as listed in Table 1-1 of this EIS) and no Ute ladies'-tresses orchids were found during any of those surveys.

Topographical and wetland delineation maps for the tract's general analysis area were reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat was traversed on foot during the time of actual flowering of the known population, and involved walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

Most of the suitable habitat within the West Hilight Field tract's general analysis area and adjacent areas is found along Little Thunder Creek, which flows from west to east through the central portion of the tract, and its ephemeral tributaries, Briggs Draw and Black Butte Draw, which drain the southern portion of the general analysis area. Nearly a quarter of the study area drains toward playas that are formed by natural topographic depressions; the largest of which is called Rochelle Lake. All drainages within and around this area, including Little Thunder Creek, are ephemeral. Limited portions of these drainages may receive recharge from bank storage making them locally intermittent. In response to surface discharge of groundwater associated with CBNG development on or upstream of the West Hilight Field tract, which is a relatively recent phenomenon, streamflow occurrence in Little Thunder Creek is now more persistent, and the duration of time that some playas and in-channel reservoirs hold water may be extended before going completely dry.

Within the entire general analysis area for the West Hilight Field LBA Tract, the preliminary wetland inventory conducted in 2007 identified a total of 262.7

acres of wetlands and OWUS, including approximately 252.8 acres of vegetated wetlands and 9.9 acres of channel and pond OWUS (open water in Little Thunder Creek and Little Thunder Reservoir).

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project analysis work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service was moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the West Hilight Field tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

Potential habitat for this species is marginal and currently present on the tract along several ephemeral drainages, particularly Little Thunder Creek. Outside of these drainages, potential habitat is rare within the tract's general analysis area. The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 20 miles southwest of the project area. As described above, Black Thunder Mine has conducted multiple orchid surveys of suitable habitat over multiple years during the known time of flowering using USFWS accepted techniques. All surveys at the Black Thunder Mine and other mines in this area have resulted in negative findings.

Individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year. Single season surveys that meet the current USFWS survey guidelines may not detect this species due to its ability to persist below ground level or above ground without flowering. Areas of suitable habitat within the general analysis area for the West Hilight Field tract were surveyed in August 2008 and no orchids were found. An additional survey of the tract's general analysis area is scheduled during the flowering period (mid-August to early September) in 2009. It is unlikely that Ute ladies'-tresses populations would remain undetected during multiple surveys over multiple years, if they are present in the area. Nonetheless, if undetected populations are present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the West Hilight Field LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act (CWA), as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G3-3.2 Endangered Species

G3-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse, Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has

been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The Black Thunder Mine and West Hilight Field LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the West Hilight Field LBA Tract and its 2-mile wildlife study area (Figure G1-3) harbor some small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, eight black-tailed prairie dog colonies encompassing a total of approximately 167.5 non-contiguous acres are located within 2 miles of the West Hilight Field tract (Figure G3-3). Of which, one colony occurs within the general analysis area itself and it is approximately 89.1 acres in size. The other seven colonies are located within the surrounding 2-mile survey area and range in size from approximately 0.1 to 27.2 acres. All of these colonies were occupied during 2007. None of these eight colonies within the 2-mile wildlife study area meet the 120-acre minimum threshold for supporting a breeding female ferret and her litter (Forrest et al. 1985). One colony does meet the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989).

Effects of the Proposed Project: **Mining the federal coal included in the West Hilight Field LBA Tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.**

Given the documented absence of black-footed ferrets in the region, including the West Hilight Field LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed prairie dog colonies throughout the entire state, and the distance of the LBA

area from future reintroduction sites, mining the general analysis area for the West Hilight Field LBA Tract would have no effect on black-footed ferrets.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the West Hilight Field tract general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in West Hilight Field tract's general analysis area would not contribute to cumulative adverse effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming

or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G3-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The West Hilight Field LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No suitable sand dunes (whether stable or active) are currently present in the West Hilight Field tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the West Hilight Field LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G3-4.0 SUMMARY OF DETERMINATIONS

Table G3-1 summarizes the determinations for federally listed T&E species in the area of the West Hilight Field LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G3-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the West Hilight Field LBA Tract.

Status	Species Common Name	Potential Effects
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G4

WEST JACOBS RANCH LBA TRACT

G4-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On March 22, 2006, Jacobs Ranch Coal Company (JRCC) filed an application with the BLM for federal coal reserves in a tract located approximately 0.75 mile west of the Jacobs Ranch Mine in Campbell County, Wyoming. The tract, which is referred to as the West Jacobs Ranch LBA Tract, is located approximately 2.5 miles east of Wright, Wyoming (Figure G-1). JRCC's coal lease application was assigned case file number WYW172685. The federal coal reserves were applied for as a maintenance tract for the Jacobs Ranch Mine.

G4-1.1 The Proposed Action

Under the Proposed Action for the West Jacobs Ranch LBA Tract, the tract as applied for by JRCC would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the West Jacobs Ranch LBA Tract lease application (Figure G4-1). The Proposed Action assumes that JRCC would be the successful bidder on the West Jacobs Ranch LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed West Jacobs Ranch LBA Tract coal lease lands as applied for by JRCC under the Proposed Action is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming		
Section 3:	Lots 2 and 5 through 19;	638.38 acres
Section 4:	Lots 5 through 20;	639.50 acres
Section 5:	Lots 5 through 20;	636.67 acres
T.44N., R.71W., 6th PM, Campbell County, Wyoming		
Section 22:	Lots 9 through 16;	326.99 acres
Section 27:	Lots 1 through 16;	658.21 acres
Section 28:	Lots 1 through 3 and 5 through 16;	608.43 acres
Section 29:	Lots 5 through 15 and SE¼SE¼;	478.10 acres
Section 32:	Lots 1 through 15 and SW¼SE¼;	643.83 acres
Section 33:	Lots 1 through 15 and NE¼SE¼ ;	653.02 acres
Section 34:	Lots 1 through 16;	661.24 acres
Total:		5,944.37 acres

The coal estate included in the tract described above is federally owned. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G4-2.

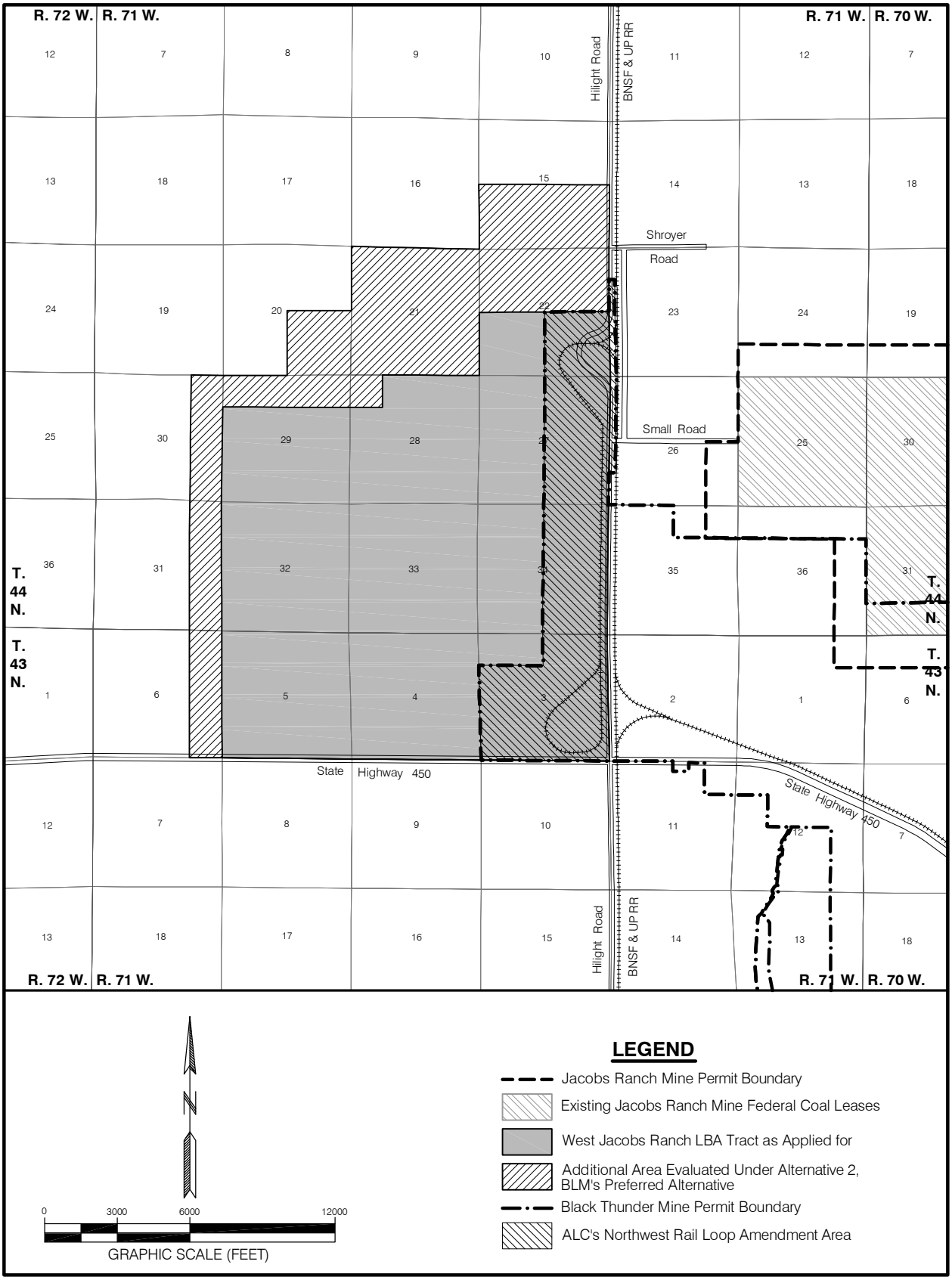

Figure G4-1. West Jacobs Ranch LBA Tract Alternatives.

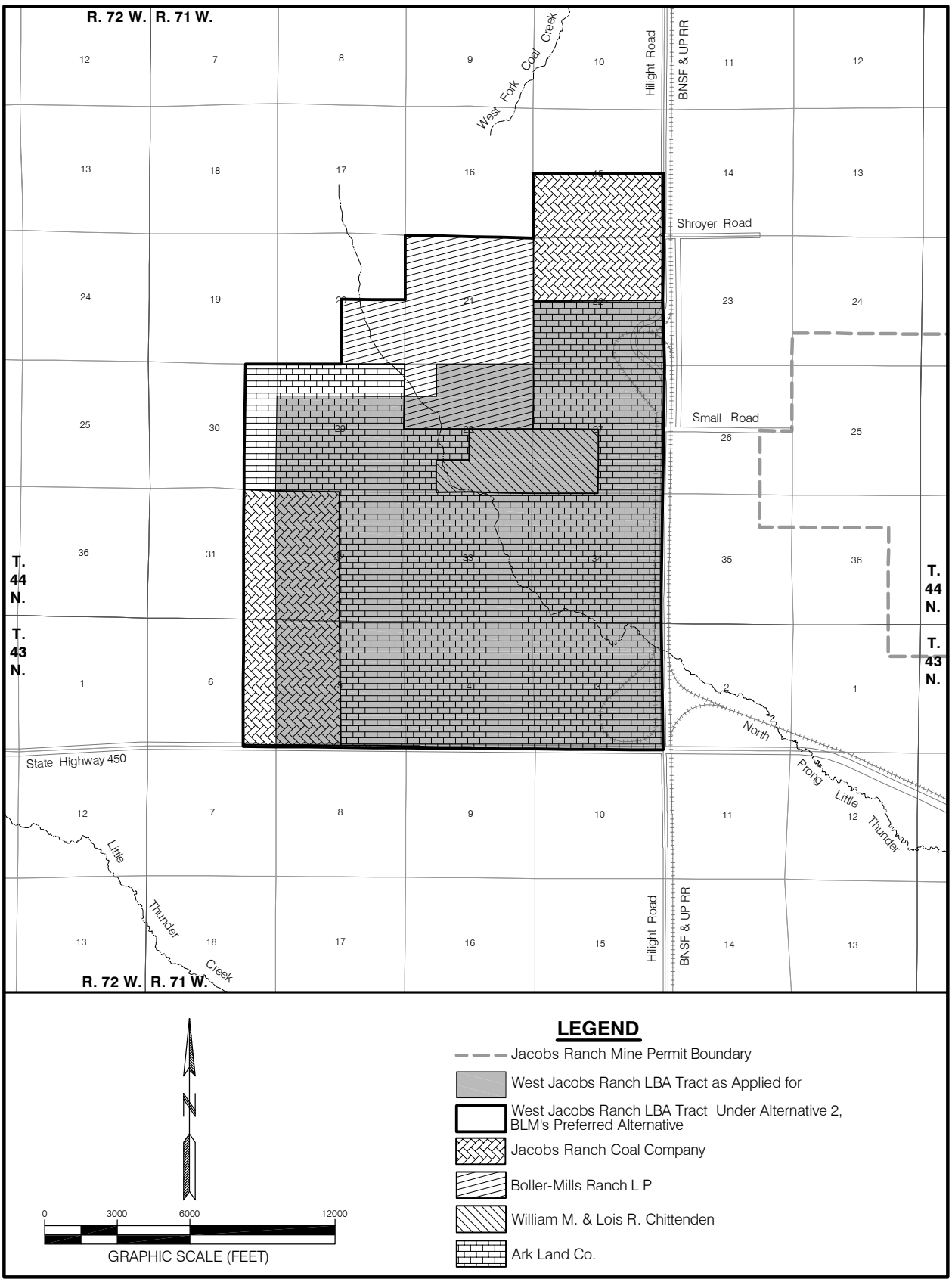

Figure G4-2. Surface Ownership Within the West Jacobs Ranch LBA Tract Alternatives.

G4-1.2 Alternatives to the Proposed Action

G4-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, JRCC's application to lease the coal included in the West Jacobs Ranch LBA Tract would be rejected. The tract would not be offered for competitive sale, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities and employment on the existing leases at Jacobs Ranch Mine. No portion of the West Jacobs Ranch LBA Tract will be disturbed under Jacobs Ranch Mine's current mining plans in order to recover the coal in the mine's existing coal leases. However, a portion of the LBA tract's surface was recently disturbed during the construction of a new train loadout facility for the Black Thunder Mine within TBCC's Northwest Rail Loop Amendment Area, which is located along the eastern side of the tract. Construction of the new coal loadout facilities was completed in 2008 (Figure G4-1).

G4-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the West Jacobs Ranch LBA Tract, BLM would reconfigure the tract, hold a competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the West Jacobs Ranch LBA Tract assumes that JRCC would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the existing Jacobs Ranch Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the West Jacobs Ranch coal lease application, BLM identified a study area that includes unleased federal coal adjacent to the northern and western edges of the tract as applied for (Figure G4-1). BLM is evaluating the potential that some or all of these lands could be added to area to be offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the West Jacobs Ranch LBA Tract, and/or reduce the potential that some of the potentially mineable federal coal in this area would be bypassed if it is not included in the West Jacobs Ranch LBA Tract.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 6:	Lots 8, 15, 16, and 23;	163.05 acres

T.44N., R.71W., 6th PM, Campbell County, Wyoming

Section 15:	Lots 9 through 16;	326.83 acres
Section 20:	Lots 9, 10, 14, and 15;	161.38 acres
Section 21:	Lots 1 through 16;	639.69 acres
Section 22:	Lots 1 through 8;	320.85 acres
Section 28:	Lot 4;	41.00 acres
Section 29:	Lots 1 through 4;	159.36 acres
Section 30:	Lots 5, 12, 13, and 20;	157.29 acres
Section 31:	Lots 5, 12, 13, and 20;	162.40 acres
Total:		2,131.85 acres

The legal description of BLM's preferred configuration of the West Jacobs Ranch LBA Tract under Alternative 2 (Figure G4-1) is as follows:

T.43N., R.71W., 6th PM, Campbell County, Wyoming

Section 3:	Lots 2 and 5 through 19;	638.38 acres
Section 4:	Lots 5 through 20;	639.50 acres
Section 5:	Lots 5 through 20;	636.67 acres
Section 6:	Lots 8, 15, 16, and 23;	163.05 acres

T.44N., R.71W., 6th PM, Campbell County, Wyoming

Section 15:	Lots 9 through 16;	326.83 acres
Section 20:	Lots 9, 10, 14, and 15;	161.38 acres
Section 21:	Lots 1 through 16;	639.69 acres
Section 22:	Lots 1 through 16;	647.84 acres
Section 27:	Lots 1 through 16;	658.21 acres
Section 28:	Lots 1 through 16;	649.43 acres
Section 29:	Lots 1 through 15 and SE¼SE¼;	637.46 acres
Section 30:	Lots 5, 12, 13, and 20;	157.29 acres
Section 31:	Lots 5, 12, 13, and 20;	162.40 acres
Section 32:	Lots 1 through 15 and SW¼SE¼;	643.83 acres
Section 33:	Lots 1 through 15 and NE¼SE¼ ;	653.02 acres
Section 34:	Lots 1 through 16;	661.24 acres
Total:		8,076.22 acres

G4-2.0 CONSULTATION TO DATE

The locations of the existing Jacobs Ranch Mine coal leases, the existing approved mine permit area, and the West Jacobs Ranch LBA Tract are shown in Figure G4-1.

The Jacobs Ranch Mine and West Jacobs Ranch LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have

applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The West Jacobs Ranch LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the West Jacobs Ranch LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the Jacobs Ranch Mine's existing approved mine permit area, shown in Figure G4-1, as part of the mine and reclamation plan approval process. This process began when the mine was initially permitted in 1975 and has continued through 2008. The most recent Migratory Bird Species of Management Concern and Raptor Monitoring and Mitigation Plan for the Jacobs Ranch Mine was approved by the USFWS on July 25, 2002, which covered 2002 through 2009. Jacobs Ranch Mine will be resubmitting its plan to the USFWS in 2009 as part of the WDEQ/LQD mine permit renewal process.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with the National Environmental Policy Act (NEPA), the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G4-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife baseline inventories and annual monitoring surveys have been conducted for the Jacobs Ranch Mine since 1980. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal (USFWS) requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed procedures and site-specific requirements have been carried out as approved by WGFD and USFWS. The wildlife monitoring program has been conducted in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations. Areas covered by the wildlife surveys included the mine's permit

area and a large perimeter around the permit boundary; therefore, a portion of the West Jacobs Ranch LBA Tract has been surveyed for several years because it is part of the survey area for the Jacobs Ranch and/or Black Thunder mines.

The approved Jacobs Ranch Mine Permit 271-T5 (JRCC 2004) includes monitoring and mitigation measures for the Jacobs Ranch Mine that are required by SMCRA and Wyoming State Law. If the West Jacobs Ranch LBA Tract is acquired by JRCC, these required monitoring and mitigation measures would be extended to cover operations on the LBA tract when the Jacobs Ranch Mine's mining permit is amended to include the tract. This amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the West Jacobs Ranch LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), the Wyoming Natural Diversity Database, records from the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies.

Site-specific data for the West Jacobs Ranch tract were obtained from several sources, including WDEQ/LQD mine permit applications and annual wildlife monitoring reports for the applicant and the neighboring (Jacobs Ranch and Black Thunder) mines, which are on file with the WDEQ/LQD in Cheyenne and Sheridan, Wyoming. Research and field surveys were conducted expressly for the West Jacobs Ranch LBA Tract beginning in February of 2007 and continuing through August of 2008. Figure G4-3 depicts the West Jacobs Ranch LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mines' existing permit areas, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides

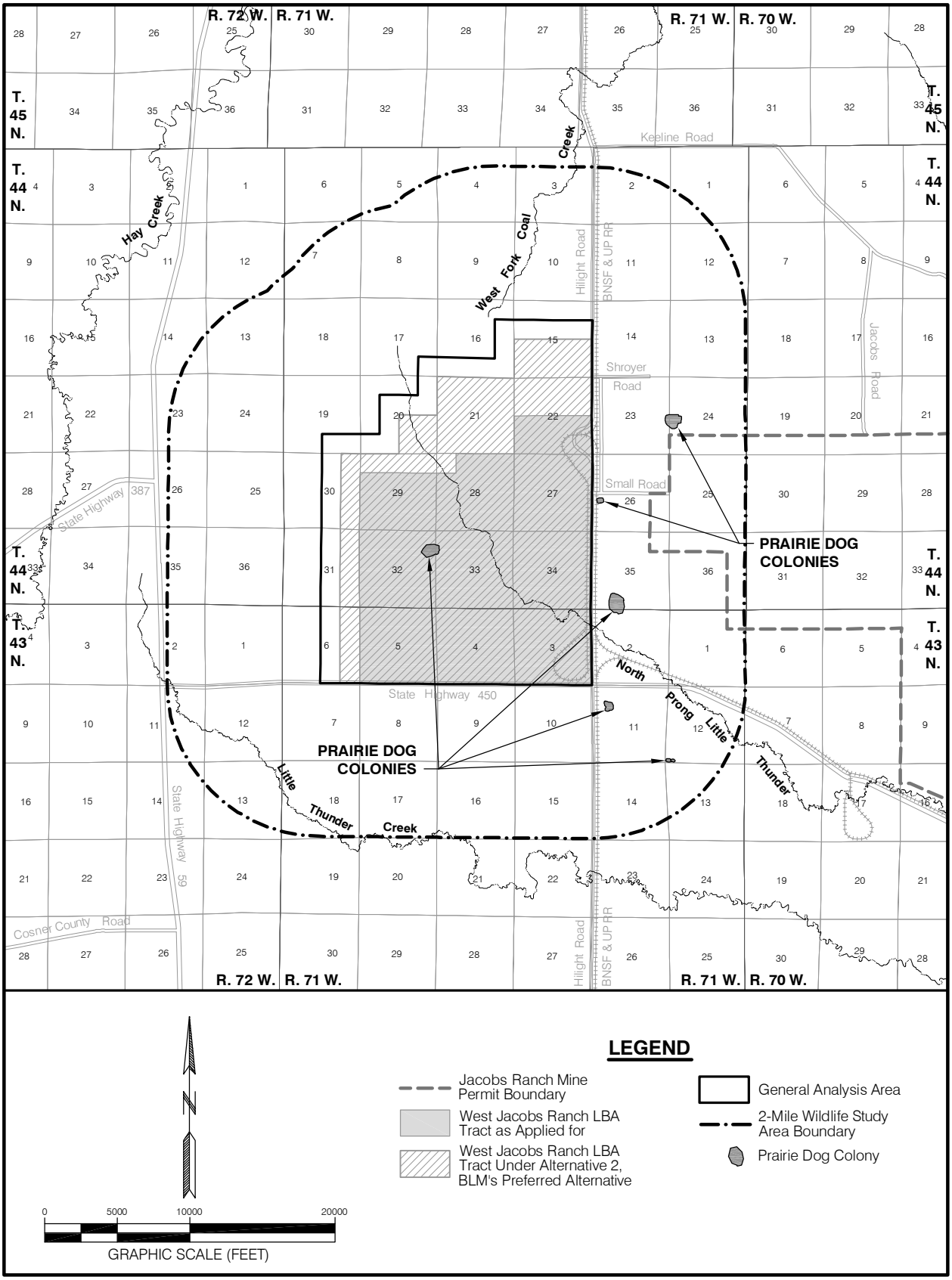

Figure G4-3. T&E Species Survey Area for the West Jacobs Ranch LBA Tract.

and along the drainages, where channel incision has created some gullying. The average land surface slope over the entire general analysis area for the West Jacobs Ranch tract is approximately 4.1 percent. Surface mine lands, both active and reclaimed, dominate the landscape east of the West Jacobs Ranch tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Other habitats present within and around the West Jacobs Ranch LBA Tract include bottomland grassland, rough breaks, playas, reservoirs/stockponds, and disturbed lands. Disturbance areas associated with oil and gas development (i.e., networks of road and utility rights-of-way, tank batteries and well pads) overlay much of the tract's general analysis area and make up the majority of disturbed lands. Few trees are present due to the lack of water and suitable habitats, most of which are found primarily in shelterbelts planted adjacent to ranching facilities. Reclaimed lands include areas that were disturbed for road construction and the installation of oil and gas development-related facilities.

The existing Jacobs Ranch Mine permit area and the general analysis area for the West Jacobs Ranch LBA Tract are located in the North Prong Little Thunder Creek watershed. North Prong Little Thunder Creek and its tributaries, Dry Fork Little Thunder Creek and School Section Draw, drain the general analysis area for the West Jacobs Ranch LBA Tract. North Prong Little Thunder Creek flows from the northwest to the southeast across the LBA tract. Springen Draw, an ephemeral tributary to an internally-drained playa, drains a small area in the northeastern corner of the West Jacobs Ranch general analysis area. Typical of this semi-arid area, Little Thunder Creek and its tributaries are all ephemeral streams. The current mine plan for the adjacent Black Thunder Mine allows disturbance of Little Thunder Creek and several of its tributaries, including North Prong Little Thunder Creek.

Essentially all water courses in the tract's general analysis area are receiving, or have received, discharge water from CBNG development and, as a result, the frequency and duration of streamflow events have increased and periods of no flow are less common. Numerous in-channel stock reservoirs are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable during other seasons. At least 33 distinct diked impoundments are located within the West Jacobs Ranch tract's general analysis area. The shallow impoundments along Dry Fork Little Thunder Creek have seldom been completely dry in recent years. There are also a

number of playas within the area that provide seasonal habitat for waterbirds and other aquatic species.

A preliminary wetland inventory of the general analysis area for the West Jacobs Ranch LBA Tract, based on USFWS NWI mapping and reconnaissance in the field, was conducted in 2007 and 2008. Some wetland areas previously mapped by the USFWS NWI have been recently altered due to coal bed natural gas (CBNG)-related water production within and upstream of the tract's general analysis area. The NWI maps were consulted prior to the initiation of the preliminary wetland field survey; however, the boundaries of the existing potential wetlands vary to a greater or lesser extent from the boundaries shown on the NWI maps. Due to the ephemeral nature of CBNG dewatering activities, the boundaries, and therefore wetland areas, are likewise ephemeral. A formal jurisdictional wetland delineation survey for the North Hilight Field LBA Tract would be conducted and submitted to the U.S. Army Corps of Engineers (COE) for verification as part of the mine permitting process, if the LBA tract is leased.

Within the entire general analysis area for the West Jacobs Ranch LBA Tract (9,370.4 acres), the preliminary wetland inventory identified a total of 68.4 acres of wetlands and OWUS. These wetlands and OWUS were found within four general land categories: ponds/reservoirs, ephemeral streams, playas, and isolated depressions. Of these 68.4 acres, approximately 16.7 acres are vegetated wetlands, which include 4.7 acres around ponds, 7.8 acres along ephemeral streams, 1.7 acres on playas, and 2.5 acres in other depressions. The remaining 51.7 acres are pond or channel other waters (i.e., open water in reservoirs/stockponds, along ephemeral streams, and in playas). All of these wetlands and OWUS are classified as palustrine. Most of the wetlands have emergent vegetation, while most of the ponds and playas have aquatic beds and are seasonally or temporarily flooded. The vegetated wetlands are located primarily along the stream channels associated with Dry Fork and North Prong Little Thunder Creek.

At this time, a distinction has not been made between jurisdictional and non-jurisdictional acreages of wetlands and OWUS since only the COE has the authorization to make such determination following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the West Jacobs Ranch LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 1 and 2 on federally listed species.

G4-3.1 Threatened Species

G4-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS 2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their 1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).

This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

<u>Existing Environment:</u> Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County. The nearest population to the West Jacobs Ranch LBA Tract is located on a tributary of Antelope Creek in northern Converse County.

Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. In order to adequately determine the presence of the species, areas of suitable habitat within the general analysis area for the West Jacobs Ranch LBA Tract were surveyed by Intermountain Resources in early and mid-August of 2007 and again in early and mid-August of 2008. These surveys were completed during the period that Ute ladies'-tresses orchids are known to flower in the region, and no Ute ladies'-tresses orchids were found. Previous surveys have

been conducted during the flowering period within the existing adjacent Jacobs Ranch and Black Thunder mine permit areas (e.g., for each of BLM's EISs analyzing the environmental impacts of leasing LBA tracts obtained by the mines since 1992) and no Ute ladies'-tresses orchids were found during any of those surveys.

Topographical and wetland delineation maps for the tract's general analysis area were reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat was traversed on foot during the time of actual flowering of the known population, and involved walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

Most of the potentially suitable habitat within the West Jacobs Ranch tract's general analysis area and adjacent areas is very limited and is mostly found along the CBNG-impacted bottomlands of North Prong Little Thunder Creek , Dry Fork Little Thunder Creek, and their tributaries. The quality of potential habitat in this area is poor for a number of key reasons:

- The soils tend to be heavy and trend from moderately to very saline/sodic. The saline/sodic areas typically have monocultural stands of inland saltgrass (*Distichlis spicata stricta*), foxtail barley (*Hordeum jubatum*) or alkali bulrush (*Scirpus maritimus*).

- Wet meadow habitat types are heavily colonized by aggressive rhizomatous graminoid plant species, including common spikerush (*Eleocharis palustris*), alkali cordgrass (*Spartina gracilis*), and western wheatgrass (*Pascopyron smithii*). These narrow riparian strips located between emergent aquatic vegetation and dry upland prairie may be too dense and too shaded by tall vegetation to provide suitable habitat.

- Surface discharge of groundwater associated with CBNG development within and upstream of the study area, which is a relatively recent phenomenon, has altered historic shallow groundwater and soil moisture conditions along all water courses, causing major shifts in plant community distributions.

- Livestock grazing, particularly during the wetter times of the year, has impacted the quality of riparian areas.

Conversely, in response to surface discharge of groundwater associated with CBNG development on or upstream of the West Jacobs Ranch tract, streamflow occurrence is now more persistent and the duration of time that some playas and in-channel reservoirs hold water may be extended before going completely

dry, which may improve the quality of potential habitat for Ute ladies'-tresses in those areas.

Within the entire general analysis area for the West Jacobs Ranch LBA Tract, the preliminary wetland inventory conducted in 2007 and 2008 identified a total of 68.4 acres of wetlands and OWUS, including approximately 16.7 acres are vegetated wetlands and 51.7 acres are pond or channel other waters (i.e., open water in reservoirs/stockponds, along ephemeral streams, and in playas). Most of the wetlands have emergent vegetation, while most of the ponds and playas have aquatic beds and are seasonally or temporarily flooded. The vegetated wetlands are located primarily along the stream channels associated with Dry Fork and North Prong Little Thunder Creek.

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project clearance work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service was moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the West Jacobs Ranch tract's general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

There is limited potential habitat for this species on the tract along the CBNG-impacted bottomlands of the North Prong Little Thunder Creek and its tributaries. However, the quality of the potential habitat is poor. Outside of the narrow riparian strips located along these impacted drainages, potential suitable habitat is rare or non-existent in the surveyed area.

The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 28 miles southwest of the project area. As described above, the surrounding mines (Jacobs Ranch, Black Thunder, North Antelope Rochelle, and Antelope) have conducted multiple orchid surveys of suitable habitat within their existing permit areas over multiple years during the known time of flowering using USFWS accepted techniques. All surveys in this area of the Powder River Basin that have been conducted for the purpose of analyzing the environmental impacts of leasing and mining tracts of federal coal (Table 1-1 of this EIS) have resulted in negative findings.

Although individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year, it is unlikely that Ute ladies'-tresses populations would have remained undetected during multiple surveys over multiple years, if they were present in the area. Nonetheless, if undetected populations were present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the West Jacobs Ranch LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act (CWA), as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G4-3.2 Endangered Species

G4-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse,

Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The Jacobs Ranch Mine and West Jacobs Ranch LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the West Jacobs Ranch LBA Tract and its 2-mile wildlife study area (Figure G4-3) harbor some small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, six black-tailed prairie dog colonies encompassing a total of approximately 78.3 non-contiguous acres are located within 2 miles of the West Jacobs Ranch tract (Figure G4-3). Of these, only one colony occurs within the general analysis area itself and is approximately 17.9 acres in size. The other five colonies located in the surrounding 2-mile survey area range in size from approximately 2.6 to 27.2 acres in size. All of these colonies were occupied during 2007. None of these six colonies within the 2-mile wildlife study area meet the 120-acre minimum threshold for supporting a breeding female ferret and her litter (Forrest et al. 1985) and none meet the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989).

Effects of the Proposed Project: **Mining the federal coal included in the West Jacobs Ranch LBA Tract general analysis area, if the tract is leased under**

the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.

Given the documented absence of black-footed ferrets in the region, including the West Jacobs Ranch LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed prairie dog colonies throughout the entire state, and the distance of the LBA area from future reintroduction sites, mining the general analysis area for the West Jacobs Ranch LBA Tract would not effect the black-footed ferret.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the West Jacobs Ranch tract general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies.

Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in West Jacobs Ranch tract's general analysis area would not contribute to cumulative adverse effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G4-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The West Jacobs Ranch LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No

suitable sand dunes (whether stable or active) are currently present in the West Jacobs Ranch tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the West Jacobs Ranch LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G4-4.0 SUMMARY OF DETERMINATIONS

Table G4-1 summarizes the determinations for federally listed T&E species in the area of the West Jacobs Ranch LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G4-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the West Jacobs Ranch LBA Tract.

Status	Species Common Name	Potential Effects
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G5

NORTH PORCUPINE LBA TRACT

G5-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On September 29, 2006, BTU Western Resources, Inc. (BTU) filed an application with the BLM for federal coal reserves in three separate tracts located west, northwest, and north of and immediately adjacent to the North Antelope Rochelle Mine in Campbell County, Wyoming (Figure G-1). The two tracts on the north side of the mine were referred to as the North Porcupine LBA Tract, and the tract on the west side of the mine was referred to as the South Porcupine LBA Tract. On October 12, 2007, BTU filed a request with the BLM to modify the Porcupine LBA Tract configuration to increase the lease area and coal volume. The North Porcupine LBA Tract, which is located approximately 12 miles southeast of Wright, Wyoming, was combined into one tract and its size was increased with additional lands. The South Porcupine LBA Tract, which is located approximately 14 miles southeast of Wright, was also increased in size with additional lands. BTU's coal lease application was assigned case file numbers WYW173408 (North Porcupine) and WYW176095 (South Porcupine). BLM determined that the two tracts in the application would be processed separately and, if the decision is made to conduct a lease sale, would be offered for sale separately.

G5-1.1 The Proposed Action

Under the Proposed Action for the North Porcupine LBA Tract, the tract as applied for by BTU would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the North Porcupine LBA Tract lease application (Figure G5-1). The Proposed Action assumes that BTU would be the successful bidder on the North Porcupine LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed North Porcupine LBA Tract coal lease lands as applied for by BTU under the Proposed Action is as follows:

T.42N., R.70W., 6th PM, Campbell County, Wyoming

Section 19:	Lots 13 through 20;	296.94 acres
Section 20:	Lots 9 through 16;	328.00 acres
Section 21:	Lots 9 through 16;	329.54 acres
Section 22:	Lots 9 through 16;	327.74 acres
Section 26:	Lots 3 through 6 and 9 through 16;	496.64 acres
Section 27:	Lots 1 through 16;	664.48 acres
Section 28:	Lots 1 through 4;	165.98 acres
Section 29	Lots 1 through 4;	164.30 acres
Section 30:	Lots 5 through 8;	147.79 acres

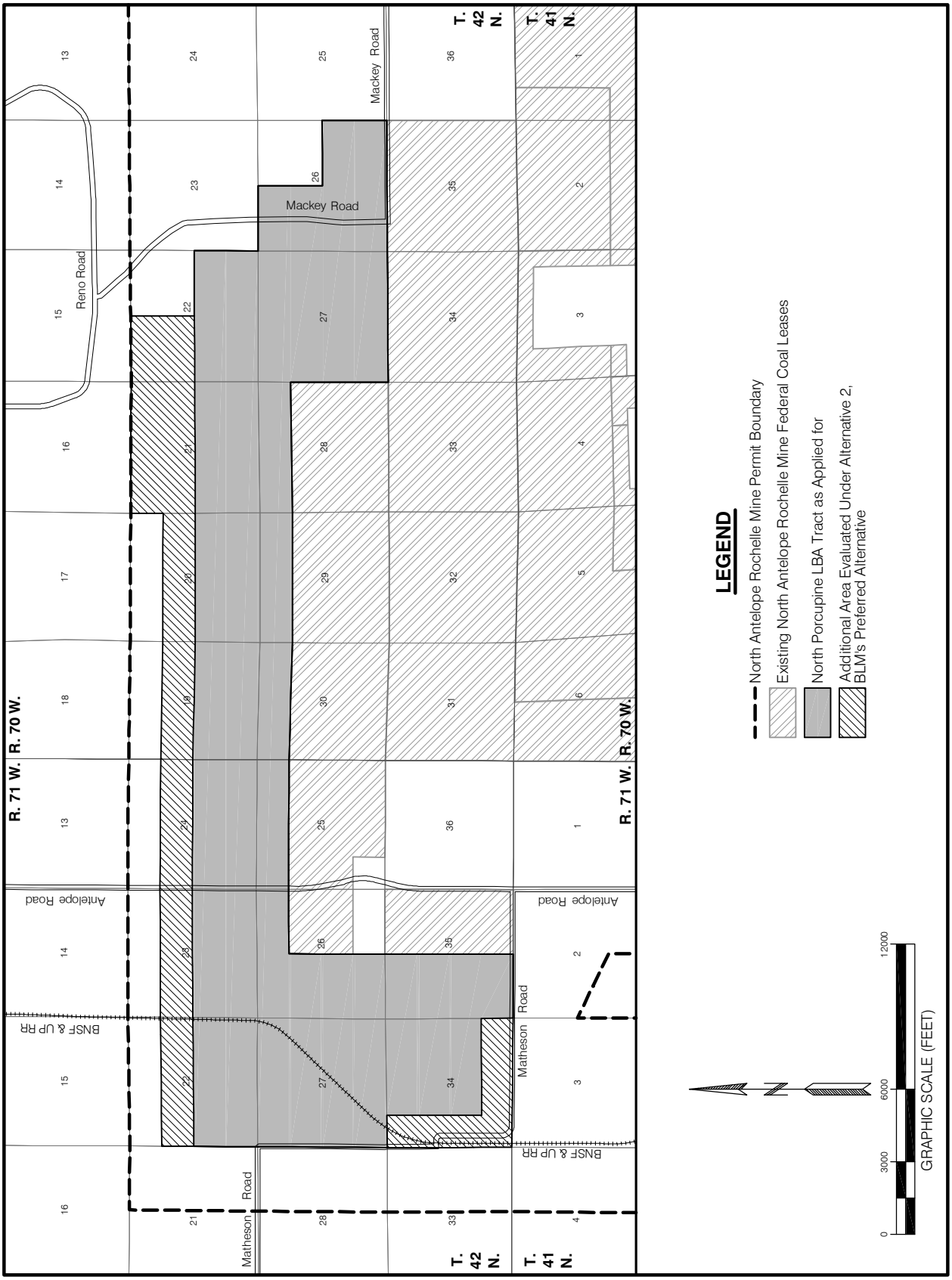

Figure G5-1. North Porcupine LBA Tract Alternatives.

T.42N., R.71W., 6th PM, Campbell County, Wyoming

Section 22:	Lots 10 through 15 and 21 through 24;	323.49 acres
Section 23:	Lots 9 through 16;	324.94 acres
Section 24:	Lots 9 through 16;	325.82 acres
Section 25:	Lots 1 through 4;	162.96 acres
Section 26:	Lots 1 through 6 and 11 through 14;	404.09 acres
Section 27:	Lots 2 through 6, 9, 12, and 15 through 30;	649.42 acres
Section 34:	Lots 1 through 3 and 6 through 11;	360.46 acres
Section 35:	Lots 3 through 6 and 11 through 14;	323.19 acres
Total:		5,795.78 acres

The coal estate included in the tract described above is federally owned. Much of the surface (approximately 85 percent) of the tract as applied for includes lands on the TBNG, which is administered by the USFS. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G5-2.

G5-1.2 Alternatives to the Proposed Action

G5-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, BTU's application to lease the coal included in the North Porcupine LBA Tract would be rejected. The tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities or employment on the existing leases at the North Antelope Rochelle Mine. Portions of the surface of the LBA tract will be disturbed due to overstripping to allow coal to be removed from existing contiguous leases.

G5-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the North Porcupine LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the North Porcupine LBA Tract assumes that BTU would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the existing North Antelope Rochelle Mine. Other assumptions are the same as for the Proposed Action.

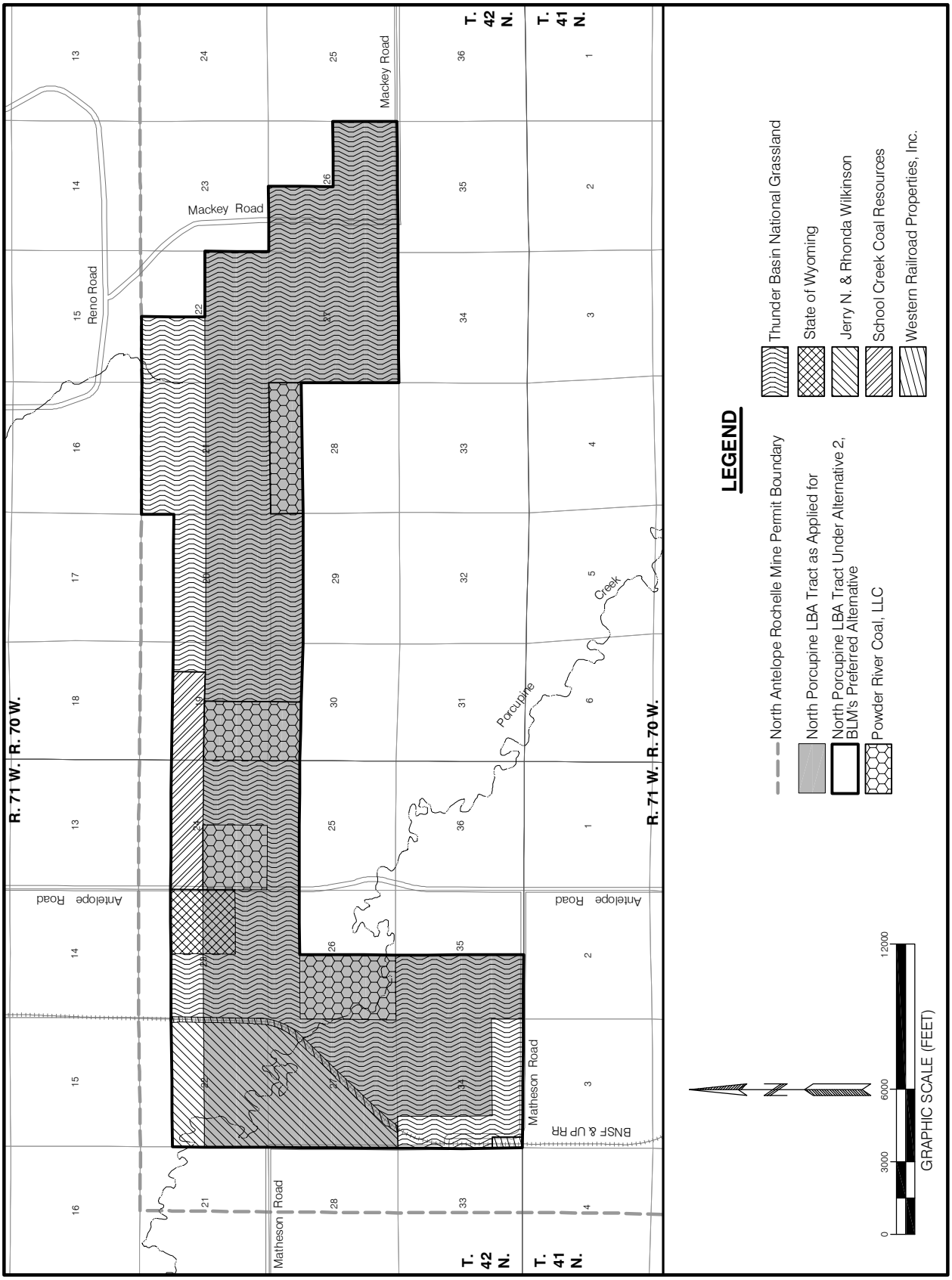

Figure G5-2. Surface Ownership Within the North Porcupine LBA Tract Alternatives.

In evaluating the North Porcupine coal lease application, BLM identified a study area that includes unleased federal coal adjacent the northern and southwestern edges of the tract as applied for (Figure G5-1). BLM is evaluating the potential that some or all of these lands could be added to the area offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the North Porcupine LBA Tract, and/or reduce the potential that some of the potentially mineable federal coal in this area would be bypassed if it is not included in the North Porcupine LBA Tract.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.42N., R.70W., 6th PM, Campbell County, Wyoming

Section 19:	Lots 9 through 12;	149.02 acres
Section 20:	Lots 5 through 8;	162.93 acres
Section 21:	Lots l through 8;	330.71 acres
Section 22:	Lots 3 through 6;	163.80 acres

T.42N., R.71W., 6th PM, Campbell County, Wyoming

Section 22:	Lots 5 through 7, 19, and 20;	162.70 acres
Section 23:	Lots 5 through 8;	162.51 acres
Section 24:	Lots 5 through 8;	163.30 acres
Section 34:	Lots 4, 5, and 12 through 16;	276.04 acres
Total:		1,572.01 acres

The legal description of BLM's preferred configuration of the North Porcupine LBA Tract under Alternative 2 (Figure G5-1) is as follows:

T.42N., R.70W., 6th PM, Campbell County, Wyoming

Section 19:	Lots 9 through 20;	445.96 acres
Section 20:	Lots 5 through 16;	490.93 acres
Section 21:	Lots 1 through 16;	660.25 acres
Section 22:	Lots 3 through 6 and 9 through 16;	491.54 acres
Section 26:	Lots 3 through 6 and 9 through 16;	496.64 acres
Section 27:	Lots 1 through 16;	664.48 acres
Section 28:	Lots 1 through 4;	165.98 acres
Section 29	Lots 1 through 4;	164.30 acres
Section 30:	Lots 5 through 8;	147.79 acres

T.42N., R.71W., 6th PM, Campbell County, Wyoming

Section 22:	Lots 5 through 7, 10 through 15, and 19 through 24;	486.19 acres
Section 23:	Lots 5 through 16;	487.45 acres
Section 24:	Lots 5 through 16;	489.12 acres
Section 25:	Lots 1 through 4;	162.96 acres
Section 26:	Lots 1 through 6 and 11 through 14;	404.09 acres
Section 27:	Lots 2 through 6, 9, 12, and 15 through 30;	649.42 acres

Section 34:	Lots 1 through 16;	636.50 acres
Section 35:	Lots 3 through 6 and 11 through 14;	323.19 acres
Total:		7,366.79 acres

Much of the surface (approximately 83 percent) of the BLM study area includes lands on the TBNG, which is administered by the USFS.

G5-2.0 CONSULTATION TO DATE

The locations of the existing North Antelope Rochelle Mine coal leases, the existing approved mine permit area, and the North Porcupine LBA Tract are shown in Figure G5-1.

The North Antelope Rochelle Mine and North Porcupine LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The North Porcupine LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. This analysis is referenced in the *Final Environmental Impact Statement (FEIS) for the Northern Great Plains Management Plans Revision* (USFS 2001a) and adopted in the *Land and Resource Management Plan (LRMP) for the Thunder Basin National Grassland* (USFS 2001b). The Record of Decision for the Thunder Basin National Grassland FEIS and LRMP was signed on July 31, 2002 (USFS 2002a). The Porcupine LBA Tract fall within Management Area 8.4, as identified in the 2002 Thunder Basin National Grassland LRMP, which is to be managed for mineral production and development. Consultation with USFWS was conducted as part of the 2002 LRMP. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a

validation of these findings for the North Porcupine LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the North Antelope Rochelle Mine's existing approved mine permit area, shown in Figure G5-1, as part of the mine and reclamation plan approval process. This process began when the North Antelope Mine and the Rochelle Mine (which are now combined as the North Antelope Rochelle Mine) were initially permitted in 1982 and 1983 and has continued through 2008. North Antelope Rochelle Mine's most recent Migratory Bird Species of Management Concern and Raptor Monitoring and Mitigation Plan, which was included as part of mine's most recent mine permit amendment, was approved by USFWS January 4, 2006. USFWS approved subsequent revisions and amendments to the plan, the most recent of which is dated December 5, 2007.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective

measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with the National Environmental Policy Act (NEPA), the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G5-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife monitoring has been conducted annually for the North Antelope Rochelle Mine since 1984. Similar annual monitoring has occurred at the nearby Antelope and Black Thunder mines since 1982 and 1983, respectively. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal agencies' requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed survey protocols and site-specific requirements have been conducted as approved by WGFD and USFWS. The annual wildlife monitoring programs at all three applicant mines have been consistent since they began in the early 1980s, with minor modifications in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations.

The annual monitoring areas for the adjacent North Antelope Rochelle, Antelope, and Black Thunder mines encompass large survey perimeters around each permit boundary; therefore, both the North and South Porcupine LBA Tracts and surrounding lands have been included in annual wildlife monitoring for many years. Surveys with respect to the North Porcupine tract are summarized as follows:

- Since the early 1980's:
  - approximately 1,480 acres (16 percent) in the eastern portion of the North Porcupine tract general analysis area; and
  - the eastern two-thirds of the North Porcupine tract two-mile wildlife survey area.
- Since 1992:

  - approximately 4,480 acres (about 50 percent) of the North Porcupine tract general analysis area and the two-mile wildlife survey area (excluding the northern- and western-most tiers) (since 1992).
- Since 2000:
  - the entire North Porcupine tract general analysis area; and
  - all but the northern- and western-most 6,770 acres (14 percent) of the North Porcupine tract two-mile wildlife survey area.
- Since 2002:
  - all lands in the general analysis area and wildlife survey area the North Porcupine tract, including targeted baseline wildlife surveys conducted for the tract from 2006 through 2008.

To summarize, the entire general analysis area for the North Porcupine LBA Tract has been included in annual wildlife monitoring for at least the last eight years (2000 through 2007). Long-term information is also available for the two-mile wildlife survey area associated with the tract.

The approved North Antelope Rochelle Mine Permit 569-T6 (PRC 2004) includes monitoring and mitigation measures that are required by SMCRA and Wyoming State Law. If the North Porcupine LBA Tract is acquired by BTU, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the North Antelope Rochelle Mine's mining permit is amended to include the tract. The amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the North Porcupine LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), the original baseline inventories for the North Antelope and Rochelle mines prior to their merger, annual wildlife monitoring and periodic wildlife baseline reports submitted by the mine to the WDEQ/LQD from 1984 through 2007, the West Antelope II Coal Lease Application FEIS (BLM 2008), records from the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies. The North Porcupine LBA Tract wildlife study area has been included in annual wildlife monitoring efforts for the nearby North Antelope Rochelle Mine, Antelope Mine, and/or Black Thunder Mine for many years. Consequently, site-specific data for the North Porcupine tract were available from several sources, including previous WDEQ/LQD mine permit applications and long-term annual wildlife monitoring reports for the applicant mine and adjacent properties. Baseline wildlife studies conducted expressly for the North Porcupine LBA Tract from 2006 through early 2008 added to those existing databases. Figure G5-3 depicts the North Porcupine LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

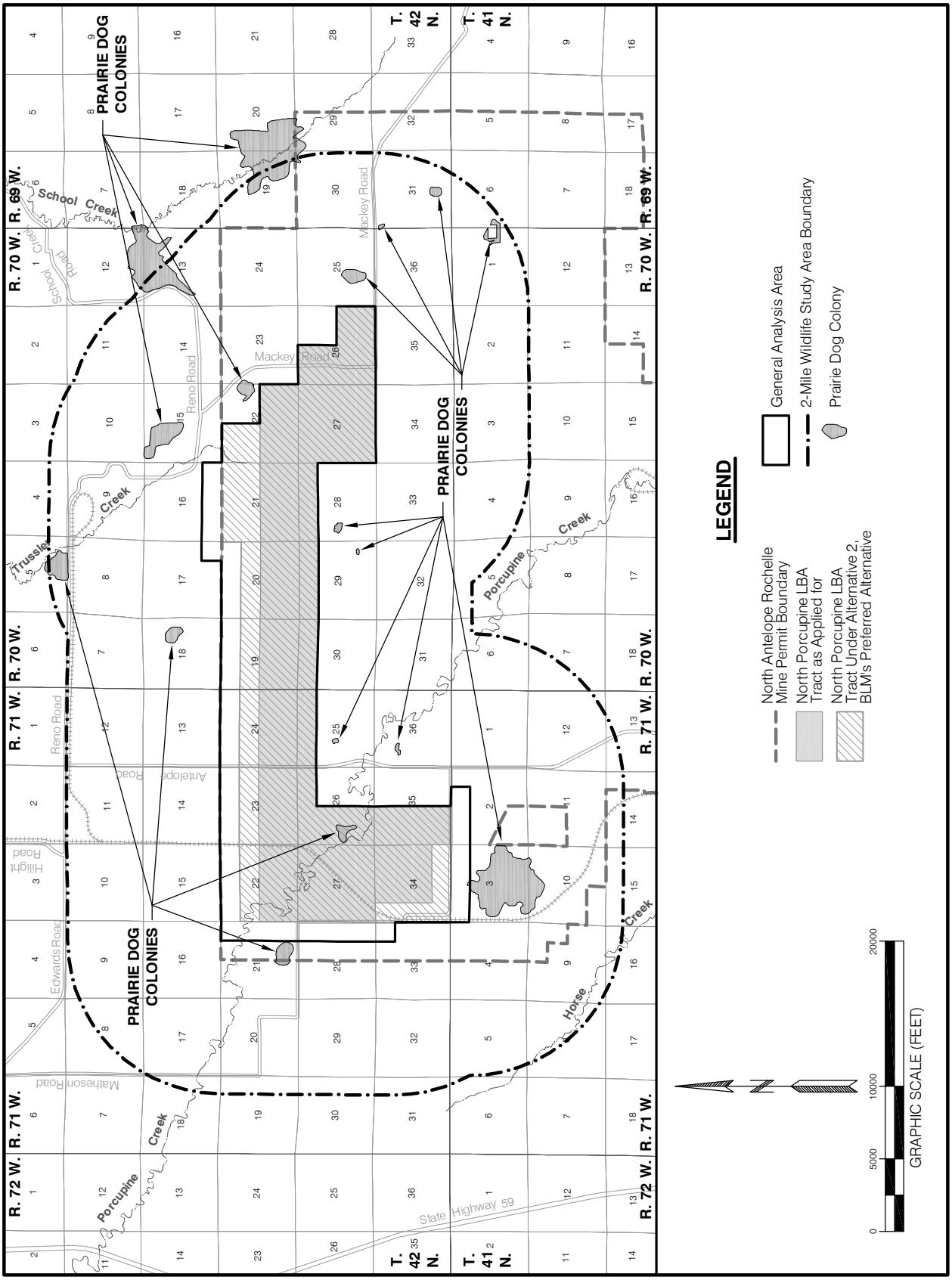

Figure G5-3. T&E Species Survey Area for the North Porcupine LBA Tract.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mines' existing permit areas, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides and along the drainages, where channel incision has created some gullying.

The topography of the North Porcupine tract is influenced by Porcupine Creek and its tributaries. Land surface elevations in the tract's general analysis area range from 4,707 to 5,000 feet and approximately 81 percent of the land surface area has a slope of less than 5 percent. The average land surface slope over the entire general analysis area for the tract is approximately 3.2 percent. Surface mine lands, both active and reclaimed, dominate the landscape south and east of the North Porcupine LBA Tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Minor vegetation types, including saline grassland, rough breaks, disturbed lands and bottomlands account for approximately 10 percent of the six combined general analysis areas. Disturbed lands include road and utility rights-of-way, areas surrounding active construction sites and mining facilities, oil and gas facilities, and occupied and abandoned homesteads. Few trees occur in the general Wright analysis area due to the lack of water and suitable habitats; most trees are found primarily in windbreaks planted adjacent to ranching facilities. Reclaimed lands include areas that were recently disturbed for road construction, installation of oil and gas development-related facilities, and mining-associated activities.

Based on total acreages, the predominant vegetation types in the general analysis area for the North Porcupine tract are Big Sagebrush Grassland (53.85 percent) and Upland Grassland (31.78 percent), both of which occur primarily on the rolling upland terrain. Other habitat types common to North Porcupine include Breaks Grassland, Salt Grassland, Meadow Undeveloped Pastureland, Disturbed, Playa Grassland, Hayland, and Water areas. Disturbed areas are characterized primarily by a network of major roads and well pads that are

stabilized with gravel or reclaimed. There are also small tank batteries and numerous miles of pipeline disturbance that, to varying degrees, are recovering vegetation cover. Those disturbances are associated with both CBNG and traditional oil and gas development in the area, though similar existing disturbance has occurred from ongoing surface mining activities.

The North Porcupine general analysis area and the majority of the existing North Antelope Rochelle Mine's permit area are located in the Porcupine Creek watershed. Porcupine Creek is an ephemeral stream in its upper reaches and an intermittent stream in its lower reaches. The North Antelope Rochelle Mine disturbs Porcupine Creek and several of its tributaries, and is currently permitted to disturb approximately 25 percent of Porcupine Creek's watershed. Approximately 6,221 acres, or about 84 percent of the 7,367-acre BLM study area for the North Porcupine LBA Tract, drain to Porcupine Creek. A short reach of Porcupine Creek, which is a meandering ephemeral stream in this area, flows southeastward across the western portion of the North Porcupine LBA Tract. Several ephemeral tributaries of Porcupine Creek (e.g., Corder Creek, Boss Draw, Rat Draw, Gray Creek, and Chipmunk Draw) also cross the North Porcupine tract's general analysis area. The northeastern portion of the tract's general analysis area is drained by Trussler and School creeks, ephemeral tributaries of Little Thunder Creek. There are also some areas in the eastern portion of the general analysis area that do not contribute runoff to any stream and playas have formed in the lowest portions of these non-contributing drainage areas.

Numerous small in-channel reservoirs/stock ponds are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. There are also a number of playas within the area. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable, and often dry, during other seasons.

Formal jurisdictional wetland delineation surveys covering North Antelope Rochelle Mine's current permit area and some additional adjacent lands were completed by PRC and submitted to the COE for verification in 1996, 1997, 2000 and 2004. These wetland delineations and the COE's respective letters of verification summarizing the acreage figures of approved jurisdictional determinations are included in Appendix D-10 of the mine's permit (PRC 2004). According to the COE's latest (October 12, 2004) jurisdictional determination, there is a total of 219.71 acres of jurisdictional wetlands and OWUS within the mine's current permit area. Of those 219.71 acres, there are 77.84 acres of riverine wetlands, 26.99 acres of stockpond wetlands, 11.42 acres of riverine open water OWUS, 44.62 acres of stockpond open water OWUS, and 58.84 acres of ephemeral stream channel OWUS. There are also 20.92 wetland acres and 1.33 open water acres of non-jurisdictional playa/depressional features.

The general analysis area for the North Porcupine LBA Tract lies completely within North Antelope Rochelle Mine's current mine permit area. Therefore, these previous wetland delineation surveys provide an estimate of the acreages of wetlands and OWUS that exist within the LBA tract's general analysis area, with the caveat that some wetland areas previously mapped may have been altered by CBNG-related water production within and upstream of the general analysis area. In addition to the effects from CBNG-related water discharges, the PRB has experienced a moderate to severe drought cycle that has persisted since 2000, which may have also altered previously-mapped wetland and OWUS areas. The boundaries of some wetlands and OWUS could, therefore, vary to a greater or lesser extent from the boundaries that existed at the time that the formal wetland delineation surveys were conducted.

Within the general analysis area for the North Porcupine LBA Tract (9,021.4 acres), there are an estimated 19.7 acres of jurisdictional wetlands and OWUS. Of those 25.8 acres, there are approximately 9.3 acres of riverine wetlands, approximately 0.9 acres of stockpond wetlands, approximately 0.9 acres of stockpond open water OWUS, and approximately 8.6 acres of ephemeral stream channel OWUS. There are also approximately 4.9 wetland acres and 1.2 open water acres of non-jurisdictional playa/depressional features. The vegetated wetland areas consist primarily of palustrine emergent herbaceous wet meadow or marsh and palustrine aquatic beds located along ephemeral stream channels and around ponds, playas and depressions, whereas the OWUS consist of dry ephemeral drainages and open water.

Only the COE has the authorization to determine whether or not wetlands are jurisdictional or non-jurisdictional, following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the North Porcupine LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 1 and 2 on federally listed species.

G5-3.1 Threatened Species

G5-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute

ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS 2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their 1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).

This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat

during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

Existing Environment: Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County. The nearest known population to the North Porcupine LBA Tract is located on an unnamed tributary to Antelope Creek in northern Converse County.

Porcupine Creek is within the Antelope Creek watershed. As discussed above, Porcupine Creek and several of its ephemeral tributaries (e.g., Payne Draw, Corder Creek, Boss Draw, Rat Draw, Gray Creek, and Chipmunk Draw) lie within and drain most of the North Porcupine tract's general analysis area. Holmes Creek and Trussler Creek drain the remainder of the tract's general analysis area but are not part of the Antelope Creek watershed, as they flow into Little Thunder Creek.

Areas of Ute ladies'-tresses potential habitat along Porcupine Creek on USFS lands within North Antelope Rochelle Mine's current mine permit area (as stated above, the general analysis area for the North Porcupine LBA Tract lies within the mine's current permit area) were surveyed by BKS Environmental Associates (BKS) on September 1 and 6, 2005. Areas of potential suitable habitat along Holmes Creek on USFS lands within the existing North Antelope Rochelle Mine's permit area were surveyed by BKS on August 16, 2006. Areas of potential suitable habitat along Trussler Creek on USFS lands within the existing North Antelope Rochelle Mine's permit area were surveyed by BKS on August 24, 2006 and August 26, 2007. These surveys were completed during the period that Ute ladies'-tresses are known to flower in the region, and no orchids were observed during any of those surveys.

The entire general analysis area for the North Porcupine tract has also undergone one or more vegetation baseline studies conducted for amendments to the North Antelope Rochelle Mine permit. Vegetation studies were conducted in 1991, 1998, and 2001. No occurrence of the orchid was recorded in the 1991 study. In 1998 and 2001, special reconnaissance for Ute ladies'-tresses was conducted with no occurrence of the species was observed. The 2001 study covered more than 70 percent of the North Porcupine tract's general analysis area and included the entire reach of Porcupine Creek that is located within the tract's general analysis area. However, Porcupine Creek in this area provided very little suitable habitat due to excessive saline/sodic soil properties.

A special reconnaissance for Ute ladies'-tresses was included as part of the vegetation baseline study for the proposed School Creek Mine, which is located north of and adjacent to the North Antelope Rochelle Mine. That study, which was conducted in 2005 and 2006, covered approximately 24 percent of the North Porcupine tract's general analysis area and no occurrence of the species was observed.

Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. Because the surveys that were conducted by BKS in 2005, 2006, and 2007 covered only those areas of suitable habitat on USFS lands and therefore did not include all of the areas of suitable habitat within the entire general analysis area for the North Porcupine tract, additional surveys of potential habitat within the tract's entire general analysis area are scheduled during the known populations' flowering period (mid-August to early September) in 2009 and 2010 by BKS. Topographical and wetland delineation maps for the tract's general analysis area will be reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat will be traversed on foot during the time of actual flowering of the known population, and involve walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

The potentially suitable habitat within the North Porcupine tract's general analysis area and adjacent areas is mostly found along Porcupine Creek. Porcupine Creek is classified as an ephemeral stream, although surface discharge of groundwater associated with CBNG development on or upstream of the LBA tract, which is a relatively recent phenomenon, has resulted in more persistent streamflow and generally wetter conditions within the stream's channel throughout the year. There are also several stock reservoirs within the

tract's general analysis area, and some areas in the eastern portion of the general analysis area that do not contribute runoff to any stream and playas have formed in the lowest portions of these non-contributing drainage areas. Some of these areas have potential Ute ladies'-tresses habitat, as they furnish the appropriate vegetation, such as those found along Porcupine Creek.

Within the entire general analysis area for the North Porcupine LBA Tract, there are an estimated 19.7 acres of jurisdictional wetlands and OWUS, including 10.2 acres of vegetated wetlands and 9.5 acres of pond or channel OWUS.

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project analysis work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service is moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the North Porcupine tract's general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

There is limited potential habitat for this species on the tract along portions of Porcupine Creek. However, the quality of the potential suitable habitat is very poor due to excessive saline/sodic soil properties. Outside of the narrow riparian strip located along this drainage, potential suitable habitat throughout the remainder of the LBA tract's general analysis area is rare or non-existent.

The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 20 miles west of the project area. As described above, North Antelope Rochelle Mine and the surrounding mines (Black Thunder and Antelope) have conducted multiple orchid surveys of suitable habitat over multiple years during the known time of flowering using USFWS accepted techniques. All surveys have resulted in negative findings.

Individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year. Single season surveys that meet the current USFWS survey guidelines may not detect this species due to its ability to persist below ground level or above ground without flowering. All areas of suitable habitat along Porcupine Creek, Trussler Creek,

and School Creek were surveyed during the orchid's flowering season in 2005, 2006, and 2007 within North Antelope Rochelle Mine's current permit area on USFS lands only. Consequently, the suitable habitat within the entire general analysis area for the North Porcupine tract has not been surveyed multiple times over the last three years, as recommended by the Service. Therefore, additional surveys of potential habitat over the tract's general analysis area are scheduled during the flowering period (mid-August to early September) in 2009 and 2010. It is unlikely that Ute ladies'-tresses populations would remain undetected during multiple surveys over multiple years, if they are present in the area. Nonetheless, if undetected populations are present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the North Porcupine LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act, as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G5-3.2 Endangered Species

G5-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse, Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The North Antelope Rochelle Mine and North Porcupine LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the North Porcupine LBA Tract and its 2-mile wildlife study area (Figure G5-3) harbor some small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, 17 black-tailed prairie dog colonies encompassing a total of approximately 1,211.4 non-contiguous acres are located within 2 miles of the North Porcupine tract (Figure G5-3). Of which, only one colony occurs within the general analysis area itself and it is approximately 18.6 acres in size. The other 16 colonies located in the surrounding 2-mile survey area range in size from approximately 1.5 to 345.3 acres in size. All of these colonies were

occupied during 2007. Of these 17 colonies, the three largest in size meet the 120-acre minimum threshold for supporting a breeding female ferret and her litter (Forrest et al. 1985) and the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989). These three colonies are 228.9, 338.1, and 345.3 acres in size.

Effects of the Proposed Project: **Mining the federal coal included in the North Porcupine LBA Tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.**

Given the documented absence of black-footed ferrets in the region, including the North Porcupine LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed prairie dog colonies throughout the entire state, and the distance of the LBA area from future reintroduction sites, mining the general analysis area for the North Porcupine LBA Tract would not result in any direct or indirect effects on black-footed ferrets.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the North Porcupine tract general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be

different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in North Porcupine tract's general analysis area would not contribute to cumulative adverse effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G5-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two

habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The North Porcupine LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No suitable sand dunes (whether stable or active) are currently present in the North Porcupine tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the North Porcupine LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G5-4.0 SUMMARY OF DETERMINATIONS

Table G5-1 summarizes the determinations for federally listed T&E species in the area of the North Porcupine LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G5-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the North Porcupine LBA Tract.

Status	Species Common Name	Potential Effects
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G6

SOUTH PORCUPINE LBA TRACT

G6-1.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

On September 29, 2006, BTU Western Resources, Inc. (BTU) filed an application with the BLM for federal coal reserves in three separate tracts located west, northwest, and north of and immediately adjacent to the North Antelope Rochelle Mine in Campbell County, Wyoming (Figure G-1). The two tracts on the north side of the mine were referred to as the North Porcupine LBA Tract, and the tract on the west side of the mine was referred to as the South Porcupine LBA Tract. On October 12, 2007, BTU filed a request with the BLM to modify the Porcupine LBA Tract configuration to increase the lease area and coal volume. The North Porcupine LBA Tract, which is located approximately 12 miles southeast of Wright, Wyoming, was combined into one tract and its size was increased with additional lands. The South Porcupine LBA Tract, which is located approximately 14 miles southeast of Wright, was also increased in size with additional lands. BTU's coal lease application was assigned case file numbers WYW173408 (North Porcupine) and WYW176095 (South Porcupine). BLM determined that the two tracts in the application would be processed separately and, if the decision is made to conduct a lease sale, would be offered for sale separately.

G6-1.1 The Proposed Action

Under the Proposed Action for the South Porcupine LBA Tract, the tract as applied for by BTU would be offered for lease at a sealed-bid, competitive lease sale, subject to standard and special lease stipulations developed for the PRB (Appendix D of this EIS). The boundaries of the tract would be consistent with the tract configuration proposed in the South Porcupine LBA Tract lease application (Figure G6-1). The Proposed Action assumes that BTU would be the successful bidder on the South Porcupine LBA Tract if it is offered for sale, and the tract would be mined as a maintenance lease for an existing mine.

The legal description of the proposed South Porcupine LBA Tract coal lease lands as applied for by BTU under the Proposed Action is as follows:

T.41N., R.70W., 6th PM, Campbell County, Wyoming		
Section 7:	Lots 7 through 10 and 15 through 18;	320.94 acres
Section 18:	Lots 6 through 11 and 14 through 19;	479.71 acres
T.41N., R.71W., 6th PM, Campbell County, Wyoming		
Section 1:	Lots 5 through 20;	638.15 acres
Section 12:	Lots 1 through 16;	678.52 acres
Section 13:	Lots 1 through 16;	668.93 acres
Section 14:	Lots 1, 8, 9, and 16;	154.62 acres
Section 23:	Lot 1 and N½ of Lot 8;	59.81 acres
Section 24:	Lots 2 through 4 and N½ of Lots 5, 6 and 7;	185.28 acres
Total:		3,185.96 acres

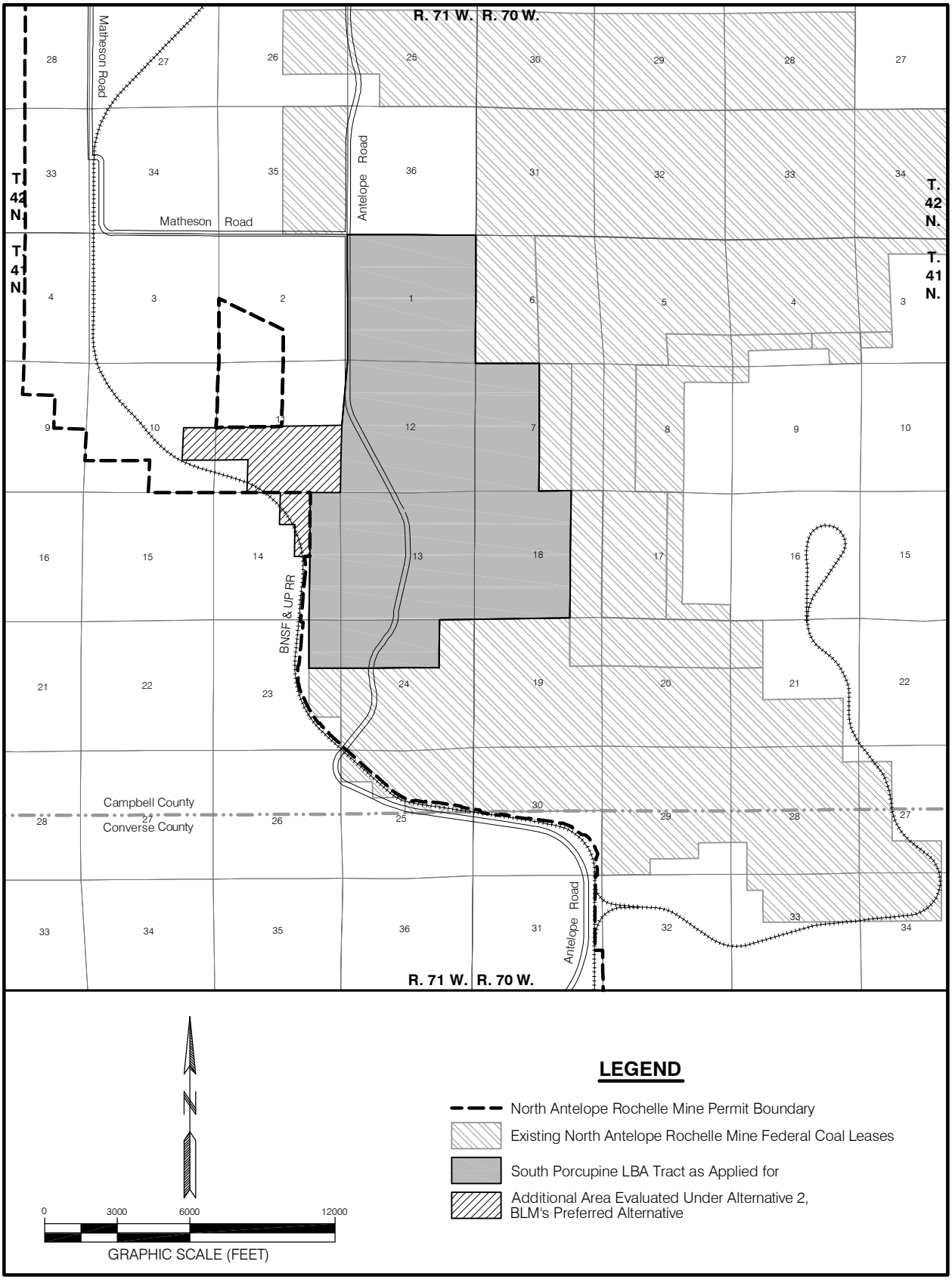

Figure G6-1. South Porcupine LBA Tract Alternatives.

The coal estate included in the tract described above is federally owned. Much of the surface (approximately 78 percent) of the tract as applied for includes lands on the TBNG, which is administered by the USFS. The ownership of the surface and oil and gas estates is discussed in Section 3.11 of this EIS. Surface ownership is shown in Figure G6-2.

G6-1.2 Alternatives to the Proposed Action

G6-1.2.1 Alternative 1

Under Alternative 1, the No Action Alternative, BTU's application to lease the coal included in the South Porcupine LBA Tract would be rejected. The tract would not be offered for competitive sale at this time, and the coal included in the tract would not be mined. Rejection of the application would not affect permitted mining activities or employment on the existing leases at the North Antelope Rochelle Mine. Portions of the surface of the LBA tract will probably be disturbed due to overstripping to allow coal to be removed from existing contiguous leases.

G6-1.2.2 Alternative 2 (BLM's Preferred Alternative)

Under Alternative 2 for the South Porcupine LBA Tract, BLM would reconfigure the tract, hold one competitive coal sale for the lands included in the reconfigured tract, and issue a lease to the successful bidder. The modified tract would be subject to standard and special lease stipulations developed for the PRB and for this tract if it is offered for sale (Appendix D of this EIS). Alternative 2, holding a competitive coal sale for a modified tract, is BLM's Preferred Alternative.

Alternative 2 for the South Porcupine LBA Tract assumes that BTU would be the successful bidder on the tract if a lease sale is held and that the federal coal would be mined as a maintenance lease to extend the life of the existing North Antelope Rochelle Mine. Other assumptions are the same as for the Proposed Action.

In evaluating the South Porcupine coal lease application, BLM identified a study area that includes unleased federal coal adjacent the western edge of the tract as applied for (Figure G6-1). BLM is evaluating the potential that some or all of these lands could be added to the area offered for lease to provide for more efficient recovery of the federal coal, increase competitive interest in the South Porcupine LBA Tract, and/or reduce the potential that some of the potentially mineable federal coal in this area would be bypassed if it is not included in the South Porcupine LBA Tract.

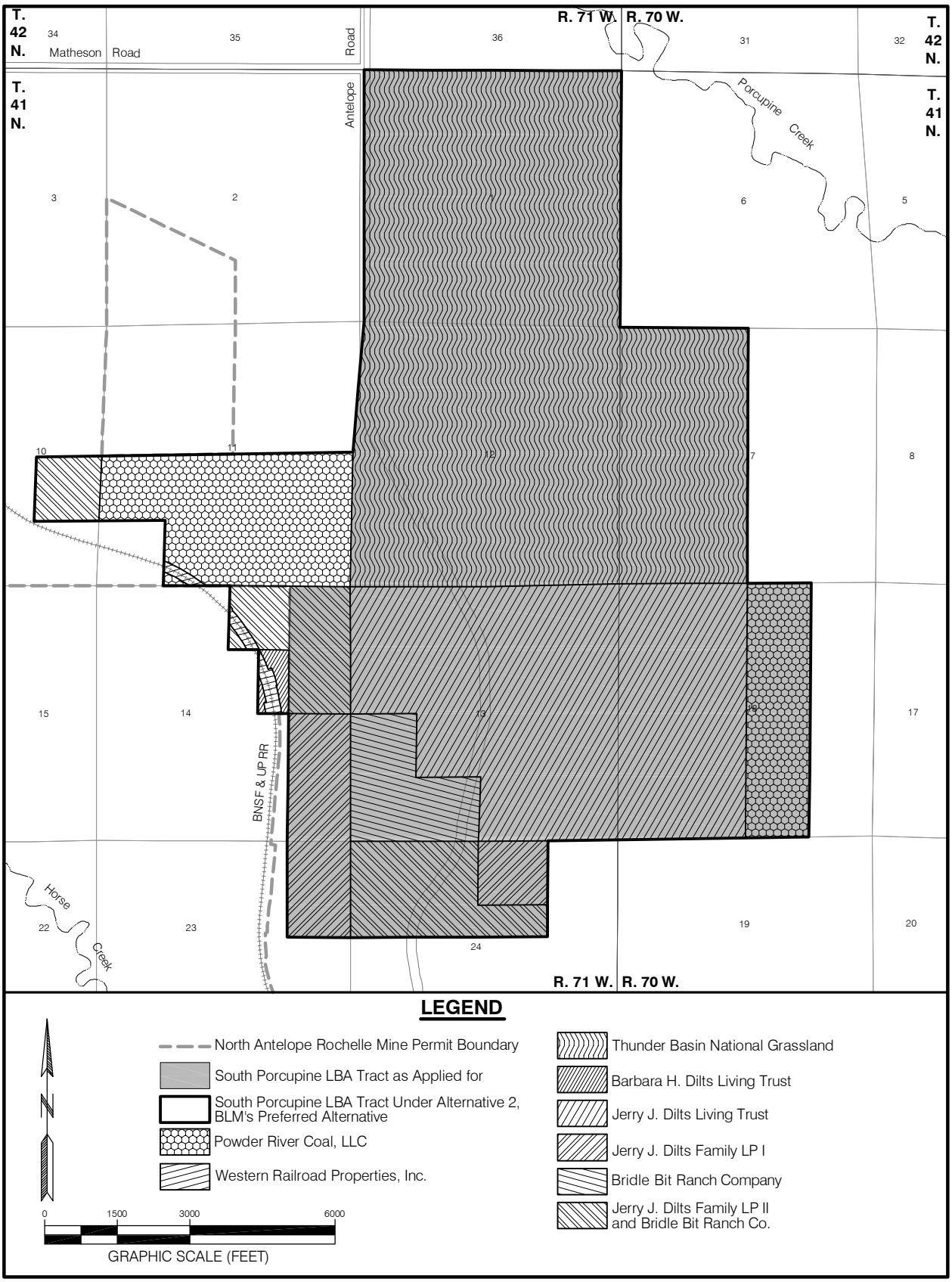

Figure G6-2. Surface Ownership Within the South Porcupine LBA Tract Alternatives.

Under Alternative 2, the area BLM is evaluating adding to the tract as applied for includes the following lands:

T.41N., R.71W., 6th PM, Campbell County, Wyoming		
Section 10:	Lot 9;	41.20 acres
Section 11:	Lots 9 through 12 and 14 through 16;	283.80 acres
Section 14:	Lot 2 and E½ of Lot 7;	57.07 acres
Total:		382.07 acres

The legal description of BLM's preferred configuration of the South Porcupine LBA Tract under Alternative 2 (Figure G6-1) is as follows:

T.41N., R.70W., 6th PM, Campbell County, Wyoming		
Section 7:	Lots 7 through 10 and 15 through 18;	320.94 acres
Section 18:	Lots 6 through 11 and 14 through 19;	479.71 acres

T.41N., R.71W., 6th PM, Campbell County, Wyoming		
Section 1:	Lots 5 through 20;	638.15 acres
Section 10:	Lot 9;	41.20 acres
Section 11:	Lots 9 through 12 and 14 through 16;	283.80 acres
Section 12:	Lots 1 through 16;	678.52 acres
Section 13:	Lots 1 through 16;	668.93 acres
Section 14:	Lots 1, 2, E½ of 7, 8, 9, and 16;	211.69 acres
Section 23:	Lot 1 and N½ of Lot 8;	59.81 acres
Section 24:	Lots 2 through 4 and N½ of Lots 5, 6 and 7;	185.28 acres
Total:		3,568.03 acres

Much of the surface (approximately 70 percent) of the BLM study area includes lands on the TBNG, which is administered by the USFS.

G6-2.0 CONSULTATION TO DATE

The locations of the existing North Antelope Rochelle Mine coal leases, the existing approved mine permit area, and the South Porcupine LBA Tract are shown in Figure G6-1.

The North Antelope Rochelle Mine and South Porcupine LBA Tract are included in the area determined to be "acceptable for further consideration for leasing" as part of the coal screening process. The coal screening process is a four-part process that includes application of the coal unsuitability criteria, which are defined in 43 CFR 3461.5 and listed in Appendix B of this EIS. BLM and USFS have applied these coal screens to federal coal lands in Campbell County several times, starting in the early 1980s. The South Porcupine LBA Tract is located in the area covered by the USFS screening analysis published as Appendix F of the 1985 *Thunder Basin National Grassland Land and Resource Management Plan*. Most recently, in 1993, BLM, USFS and the U.S. Fish and

Wildlife Service (USFWS) began the process of reapplying these screens to federal coal lands in Campbell, Converse, and Sheridan counties. The results of this analysis were included as Appendix D of the 2001 *Approved Resource Management Plan for Public Lands Administered by the BLM Buffalo Field Office* (BLM 2001), which can be viewed on the Wyoming BLM website at http://www.wy.blm.gov in the NEPA documents section. This analysis is referenced in the *Final Environmental Impact Statement (FEIS) for the Northern Great Plains Management Plans Revision* (USFS 2001a) and adopted in the *Land and Resource Management Plan (LRMP) for the Thunder Basin National Grassland* (USFS 2001b). The Record of Decision for the Thunder Basin National Grassland FEIS and LRMP was signed on July 31, 2002 (USFS 2002a). The South Porcupine LBA Tract fall within Management Area 8.4, as identified in the 2002 Thunder Basin National Grassland LRMP, which is to be managed for mineral production and development. Consultation with USFWS was conducted as part of the 2002 LRMP. Consultation with USFWS occurred in conjunction with the unsuitability findings under Criterion 9 (Critical Habitat for Threatened or Endangered Plant and Animal Species), Criterion 11 (Bald or Golden Eagle Nests), Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas), Criterion 13 (Falcon Nesting Site(s) and Buffer Zone(s)), and Criterion 14 (Habitat for Migratory Bird Species).

Appendix B of the this EIS summarizes the unsuitability criteria, describes the general findings for the screening analyses discussed above, and presents a validation of these findings for the South Porcupine LBA Tract based on the current information.

Consultation with USFWS has previously been completed for the area included within the North Antelope Rochelle Mine's existing approved mine permit area, shown in Figure G6-1, as part of the mine and reclamation plan approval process. This process began when the North Antelope Mine and the Rochelle Mine (which are now combined as the North Antelope Rochelle Mine) were initially permitted in 1982 and 1983 and has continued through 2008. North Antelope Rochelle Mine's most recent Migratory Bird Species of Management Concern and Raptor Monitoring and Mitigation Plan, which was included as part of the most recent mine permit amendment, was approved by USFWS January 4, 2006. USFWS approved subsequent revisions and amendments to the plan, the most recent of which is dated December 5, 2007.

USFWS maintains a list of "threatened" or "endangered" (T&E) and candidate species and designated critical habitat on their official website; the website includes those species found in Wyoming. USFWS updates the species list annually, or sooner if any listing changes occur. The species list on the USFWS website fulfills the obligation of the USFWS, under Section 7(c) of the Endangered Species Act of 1973 (ESA), to provide a list of T&E species upon request for federal actions and the National Environmental Policy Act of 1969 (NEPA) compliance.

According to USFWS information (USFWS 2009), three federally listed species could potentially occur in the general Wright analysis area

- Ute ladies'-tresses orchid (*Spiranthes diluvialis*): Threatened
- Black-footed ferret (*Mustela nigripes*): Endangered
- Blowout penstemon (*Penstemon haydenii*): Endangered

The effects upon these three species are described and analyzed in detail in this appendix. The bald eagle (*Haliaetus leucocephalus*) was removed from listing as a threatened species in August 2007. Discussion on the bald eagle is included in Appendix H of this EIS as a sensitive species.

USFWS provided BLM a listing of the T&E species that may be present in the Buffalo Field Office Area (northeastern Wyoming) in a memorandum letter from Brian T. Kelly, USFWS, Cheyenne, Wyoming, to Chris Hanson, BLM Buffalo Field Office, Buffalo, Wyoming, dated August 8, 2007 (USFWS 2007), which included the black-footed ferret and Ute ladies'-tresses, but not blowout penstemon. Recently, blowout penstemon was added to the Campbell County listing (USFWS 2009).

The August 8, 2007 memorandum stated that the USFWS focuses on three broad categories of trust resources: 1) T&E and candidate species, 2) migratory birds, and 3) wetlands and riparian areas. The memorandum stated that the Service would work with the BLM to ensure that species-specific protective measures and programs for the conservation and recovery of listed species as required by under the ESA are satisfied and carried out. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, and the protection of wetlands is pursuant to Section 404 of the Clean Water Act, Executive Order 11990, and Executive Order 11988. The memorandum also provided recommendations for biological assessments in compliance with the National Environmental Policy Act (NEPA), the protection of migratory birds, wetlands, and for other fish and wildlife resources (under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956).

The Wyoming Game and Fish Department (WGFD) provided BLM with scoping comments for the six LBA tracts included in the Wright Area Coal Lease Applications EIS in a letter from John Emmerich, Deputy Director, WGFD, Cheyenne, Wyoming, to Sarah Bucklin, BLM, Casper Field Office, Casper, Wyoming, dated July 5, 2007 (WGFD 2007). WGFD recommended consideration be given to possible impacts to big game species and their habitat, sage grouse, other sagebrush obligates, and nongame species that occur within the general Wright analysis area.

G6-3.0 SPECIES HABITAT AND OCCURRENCE AND EFFECTS OF THE PROPOSED PROJECT

Wildlife monitoring has been conducted annually for the North Antelope Rochelle Mine since 1984. Similar annual monitoring has occurred at the nearby Antelope and Black Thunder mines since 1982 and 1983, respectively. This wildlife monitoring was designed to meet the WDEQ/LQD, WGFD, and federal agencies' requirements for annual monitoring and reporting of wildlife activity on coal mining areas. Detailed survey protocols and site-specific requirements have been conducted as approved by WGFD and USFWS. The annual wildlife monitoring programs at all three applicant mines have been consistent since they began in the early 1980s, with minor modifications in accordance with Appendix B of WDEQ/LQD Coal Rules and Regulations.

The annual monitoring areas for the adjacent North Antelope Rochelle, Antelope, and Black Thunder mines encompass large survey perimeters around each permit boundary; therefore, both the North and South Porcupine LBA Tracts and surrounding lands have been included in annual wildlife monitoring for many years. Surveys with respect to the South Porcupine tract are summarized as follows:

- Since the early 1980's:
  - all but the western-most extension and southwestern corner of the South Porcupine tract general analysis area; and
  - the eastern two-thirds of the South Porcupine tract two-mile wildlife survey area.
- Since 1994:
  - all but the western-most 114 acres (3 percent) of the South Porcupine tract general analysis area; and;
  - the eastern 70 percent of the South Porcupine tract wildlife survey area.
- Since 2000:
  - the entire South Porcupine tract general analysis area; and
  - all but 2,216 acres (8 percent) at the west-central edge of the South Porcupine tract wildlife survey area.
- Since 2002:
  - all lands in the general analysis area and wildlife survey area the South Porcupine tract, including targeted baseline wildlife surveys conducted for the tract from 2006 through 2008.

To summarize, the entire general analysis area for the South Porcupine LBA Tract has been included in annual wildlife monitoring for at least the last eight years (2000 through 2007), and 97 percent of the tract's general analysis area was monitored annually from 1994 through 2000. Long-term information is also available for the two-mile wildlife survey area associated with the tract.

The approved North Antelope Rochelle Mine Permit 569-T6 (PRC 2004) includes monitoring and mitigation measures that are required by SMCRA and Wyoming

State Law. If the South Porcupine LBA Tract is acquired by BTU, these monitoring and mitigation measures would be extended to cover operations on the LBA tract when the North Antelope Rochelle Mine's mining permit is amended to include the tract. The amended permit would have to be approved before mining operations could take place on the tract. Continued site-specific surveys for the lease area and appropriate perimeter would be part of the mine permitting process if the tract is leased and proposed for mining. These monitoring and mitigation measures are considered to be part of the Proposed Action and Alternative 2 (BLM's preferred alternative) during the leasing process because they are regulatory requirements.

Background information on wildlife in the vicinity of the general analysis area for the South Porcupine LBA Tract was obtained from several sources, including the South Powder River Basin Coal FEIS (BLM 2003), the original baseline inventories for the North Antelope and Rochelle mines prior to their merger, annual wildlife monitoring and periodic wildlife baseline reports submitted by the mine to the WDEQ/LQD from 1984 through 2007, the West Antelope II Coal Lease Application FEIS (BLM 2008), records from the WGFD, BLM, USFWS and USFS, and personal contact with biologists from those four agencies. The South Porcupine LBA Tract wildlife study area has been included in annual wildlife monitoring efforts for the nearby North Antelope Rochelle Mine, Antelope Mine, and/or Black Thunder Mine for many years. Consequently, site-specific data for the South Porcupine tract were available from several sources, including previous WDEQ/LQD mine permit applications and long-term annual wildlife monitoring reports for the applicant mine and adjacent properties. Baseline wildlife studies conducted expressly for the North Porcupine LBA Tract from 2006 through early 2008 added to those existing databases. Figure G6-3 depicts the South Porcupine LBA Tract, the tract's general analysis area, and the T&E animal species survey area.

The LBA tract and adjacent areas consist primarily of uplands. The topography of the general analysis area, like the areas within the adjacent mines' existing permit areas, is relatively subdued. The landscape consists primarily of gently rolling terrain broken by minor drainages and internally-drained playa areas. Drainage densities are quite low, and the playas are common topographic and hydrologic features. Much of the land surface does not contribute runoff to any stream, and playas have formed in the lowest portion of these non-contributing drainage areas. Land surface elevations range from about 4,690 to 5,170 feet above sea level and slopes range from essentially flat to over 50 percent within the general Wright analysis area. Gently rolling uplands comprise most of the general Wright analysis area; most of the land surface (between 75 and 90 percent, depending on the particular LBA tract) seldom exceeds a 5 percent slope. The steepest slopes typically occur near the highest elevations along the ridge lines and drainage divides and along the drainages, where channel incision has created some gullying.

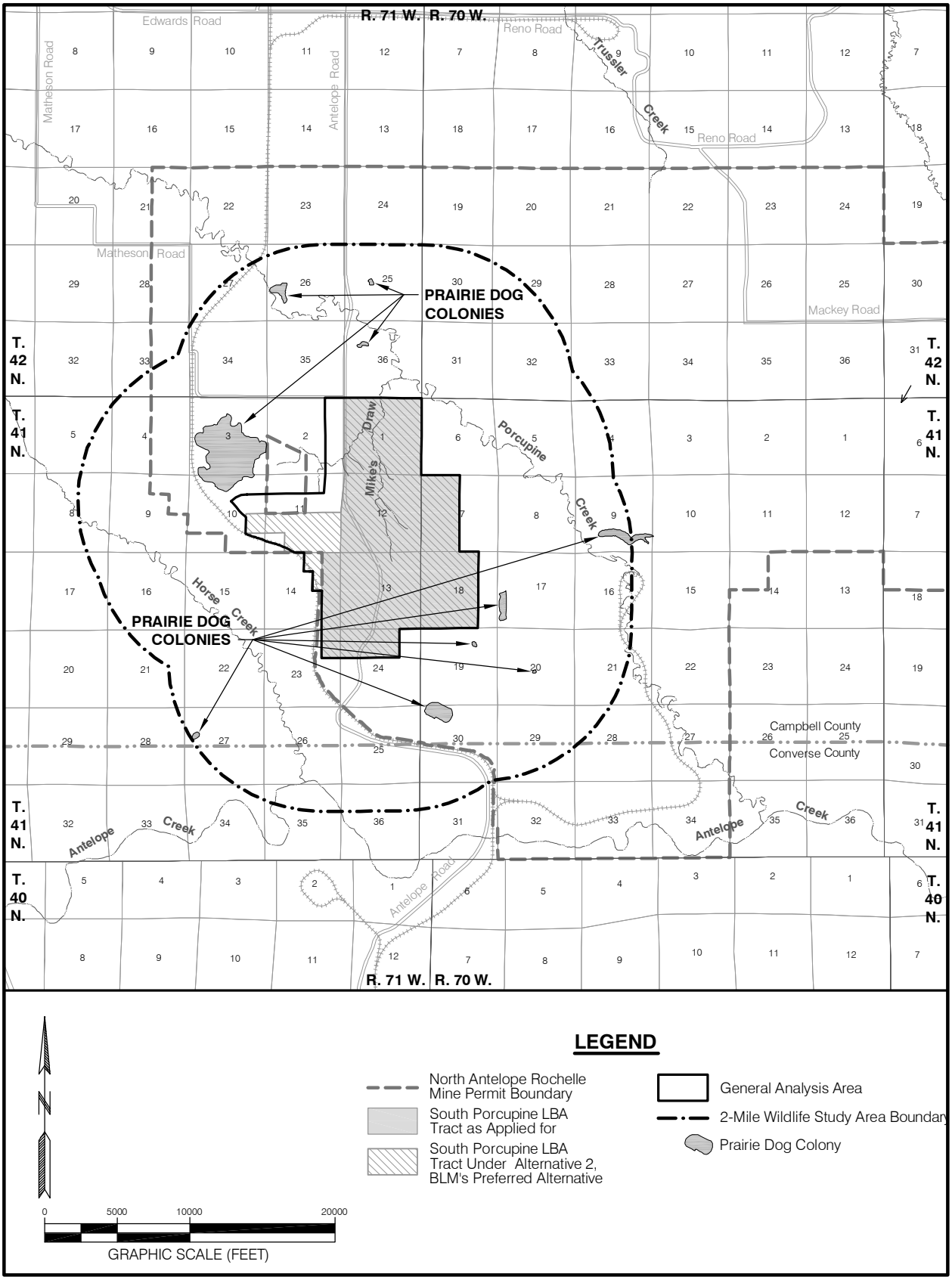

Figure G6-3. T&E Species Survey Area for the South Porcupine LBA Tract.

Of the six LBA tracts included in this analysis, the topography of the South Porcupine tract is somewhat unique due to the presence of more pronounced gullies and deeper tributary draws that are formed by the headwaters of Antelope, Horse, and Porcupine creeks. Land surface elevations in the tract's general analysis area range from 4,675 to 4,950 feet, and approximately 51 percent of the land surface area has a slope of less than 5 percent. The average land surface slope over the entire general analysis area for the tract is approximately 6.2 percent. Surface mine lands, both active and reclaimed, dominate the landscape north, south and east of the South Porcupine LBA Tract.

Predominant wildlife habitat types classified in the general Wright analysis area generally correspond with the major vegetation communities defined during the vegetation baseline survey. In terms of relative acres of occurrence, the predominant vegetation types are the Big Sage Shrubland (approximately 42 percent), Upland/Mixed Prairie Grassland (approximately 28 percent), and Crested Wheatgrass/Agricultural Pastureland (approximately 15 percent). Minor vegetation types, including saline grassland, rough breaks, disturbed lands and bottomlands account for approximately 10 percent of the six combined general analysis areas. Disturbed lands include road and utility rights-of-way, areas surrounding active construction sites and mining facilities, oil and gas facilities, and occupied and abandoned homesteads. Few trees occur in the general Wright analysis area due to the lack of water and suitable habitats; most trees are found primarily in windbreaks planted adjacent to ranching facilities. Reclaimed lands include areas that were recently disturbed for road construction, installation of oil and gas development-related facilities, and mining-associated activities.

Based on total acreages, the predominant vegetation types in the general analysis area for the South Porcupine tract are Upland Grassland (55.7 percent) and Breaks Grassland (23.5 percent), both of which occur primarily on the rolling upland terrain. Other habitat types common to South Porcupine include Salt Grassland, Playa Grassland, Disturbed, and Water areas. Disturbed areas are characterized primarily by a network of major roads and well pads that are stabilized with gravel or reclaimed. There are also small tank batteries and numerous miles of pipeline disturbance that, to varying degrees, are recovering vegetation cover. Those disturbances are associated with both CBNG and traditional oil and gas development in the area, though similar existing disturbance has occurred from ongoing surface mining activities.

As stated above, the South Porcupine LBA Tract is located at the headwaters of tributaries to Antelope, Horse, and Porcupine creeks. Surface water drainage in the tract is divided, in that the northern and eastern portions of the tract drain north and east to Porcupine Creek via several of its ephemeral tributaries, the southern portion of the tract drains south to Antelope Creek via several of its ephemeral tributaries, and the western portion of the tract drains west to Horse Creek via several of its ephemeral tributaries. With the exception

of about 60 acres, the entire BLM study area for the South Porcupine LBA Tract is within the existing North Antelope Rochelle Mine's permit area. The North Antelope Rochelle Mine disturbs Porcupine Creek and several of its tributaries as well as several of Antelope Creek's unnamed ephemeral tributaries. The mine is currently permitted to disturb approximately 25 percent of Porcupine Creek's watershed.

Numerous small in-channel reservoirs/stock ponds are scattered throughout the general Wright analysis area. Most of these stock ponds are many decades old and are constructed with earthen berms or dams. There are also a number of playas within the area. Those water bodies provide short-term habitat of variable quality for migrating waterfowl, shorebirds, and other aquatic species (birds, fish, herptiles) during spring but are less reliable, and often dry, during other seasons.

All but about 140 acres of the general analysis area for the South Porcupine LBA Tract lies within North Antelope Rochelle Mine's current mine permit area. Therefore, the mine's wetland delineation surveys (described in Section G5 of this appendix) provide an estimate of the acreages of wetlands and OWUS that exist within the LBA tract's general analysis area, with the caveat that some wetland areas previously mapped may have been altered by CBNG-related water production within and upstream of the tract's general analysis area. In addition to the effects from CBNG-related water discharges, the PRB has experienced a moderate to severe drought cycle that has persisted since 2000, which may have also altered previously-mapped wetland and OWUS areas. The boundaries of some wetlands and OWUS could, therefore, vary to a greater or lesser extent from the boundaries that existed at the time that the formal wetland delineation surveys were conducted.

Within the general analysis area for the South Porcupine LBA Tract (4,020.5 acres), there are an estimated 12.3 acres of jurisdictional wetlands and OWUS. Of those 12.3 acres, there are approximately 6.8 acres of riverine wetlands, approximately 0.4 acres of stockpond wetlands, approximately 0.2 acres of stockpond open water OWUS, and approximately 4.9 acres of ephemeral stream channel OWUS. There are also approximately 0.2 wetland acres of non-jurisdictional playa/depressional features. The vegetated wetland areas consist primarily of palustrine emergent herbaceous wet meadow or marsh along ephemeral stream channels and around ponds, playas and depressions, whereas the OWUS consist of dry ephemeral drainages and open water.

Only the COE has the authorization to determine whether or not wetlands are jurisdictional or non-jurisdictional, following the submittal and review of a formal wetland delineation as part of the mine permitting process. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate the replacement of at least equal types and numbers of jurisdictional wetland acreages.

Within the proposed lease area and adjacent study area, no designated critical, crucial, or unique habitats designated by USFWS for T&E species are present. The following discussion describes species' habitat requirements and their occurrence in the area of the South Porcupine LBA Tract and evaluates the potential environmental effects of the Proposed Action and Alternatives 1 and 2 on federally listed species.

G6-3.1 Threatened Species

G6-3.1.1 Ute ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses, a member of the orchid family, was listed as threatened on January 17, 1992, due to a variety of factors, including habitat loss and modification, hydrological modifications of existing and potential habitat areas, and invasion of exotic plant species. At the time of listing, Ute ladies'-tresses was only known from Colorado, Utah, and extreme eastern Nevada. Ute ladies'-tresses orchids were discovered in Wyoming in 1993. It is currently known from western Nebraska, eastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central and southeastern Idaho, southwestern Montana, central Washington, and Canada.

Biology and Habitat Requirements: Ute ladies'-tresses is a perennial, terrestrial orchid with erect, glandular-pubescent stems 12 to 50 centimeters (5 to 20 inches) tall arising from tuberous-thickened roots. Ute ladies'-tresses occurs primarily on moist, subirrigated or seasonally flooded soils bordering wetland meadows, springs, lakes, or perennial streams. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Most populations are found on alluvial sand, coarse silt, or whitish loamy clay with a slightly basic pH. These soils are derived from Quaternary alluvial deposits or drab Eocene-age sandstones and claystones (Fertig 2000). Ute ladies'-tresses is generally not found in heavy, tight clay soils, saline, or alkaline soils.

This orchid can be commonly associated with horsetail, milkweed, verbena, blue-eyed grass, reedgrass, goldenrod, bentgrass, and arrowgrass (USFWS 2005). Wyoming populations often occur in moist meadow communities dominated by redtop, common quackgrass, Baltic rush, foxtail barley, or switchgrass within a narrow vegetative band between emergent aquatic vegetation and dry upland prairie (Fertig 2000). Vegetative cover tends to range from 75-90 percent and is usually less than 45 centimeters (18 inches) tall (Fertig 2000). The orchid seems intolerant of shade. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system.

In Wyoming, this species typically blooms from late July through early September (Heidel 2007). Leaves persist during flowering (Moseley 1998). Flowers are white or ivory and are clustered into a spike at the top of the stem. No direct observations of pollination have been made in Wyoming. In their

1994 report, Sipes and Tepedino indicated that large, long-tongued bumblebees in the genus *Bombus* are the primary pollinators in Utah and Colorado (Fertig 2000). Smaller bees may also visit these flowers, but have the incorrect body shape or mass to properly accommodate the orchid's large, sticky anther/pollen clusters (Fertig 2000).

This species reproduces basically by sexual reproduction and can produce as many as 7,300 tiny seeds per fruit (Fertig 2000). The plant requires mycorrhizal fungi to germinate and establish. Individual plants may not flower in consecutive years under adverse environmental conditions but will persist below ground with their mycorrhizal symbionts (Fertig 2000).

Flowers are needed for positive plant identification. The species can be reliably located only when it is flowering (Heidel 2001). Plants probably do not flower every year and may remain dormant below ground during drought years. In general, the species' best flowering years seem to correspond with extreme heat during flowering. Preliminary review of climate data also indicates that growing seasons that start out as relatively cold and wet correspond with low flowering levels (Heidel 2001).

The orchid is well adapted to disturbances from stream movement and is tolerant of other disturbances such as grazing that are common to grassland riparian habitats (USFWS 1995). Populations are often dynamic and "move" within a watershed as disturbances create new habitat or succession eliminates old habitat (Fertig and Beauvais 1999). Ute ladies'-tresses colonize early successional riparian habitats such as point bars, sand bars, and low-lying gravelly, sandy, or cobbley edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. The orchid has been known to establish in heavily disturbed sites, such as revegetated gravel pits, heavily grazed riparian edges, and along well-traveled foot trails on old berms (USFWS 1995).

<u>Existing Environment:</u> Prior to 2005, four orchid populations had been documented within Wyoming, all discovered between 1993 and 1997 (Fertig and Beauvais 1999). Four additional sites were located in 2005 and one additional site was found in 2006 (Heidel 2007). The new locations were in the same drainages or tributaries as the original four populations. Drainages with documented orchid populations include Antelope Creek and tributaries in northern Converse County, Bear Creek in northern Laramie and southern Goshen Counties, Horse Creek in Laramie County, and Niobrara River in Niobrara County. No occurrences have been recorded in Campbell County. The nearest known population to the South Porcupine LBA Tract is located on an unnamed tributary to Antelope Creek in northern Converse County. As discussed above, the South Porcupine LBA Tract is within the Antelope Creek watershed.

Areas of Ute ladies'-tresses potential habitat along Porcupine Creek and Mike's Draw, a tributary of Porcupine Creek, on USFS lands within North Antelope

Rochelle Mine's current mine permit area (as stated above, the general analysis area for the South Porcupine LBA Tract lies within the mine's current permit area) were surveyed by BKS Environmental Associates (BKS) on September 1 and 6, 2005. Areas of potential suitable habitat along Holmes Creek on USFS lands within the existing North Antelope Rochelle Mine's permit area were surveyed by BKS on August 16, 2006. Areas of potential suitable habitat along Trussler Creek on USFS lands within the existing North Antelope Rochelle Mine's permit area were surveyed by BKS on August 24, 2006 and August 26, 2007. These surveys were completed during the period that Ute ladies'-tresses are known to flower in the region, and no orchids were observed during any of those surveys.

The entire general analysis area for the South Porcupine tract has also undergone one or more vegetation baseline studies conducted for amendments to the North Antelope Rochelle Mine permit. Vegetation studies were conducted in 1991, 1998, and 2001. No occurrence of the orchid was recorded in the 1991 study. In 1998 and 2001, special reconnaissance for Ute ladies'-tresses was conducted with no occurrence of the species was observed. The 2001 study covered more than 70 percent of the South Porcupine tract's general analysis area.

Dormant plants typically persist underground for one to many years and can only be reliably documented after several years of repeated surveys (Lesica and Steele 1994). Recent USFWS guidelines therefore recommend that multiple surveys of all potentially suitable habitat be conducted within the last 3 years. Because the surveys that were conducted by BKS in 2005, 2006, and 2007 covered only those areas of suitable habitat on USFS lands and therefore did not include all of the areas of suitable habitat within the entire general analysis area for the South Porcupine tract, additional surveys of potential habitat within the tract's entire general analysis area are scheduled during the known populations' flowering period (mid-August to early September) in 2009 and 2010 by BKS. Topographical and wetland delineation maps for the tract's general analysis area will be reviewed to identify all potential drainages that may contain the orchid. Suitable habitat factors included less steep stream banks, light soil texture and well drained soils, close lateral or vertical distance to perennial water source during the flowering period, lack of plant competition, lack of general soil alkalinity/salinity, and current or historical management practices that did not promote overgrazing and extensive use of riparian areas. Suitable habitat will be traversed on foot during the time of actual flowering of the known population, and involve walking entire lengths of the drainages documenting locations of potential habitat and searching for this species.

The potentially suitable habitat within the South Porcupine tract's general analysis area is found along Mike's Draw. Mike's Draw is an ephemeral stream, although surface discharge of groundwater associated with CBNG development within the tract's general analysis area, which is a relatively recent phenomenon, has resulted in more persistent streamflow and generally

wetter conditions within the stream's channel throughout the year. Subsurface lateral water flow is present along portions of the drainage, which is providing potential Ute ladies'-tresses habitat.

Within the entire general analysis area for the South Porcupine LBA Tract, there are an estimated 12.3 acres of jurisdictional wetlands and OWUS, including 7.2 acres of vegetated wetlands and 5.1 acres of pond or channel OWUS.

According to the USFWS 2005 Rangewide Status Review of Ute Ladies'-tresses (Fertig et al. 2005), the number of populations, geographic ranges, acreages, and estimated population sizes of this species has increased significantly since it was listed in 1992. Much of this can be attributed to increased survey and project clearance work over much of the western United States and heightened awareness of the plant due to its protected status. When the orchid was listed as threatened in 1992, it had an estimated population size of 6,000 individuals. In 2005, additional survey work estimated the number of plants to be over 83,300. USFWS determined that a petition to remove the orchid from federal protection under the ESA provided substantial biological information, which indicated that removal may be warranted. As of December 2005, the Service is moving forward with the proposal to delist the Ute ladies'-tresses, but a final decision has not yet been made.

Effects of the Proposed Project: **Mining the federal coal included in the South Porcupine tract's general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), may affect, but is not likely to adversely affect Ute ladies'-tresses.**

There is limited potential habitat for this species on the tract along portions of Mike's Draw. If the South Porcupine tract is leased by BTU and proposed for mining, the North Antelope Rochelle Mine does not presently intend to mine through Mike's Draw and the potential habitat would not be disturbed under the Proposed Action or Alternative 2. Outside of the narrow riparian strip located along this drainage, potential habitat throughout the remainder of the LBA tract's general analysis area is rare or non-existent.

The nearest known Ute ladies'-tresses population is located on an Antelope Creek tributary approximately 20 miles west of the project area. As described above, North Antelope Rochelle Mine and the surrounding mines (Black Thunder and Antelope) have conducted multiple orchid surveys of suitable habitat over multiple years during the known time of flowering using USFWS accepted techniques. All surveys have resulted in negative findings.

Individual plants of this species do not necessarily produce annual flowering stalks or above-ground growth consistently from year to year. Single season surveys that meet the current USFWS survey guidelines may not detect this species due to its ability to persist below ground level or above ground without flowering. All areas of suitable habitat along Mike's Draw were surveyed during

the orchid's flowering season in 2005 within North Antelope Rochelle Mine's current permit area on USFS lands only. Consequently, the suitable habitat within the entire general analysis area for the South Porcupine tract has not been surveyed multiple times over the last three years, as recommended by the Service. Therefore, additional surveys of potential habitat over the tract's general analysis area are scheduled during the flowering period (mid-August to early September) in 2009 and 2010. It is unlikely that Ute ladies'-tresses populations would remain undetected during multiple surveys over multiple years, if they are present in the area. Nonetheless, if undetected populations are present on the ephemeral streams in the general analysis area, they would be lost due to surface disturbing activities.

Jurisdictional wetlands located in the South Porcupine LBA Tract that are destroyed by mining operations would be replaced in accordance with the requirements of Section 404 of the Clean Water Act, as determined by the COE. The replaced wetlands may not duplicate the exact function and landscape features of the pre-mine wetlands. COE considers the type and function of each jurisdictional wetland that will be impacted and may require restoration of additional acres if the type and function of the restored wetlands will not completely replace the type and function of the original wetland. Replacement of non-jurisdictional and functional wetlands may be required by the surface land owner and/or WDEQ/LQD. WDEQ/LQD allows, and sometimes requires, mitigation of non-jurisdictional wetlands affected by mining, depending on the values associated with the wetland features. WDEQ/LQD also requires replacement of playas with hydrologic significance.

Cumulative Effects: Alterations of stream morphology and hydrology are believed to have extirpated Ute ladies'-tresses from most of its historical range (USFWS 2002). Disturbance and reclamation of streams by surface coal mining may alter stream morphology and hydrology. The large quantities of water produced from CBNG development and water discharge on the surface may also alter stream morphology and hydrology.

G6-3.2 Endangered Species

G6-3.2.1 Black-footed ferret (*Mustela nigripes*)

The black-footed ferret, a nocturnal mammal and an obligate associate of prairie dogs (*Cynomys* spp.), was listed as endangered in March, 1967. This species is thought to have historically inhabited a nearly contiguous matrix of prairie dog colonies spanning the short-grass prairies of the eastern and southern Rockies and the Great Plains of North America (Forrest et al. 1985). Since the early 1930s, numerous factors have led to substantial declines in prairie dog colonies in that region. Reductions in some states are estimated as high as 90 percent from formerly occupied colonies (Rose 1973, Tyler 1968).

Conversion of grasslands to agricultural landscapes, eradication of prairie dogs, and diseases such as the plague and canine distemper have resulted in

severe reductions in prairie dog colonies across the west, colonies which provided food, shelter, and habitat for black-footed ferrets. This species of ferret is currently one of the most endangered mammals in North America and was thought to be extinct until a small population was discovered in Meeteetse, Wyoming in September, 1981. Since then, successful captive breeding and reintroduction programs have released black-footed ferrets back into the wild in several western and Great Plains states including Wyoming, Montana, South Dakota, Colorado, Utah, and Arizona.

Biology and Habitat Requirements: Ferrets rely on prairie dogs to provide both shelter and food (Hillman and Clark 1980). Ferrets produce one litter per year, typically giving birth to four or five kits. The decline in ferret populations has been largely attributed to the reduction in the vast prairie dog colonies that historically existed in the western United States. Despite extensive ferret surveys over the past 20 plus years throughout Wyoming, the last known wild black-footed ferret population was discovered near Meeteetse in 1981 (Miller et al. 1996). Those surveys included numerous USFWS-approved clearances for coal mining and other development in Wyoming's PRB, as well as USFS surveys for ferrets on the neighboring TBNG. Reintroduction efforts involving captive bred individuals have successfully established one black-footed ferret population in the Shirley Basin area in south-central Wyoming. Currently, this is the only known black-footed ferret population within the state, though other populations are present elsewhere in the United States and Mexico.

Existing Environment: Few ferrets have historically been recorded in locations away from prairie dog colonies. The North Antelope Rochelle Mine and South Porcupine LBA Tract's general analysis area are beyond the focus area for ferret reintroduction efforts on the TBNG and elsewhere in the general region (USFS 2002b, Grenier 2003). While the general analysis area for the South Porcupine LBA Tract and its 2-mile wildlife study area (Figure G6-3) harbor some small prairie dog colonies, black-footed ferrets have never been documented at the mine, nor the surrounding region, during surveys conducted over the last 30 plus years (1976 to present) by a variety of private, state, and federal entities. No black-footed ferret observations or scat have ever been documented in this LBA tract's wildlife study area. On February 2, 2004, the USFWS declared that surveys for black-footed ferrets were no longer required in black-tailed prairie dog colonies throughout Wyoming (USFWS 2004).

Currently, 10 black-tailed prairie dog colonies encompassing a total of approximately 476.3 non-contiguous acres are located within 2 miles of the South Porcupine tract (Figure G6-3). Of which, no colonies occur within the general analysis area itself. These 10 colonies are all located in the surrounding 2-mile survey area and range in size from approximately 1 acre to 345.3 acres. All of these colonies were occupied during 2007. The largest colony is located within the wildlife survey area for both the North and South Porcupine tracts (Figures G5-3 and G6-3), and only this colony meets the 120-acre minimum threshold for supporting a breeding female ferret and her litter

(Forrest et al. 1985) and the 80-acre minimum requirement for black-footed ferret habitat (USFWS 1989).

Effects of the Proposed Project: **Mining the federal coal included in the South Porcupine LBA Tract general analysis area, if the tract is leased under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on black-footed ferrets.**

Given the documented absence of black-footed ferrets in the region, including the South Porcupine LBA Tract, during specific surveys for this species, the lack of sizeable, contiguous prairie dog colonies within the LBA tract and surrounding areas, the block clearance issued by USFWS for black-tailed prairie dog colonies throughout the entire state, and the distance of the LBA area from future reintroduction sites, mining the general analysis area for the South Porcupine LBA Tract would not result in any direct or indirect effects on black-footed ferrets.

Mine activities include, but are not limited to, large-scale topsoil stripping, the intense presence of heavy machinery, extended human presence, loud noise and various linear disturbances such as roads, power lines and fences. Additionally, ongoing disturbance (grazing, oil and gas production, etc.) from sources unrelated to mining would likely continue, with some activities occurring within prairie dog colonies in the area. These activities would result in less habitat disturbance than surface mining, but physical disturbance would occur.

Based on more than 30 years of historic and recent survey efforts and other general analysis area data and information, it is unlikely that ferrets exist in the South Porcupine tract general analysis area or surrounding wildlife survey area.

Cumulative Effects: Mineral development within black-tailed prairie dog colonies is a leading cause of potential ferret habitat loss in the PRB. Surface coal mining tends to have more intense impacts on fairly localized areas, while oil and gas development tends to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. In reclaimed areas, vegetation cover may differ from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved plant species are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats, particularly in the short-term, when species composition, shrub cover, and other environmental factors are likely to be different. Shifts in habitat composition or distribution following reclamation could increase or decrease potential habitat for prairie dogs and associated habitat for black-footed ferrets. However, black-tailed prairie dogs have been recorded in colonies on reclaimed coal mined lands in northeastern Wyoming

in recent years, whether by natural expansion or purposeful relocations (J&S 2008, IR 2007).

Potential ferret habitat is also affected by other impacts to prairie dog populations. Plague can infect and eliminate entire prairie dog colonies. Poisoning and recreational prairie dog shooting may locally reduce prairie dog populations, but seldom completely eliminate colonies.

As indicated, coal mining and natural gas development have occurred in the general Wright analysis area for more than 30 years, with activities expected to increase in the immediate future. Leasing and mining lands in South Porcupine tract's general analysis area would not contribute to cumulative adverse effects to black-footed ferrets within either the general analysis area or the region. No black-footed ferret populations exist within northeastern Wyoming or the TBNG. The USFWS issued a block clearance for this species in black-tailed prairie dog colonies throughout Wyoming. The general analysis area and surrounding perimeter are beyond the focus area for future ferret reintroduction efforts on the TBNG and in the general region (USFS 2002b, Grenier 2003). Furthermore, the Proposed Action and Alternatives 1 and 2 would not conflict with any future objectives to manage the area for, or reintroduce black-footed ferrets into, the TBNG.

G6-3.2.2 Blowout penstemon (*Penstemon haydenii*)

Blowout penstemon, a member of the figwort family, was listed as endangered on October 1, 1987. It is known from multiple populations in western Nebraska and in the Ferris dunes area in northwestern Carbon County, Wyoming. The plant was first discovered in Wyoming in 1877 and then rediscovered in 1996 (BLM 2007). The removal of fire, leveling of dunes, reduction of grazing, and cultivation of stabilizing cover crops drastically reduced the amount of habitat available for this species. Loss of habitat, coupled with impacts from insect outbreaks, drought, inbreeding, and potential over collection, has caused problems for the plant (University of Wyoming 2008). Only 3,500-5,000 plants are currently found in Nebraska at about a dozen sites. The Wyoming population is limited to three sites in northern Carbon County that contain several thousand plants (BLM 2007). Threats to the plant may occur when sand dunes are removed or overly disturbed by vehicular traffic (University of Wyoming 2008).

Biology and Habitat Requirements: Blowout penstemon is a perennial herb with stems less than 30 centimeters (12 inches) tall. The inflorescence is 5 to 15 centimeters (2 to 6 inches) long and has six to ten compact whorls of milky-blue to pale lavender flowers. This species typically flowers from mid-June to early-July. The plant's current known range in Wyoming is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than 5 percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25 to 40 percent vegetative cover (University of Wyoming 2008).

Existing Environment: The South Porcupine LBA Tract is not within the documented historical range of the blowout penstemon. The tracts are located approximately 150 miles northwest of the known occurrences in Nebraska and approximately 150 miles northeast of the known occurrences in Wyoming. No suitable sand dunes (whether stable or active) are currently present in the South Porcupine tract's general analysis area.

Effects of the Proposed Project: **Mining the federal coal included in the South Porcupine LBA Tract, if a lease is issued under the Proposed Action or Alternative 2 (BLM's preferred alternative), would have no effect on the blowout penstemon.**

Typical suitable habitat for this species within the tract's general analysis area is non-existent. If undetected populations are present, they could be lost to surface disturbing activities. Any potential habitat that has not already been surveyed for blowout penstemon within the project area should be identified and surveyed prior to surface mining activities.

Cumulative Effects: This species is potentially vulnerable to habitat loss and degradation resulting from sand mining, water development, energy development, off road vehicle use, and associated destabilization of the plant's sand dune habitat. It could also be vulnerable to negative effects related to the spread of non-native species within its range.

G6-4.0 SUMMARY OF DETERMINATIONS

Table G6-1 summarizes the determinations for federally listed T&E species in the area of the South Porcupine LBA Tract that may result from implementing the Proposed Action or Alternative 2 (BLM's preferred alternative).

Table G6-1. Effects Evaluation of Sensitive and Federal T&E Species in the Area of the South Porcupine LBA Tract.

Status	Species Common Name	Potential Effects
Threatened	Ute ladies'-tresses	May affect[1]
Endangered	Black-footed ferret	No effect
Endangered	Blowout penstemon	No effect

[1] Not likely to adversely affect individuals or populations.

SECTION G7

REGULATORY REQUIREMENTS AND MITIGATION, CUMULATIVE IMPACTS, CREDENTIALS OF SURVEY PERSONNEL, AND CITED REFERENCES

G7-1.0 REGULATORY REQUIREMENTS AND MITIGATION

The issuance of a Federal coal lease grants the lessee the exclusive rights to mine the coal, subject to the terms and conditions of the lease. Lease ownership is necessary for mining federal coal, but lease ownership does not authorize mining operations. Surface coal mining operations are regulated in accordance with the requirements of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and Wyoming State regulations. SMCRA gives the Office of Surface Mining Reclamation and Enforcement (OSM) primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations.

Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved, a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the State of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state. In order to get approval of this cooperative agreement, the state had to demonstrate that the state laws and regulations are no less stringent than, meet the minimum requirements of, and include all applicable provisions of SMCRA.

If the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, or South Porcupine LBA Tracts are leased, they would each be a maintenance lease for the existing applicant mines, which currently have both approved Mineral Leasing Act of 1920 (MLA) mining plans and approved state mining and reclamation permits. In the case of maintenance leases, such as the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts, the existing MLA mining plans and state mining and reclamation plans must be amended to include any newly leased area before that area can be mined.

In order to amend the existing MLA mining plans and state mining and reclamation permits, the mining companies would be required to submit detailed permit application packages to WDEQ before starting surface coal mining operations on any newly acquired lease(s). WDEQ/LQD would review the respective permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. If the permit application package does comply, WDEQ would issue the applicant an amended permit that would allow the permittee to extend coal mining operations onto the newly acquired lease(s).

Protection of fish, wildlife, and related environmental values is required under SMCRA regulations at 30 CFR 816.97, which state:

> "No surface mining activity shall be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary of which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973, as amended."

In addition to requiring the operator to minimize disturbances and adverse impacts on fish, wildlife, and related environmental values, the regulations at 30 CFR 816.97 disallow any surface mining activity which is likely to jeopardize the continued existence of endangered or threatened species and require that the operator use the best technology currently available to: 1) minimize electrocution hazards to raptors; 2) locate and operate haul and access roads to avoid or minimize impacts on important fish and wildlife species; and 3) design fences, conveyors, and other potential barriers to permit passage of large mammals.

USFWS Section 7 consultation would be required prior to approval of the mining and reclamation plan modification. Additional measures to ensure compliance with the ESA and SMCRA can be developed when the detailed mining plan, which identifies the actual location of the disturbance areas, how and when they would be disturbed, and how they would be reclaimed, is developed and reviewed for approval. At the leasing stage, a detailed mining and reclamation plan is not available for evaluation or development of appropriate mitigation measures specific to an actual proposal to mine.

The following is a partial list of measures related to federally-protected species that are required as part of the mining and reclamation permits:

- avoiding bald eagle disturbance per the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act;
- restoring bald eagle foraging areas disturbed by mining;
- using raptor safe power lines; and
- surveying for Ute ladies'-tresses if habitat is present.

G7-2.0 CUMULATIVE IMPACTS

Existing habitat-disturbing activities in the PRB include surface coal mining; conventional oil and gas and CBNG development; uranium mining; sand, gravel and scoria mining; agricultural (farming and ranching) activities; road, railroad, and power plant construction and operation; recreational activities; and rural and urban housing development. Mining, construction, farming activities, and urban development tend to have more intense impacts on fairly localized areas, while ranching (livestock grazing) activities, recreational activities, and oil and gas development can be less intensive locally but tend to spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. The net area of energy disturbance in the Wyoming PRB has been increasing. In the short term, this means a reduction in the available habitat for T&E plant

and wildlife species. In the long term, habitat is being and will continue to be restored as reclamation proceeds.

BLM has recently completed a regional technical study of current and proposed or potential development activity in the PRB to help the agency evaluate the impacts of coal development in the PRB. The Powder River Basin Coal Review consists of three tasks: Task 1 updates the BLM's 1996 status check for coal development in the PRB, Task 2 develops a forecast of reasonably foreseeable development in the PRB through the year 2020, and Task 3 predicts cumulative impacts that would be expected to occur as a result of the projected development. The environmental conditions as of 2003 are described in the PRB Coal Review as current or existing. The information about existing development in the following paragraphs is taken from the PRB Coal Review Task 2 report (BLM 2005) and BLM lease records. The project area for the PRB Coal Review encompassed over eight million acres and included all of Campbell, Sheridan, and Johnson counties and the northern portion of Converse County in northeastern Wyoming. The completed PRB Coal Review reports can be accessed at the BLM Wyoming website at http://www.wy.blm.gov/minerals/coal/prb/prbdocs.htm.

Oil and gas exploration and production have been ongoing in the PRB for more than 100 years. Conventional (non CBNG) oil and gas fields are, for the most part, concentrated in the central and southern parts of the structural basin. Development of the CBNG resources from the coal beds is a more recent occurrence, with CBNG production in the Wyoming PRB starting in the late 1980s. As of 2003, an estimated 187,761 acres had been disturbed in the coal review project area as a result of oil and gas development activities, but approximately 115,045 acres of that disturbance has been reclaimed. This includes conventional oil and gas and CBNG wells and associated facilities and major transportation pipelines.

BLM estimates that the existing federal coal leases in the Wyoming PRB include approximately 121,631 acres. The currently pending federal coal LBA tracts (including the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts) include approximately 35,245.48 additional acres. The majority of the coal in the areas permitted for surface coal mining is federal, but some state and private leases are included within some of the existing mine permit areas. All of the current and proposed federal coal leases are concentrated near the outcrop of the Wyodak coal bed, which is located in eastern Campbell County and the extreme northeastern edge of Converse County.

As of 2003, the baseline year for the PRB Coal Review, the surface coal mining operations along the Wyodak outcrop had disturbed approximately 68,794 acres. Approximately 24,097 of those acres of disturbance are occupied by "permanent" mine facilities, such as roads, buildings, coal handling facilities, etc., which are not available for reclamation until after coal mining operations

end. Of the remaining 44,697 acres of disturbance available for reclamation, approximately 21,238 acres had been reclaimed.

The PRB Coal Review identified an estimated 4,891 additional acres of coal-related development disturbance (i.e., coal-fired power plants, railroads, and coal technology projects) as of 2003.

The estimated total development-related disturbance in the Wyoming PRB in 2003 was 264,704 acres. In addition to the coal and oil and gas development discussed above, this total includes other types of development disturbance, such as reservoirs and industrial fabrication firms, as well as public and private infrastructure, such as highways and roads, government buildings, and residential and commercial real estate development. It should be noted that some of these disturbances overlap one another. In such cases, the disturbance acreage is counted separately under each category, but is not counted twice in determining the total area of disturbance.

Cumulative effects would also occur to T&E plant and wildlife resources as a result of indirect impacts. One factor is the potential import and spread of noxious weeds around roads and facilities. Noxious weeds have the ability to displace native vegetation and hinder reclamation efforts. Control of noxious weeds is addressed in surface coal mining and reclamation plans. If weed mitigation and preventative procedures are applied to all construction and reclamation practices, the impact of noxious weeds on T&E plants and wildlife would be minimized.

In reclaimed areas, vegetation cover often differs from undisturbed areas. In the case of surface coal mines, re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the species in the approved reclamation seed mixtures are native to the area; however, reclaimed areas may not serve ecosystem functions presently served by undisturbed vegetation communities and habitats. In the short-term in particular, species composition, shrub cover, and other environmental factors are likely to differ from pre-disturbance vegetation communities and habitats. Establishment of noxious weeds and alteration of vegetation in reclaimed areas has the potential to alter T&E plant and wildlife habitat composition and distribution.

Potential adverse effects to federally protected species that have occurred and would continue to occur as a result of existing and potential future activities in the PRB would include direct loss of habitat, indirect loss of habitat due to human and equipment disturbance, habitat fragmentation, displacement of bald eagle prey species, and the resultant change in bald eagle foraging, and mortality caused by equipment activities, motor vehicle collisions, power line collisions, and power line electrocution.

The existing mines have developed mitigation procedures, as required by SMCRA (at 30 CFR 816.97) and Wyoming State regulations, to protect T&E

species. These procedural requirements would be extended to include mining operations on the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts, if they are leased as proposed, and after required detailed plans to mine the coal and reclaim the mined-out areas are developed and approved. Species specific cumulative impacts are discussed above by LBA tract.

G7-3.0 CREDENTIALS OF SURVEY PERSONNEL

G7-3.1 North, South and West Hilight Field LBA Tracts

G7-3.1.1 T&E Animal Species

Consulting Firm: Thunderbird/Jones & Stokes of Gillette, Wyoming

Gwyn McKee: Ms. McKee obtained a Master of Science degree in Wildlife Ecology/Management from the University of Missouri-Columbia. She has accumulated nearly 20 years of professional experience, with the last 14 spent working with the energy industry in Wyoming, Montana, and South Dakota. Ms. McKee has conducted the wildlife surveys and impact analyses for most of the surface coal mines in the PRB during her tenure in Wyoming, including two of the three applicant mines included this EIS. She has also provided and/or reviewed the pertinent text related to impact assessments for vertebrate species of concern for most of the coal EISs that have been prepared in the PRB since 2000.

Jennifer Ottinger: Ms. Ottinger received a B.S. in Zoology from Colorado State University in 1993, with a minor in Microbiology. She has 12 years of professional experience with a variety of vertebrate species, including surveys for sage-grouse and mountain plovers, though her work has focused on raptors during that period. Ms. Ottinger has worked throughout the U.S. and abroad. She joined Jones & Stokes as a Wildlife Biologist in 2004. She has strong raptor identification and handling skills, research experience, proven abilities in data analysis and technical writing, and has presented and/or published several articles in a variety of professional meetings and publications, respectively.

G7-3.1.2 T&E Vegetation Species

Consulting Firm: Habitat Management Inc. of Gillette, Wyoming

Richard Bonine Jr.: Mr. Bonine has a Bachelor of Science degree in Agronomy from Kansas State University with significant study concentration in range, plant, and soil science. Mr. Bonine has 20 years of experience conducting vegetation and T&E surveys in Wyoming, New Mexico, Montana, Kansas, and Missouri. These surveys include baseline characterizations, T&E surveys, wetland delineations, and soil mapping delineations. Mr. Bonine has taken significant action to gain familiarly with Ute ladies'-tresses. These actions

include consulting several taxonomic texts to gain an understanding of the distinguishing botanical characteristics and habitats of this species; visiting a know population of Ute ladies'-tresses located on Clear creek near Golden, Colorado where he evaluated the site for understory and canopy vegetation, associated soil series, and hydrology; discussed with several Wyoming wildlife biologists the known Ute ladies'-tresses habitat on Antelope Creek.

G7-3.2 West Jacobs Ranch LBA Tract

G7-3.2.1 T&E Animal Species

Consulting Firm: Intermountain Resources of Laramie, Wyoming

Jim Orpet: Mr. Orpet obtained a M.S degree in Range Management and a B.S. degree in Wildlife Management, both from the University of Wyoming. He has over 30 years experience in vegetation and wildlife surveys in Wyoming and adjacent states, primarily with baseline field inventories for mining and other energy development projects including T&E, candidate and sensitive species surveys for both plants and animals. Mr. Orpet has been involved in T&E surveys and research since 1976. Experience includes research and monitoring of bald eagle nests and roosts, grizzly bear research, black-footed ferret surveys and survey certification and Ute Ladies'-tresses surveys. Mr. Orpet and his staff discovered one of the nine currently known occurrences of the Ute ladies'-tresses in Wyoming.

Russell Tait: Mr. Tait earned a B.S degree in Wildlife Management with a minor in Range Management from the University of Wyoming. He has over 14 years experience in vegetation and wildlife surveys in Wyoming, Colorado and South Dakota. These surveys were primarily baseline field inventories and final bond release studies for energy and non-energy development projects including T&E, candidate and sensitive species surveys for both plants and animals. Mr. Tait's T&E survey experience includes bald eagle roost monitoring, bald eagle nest searches, Ute ladies'-tresses surveys and black-footed ferret surveys. Mr. Tait was part of a survey crew that discovered one of the nine known occurrences of the Ute ladies'-tresses in Wyoming, finding many of the individual plants himself.

G7-3.2.2 T&E Vegetation Species

See Intermountain Resources personnel above.

G7-3.3 North and South Porcupine LBA Tracts

G7-3.3.1 T&E Animal Species

See Thunderbird/Jones & Stokes personnel above.

G7-3.3.2 T&E Vegetation Species

Consulting Firm: BKS Environmental Associates, Inc of Gillette, Wyoming

Dr. Brenda K. Schladweiler: Dr. Brenda K. Schladweiler obtained her Ph.D. in Soil Science from the University of Wyoming in 2003, her M.S. in Soil Science from the University of Wyoming in 1995, and her B.S. in Range Management (Land Rehabilitation) from Colorado State University in 1980.

Dr. Schladweiler has extensive experience over the last 26 years in conducting rare plant surveys. The following is a list of recent threatened and endangered plant studies she has conducted:

Location	**Date**	**Plants Surveyed**
Wharf Mine, Lawrence Co., SD	1992	Various, State of SD Heritage Plants
Ferris Haggerty Mine, Carbon Co., WY	1998	Various, State of WY
Crow AML, Big Horn Co., MT	1999	Various, State of MT
Caballo Mine, Campbell Co., WY	1999	*Spiranthes diluvialis*
Wright Clinic AML, Campbell Co., WY	1999	*Spiranthes diluvialis*
Kane Environmental, Campbell Co., WY	1999	*Spiranthes diluvialis*
Atlantic City Mine, Knight Piesold, Fremont Co., WY	2000	*Spiranthes diluvialis*
Eagle Butte Mine, Campbell Co., WY		*Spiranthes diluvialis*
West Antelope Mine, Converse Co., WY	2001	*Spiranthes diluvialis*
BRS, Bighorn Basin Water Project, Washakie Co., WY	2001	Various, State of Wyoming Plant
URS, Transmission Line, Campbell Co., WY	2001	*Spiranthes diluvialis*
Wright, (bike path) Campbell Co., WY	2001	*Spiranthes diluvialis*
Gillette, PCA sewer line, Campbell Co., WY	2002-2004	*Spiranthes diluvialis*
Gillette, PCA trunk line, Campbell Co., WY	2002-2004	*Spiranthes diluvialis*
Pinehaven (Wester-Wetstein), Crook Co., WY	2003	*Spiranthes diluvialis*
Spotted Horse, (CBMA CH4), Campbell Co., WY	2003	*Spiranthes diluvialis*
Bowers Oil (Antelope Creek)Campbell/ Converse Co., WY	2003	*Spiranthes diluvialis*
Gillette, PCA Swanson Rd., Campbell Co., WY	2003	*Spiranthes diluvialis*
North Rochelle Mine USFS Survey, Campbell Co., WY	2004	Various USFS Sensitive Species for TBNG
Westport Oil & Gas, Nicholson POD, Campbell Co., WY	2004	*Spiranthes diluvialis*
Devon Energy, Mustang POD, Campbell Co., WY	2004	*Spiranthes diluvialis*
NARM, Beckwith Rd., Campbell Co., WY	2004	*Spiranthes diluvialis*
Yates Petroleum, Campbell Co., WY	2004	*Spiranthes diluvialis*; various USFS Sensitive Species for TBNG

PRCC, Ridgeroad USFS, Campbell Co., WY	2004	*Spiranthes diluvialis*
Lance, Black Thunder POD, Campbell Co., WY	2004	*Spiranthes diluvialis*
Devon Energy, Mulie POD, Campbell Co., WY	2004	*Spiranthes diluvialis*
Devon Energy Whitetail POD, Campbell Co., WY	2004	*Spiranthes diluvialis*
Devon Energy, Bighorn POD, Campbell Co., WY	2004	*Spiranthes diluvialis*

Numerous actions have been taken by Dr. Schladweiler to become acquainted with the known locations and the appearance of *Spiranthes diluvialis*. Research has been conducted through the Wyoming Natural Diversity Database and the Internet for sensitive plants. In addition, she has actually visited the population on the unnamed tributary to Antelope Creek numerous times over the last 10 years. This known population verification was completed as part of a field survey conducted for Yates Petroleum Company in the Rochelle Hills POD, Campbell County, Wyoming on August 29, 2004. She has also visited the known population near Chugwater, Wyoming.

Dr. Schladweiler, on numerous occasions, has been in contact with Mr. Ernie Nelson, University of Wyoming, Rocky Mountain Herbarium, and George Jones, Wyoming Natural Diversity Database. In addition, she has consulted with Mr. Walt Fertig, previously from the University of Wyoming.

Katie Halvorson: Katie Halvorson holds a B.S. in Environmental Studies with a minor in Biology from Bemidji State University, Bemidji, Minnesota (2005). Ms. Halvorson has been employed by BKS Environmental since the spring of 2005. She has been conducting mineland reclamation monitoring for various coal mines in Campbell and Converse counties, Wyoming since her employment. She has also performed vegetation sampling for numerous CBNG projects and baseline vegetation surveys in the PRB. In addition, she has conducted rare plant species surveys, wetland delineations, and environmental compliance assessments. Threatened, endangered, proposed and sensitive plant survey experience includes:

- Visited a tributary of Antelope Creek and observed a *Spiranthes diluvialis* (Ute ladies'-tresses orchid) population, 2005.
- Powder River Coal LLC – North Antelope Rochelle Mine Umbrella Botany Evaluation, in Campbell County, Wyoming, 2005.
- Powder River Coal LLC – Gold Mine Draw AVF Exchange – Ute ladies'-tresses orchid survey, in Campbell County, Wyoming, 2005.
- West Roundup Resources, Inc. – School Creek Mine – Ute ladies'-tresses orchid survey in Campbell County, Wyoming, 2005 and 2006.
- Devon Energy Corporation – Juniper Draw Unit – Ute ladies'-tresses orchid survey in Johnson County, Wyoming, 2005.
- Devon Energy Corporation – Crossroads Unit – Ute ladies'-tresses orchid survey in Johnson County, Wyoming, 2005.
- Marathon Oil Company – Knudson 9 Unit – Ute ladies'-tresses orchid survey in Campbell County, Wyoming, 2006.

- Marathon Oil Company – Twenty Mile Butte Unit – Ute ladies'-tresses orchid survey in Campbell County, Wyoming, 2006.
- Marathon Oil Company – West Innes 27 Unit – Ute ladies'-tresses orchid survey in Campbell County, Wyoming, 2006.
- Rio Tinto Energy America – Antelope Mine – Ute ladies'-tresses orchid habitat survey in Converse County, Wyoming, 2007.

Cindy Robinson: Cindy Robinson holds a Masters of Business Administration (MBA) and a B.S. in Environmental Science from the University of Denver, Denver, Colorado (2005). Ms. Robinson has been employed by BKS Environmental since April of 2006. She has been conducting mineland reclamation monitoring for various coal mines in Campbell County, Wyoming during the last year. In addition, she has conducted rare plant species surveys, wetland delineations, and environmental compliance assessments. Ms. Robinson has also visited an *Astragalus barrii* site, on USFS lands at the proposed School Creek Mine area when the species was blooming. Threatened and endangered and sensitive plant survey experience includes:

- West Roundup Resources, Inc., – School Creek Mine – Barr's Milkvetch survey in Campbell County, Wyoming, 2006.
- West Roundup Resources, Inc., – School Creek Mine – Ute ladies'-tresses orchid survey in Campbell County, Wyoming, 2006.
- Thunder Basin Coal Company, Black Thunder Mine – West Hilight – Barr's milkvetch survey, August 2006.
- Wellstar Corporation (Jones and Stokes), Ute ladies'-tresses orchid survey, 2007.

Jamie Eberly: Jamie Eberly holds a B.S. in Range Management, Rangeland Livestock Option with a Business Administrations minor from Chadron State College, Chadron, Nebraska (2005). Ms. Eberly has been employed by BKS Environmental since the fall of 2006. She has been conducting mineland reclamation monitoring for various coal mines in Campbell and Converse counties, Wyoming since her employment. She has also performed vegetation sampling for numerous CBNG projects and baseline vegetation surveys in the PRB. In addition, she has conducted rare plant species surveys, wetland delineations, and environmental compliance assessments. Threatened, endangered, proposed and sensitive plant survey experience includes:

- Williams Production Company, West Cripple Creek POD, Biological Evaluation/Biological Assessment in Campbell County, Wyoming, 2007.

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APPENDIX H

BLM SENSITIVE SPECIES
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USFS REGION 2 SENSITIVE SPECIES AND
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H-1.0 PROJECT AREA DESCRIPTIONS

H-1.1 North Hilight Field, South Hilight Field, and West Hilight Field LBA Tracts

Under the Proposed Actions, Bureau of Land Management (BLM[1]) would hold a separate competitive lease sale and issue a separate lease for the federal coal lands included in the North Hilight Field, South Hilight Field, and West Hilight Field LBA Tracts as applied for by the applicant for the tracts, Ark Land Company (ALC), or under other Alternatives (see Figures 2-1, 2-2, and 2-3, respectively, and land descriptions in Sections 2.1, 2.2, and 2.3, respectively, of this EIS). In each case, it is assumed that the applicant for the tracts, ALC, would be the successful bidder on each tract, and that the tract would be mined as a maintenance lease for the existing Black Thunder Mine.

The surface estate on the North Hilight Field LBA Tract as applied for is composed of privately owned lands. Under Alternative 2, additional lands, including federal lands managed by U.S. Department of Agriculture-Forest Service (USFS), were added by BLM to be analyzed for possible inclusion in that tract. The surface estate on the South Hilight Field LBA Tract as applied for is composed of privately owned and federally owned lands managed by USFS. Under Alternative 2, additional lands, including federal lands managed by USFS, were added by BLM to be analyzed for possible inclusion in that tract. The surface estate on the West Hilight Field LBA Tract as applied for is composed of privately owned and federally owned lands managed by USFS. Under Alternatives 2 and 3, additional lands, including federal lands managed by USFS, were added by BLM to be analyzed for possible inclusion in that tract. Additional information on surface ownership and current land uses can be found in Section 3.11 of this EIS. All of these federally owned lands administered by the USFS are within the Thunder Basin National Grasslands (TBNG).

H-1.2 West Jacobs Ranch LBA Tract

Under the Proposed Action, BLM would hold a competitive lease sale and issue a lease for the federal coal lands included in the West Jacobs Ranch LBA Tract as applied for or under another Alternative (see Figure 2-4 and land descriptions in Section 2.4 of this EIS). It is assumed that the applicant for the tract, Jacobs Ranch Coal Company (JRCC), would be the successful bidder, and that the tract would be mined as a maintenance lease for the existing Jacobs Ranch Mine.

The surface estate on the West Jacobs Ranch LBA Tract as applied for is composed entirely of privately owned lands. Under Alternative 2, additional lands, all privately owned, were added by BLM to be analyzed for possible

[1] Refer to page xxvi of this EIS for a list of abbreviations and acronyms used in this appendix.

inclusion in that tract. Additional information on surface ownership and current land uses can be found in Section 3.11 of this EIS.

H-1.3 North and South Porcupine LBA Tracts

Under the Proposed Actions, BLM would hold a separate competitive lease sale and issue a separate lease for the federal coal lands included in the North Porcupine and South Porcupine LBA Tracts as applied for by the applicant for the tracts, BTU Western Resources, Inc. (BTU), or under other Alternatives (see Figures 2-5 and 2-6, respectively, and land descriptions in Sections 2.5 and 2.6, respectively, of this EIS). In each case, it is assumed that the applicant for the tracts, BTU, would be the successful bidder on each tract, and that the tract would be mined as a maintenance lease for the existing North Antelope Rochelle Mine.

The surface estate on the North Porcupine LBA Tract as applied for is composed of privately owned and federally owned lands managed by USFS. Under Alternative 2, additional lands, including federal lands managed by USFS, were added by BLM to be analyzed for possible inclusion in that tract. The surface estate on the South Porcupine LBA Tract as applied for is composed of privately owned and federally owned lands managed by USFS. Under Alternative 2, additional lands, including federal lands managed by USFS, were added by BLM to be analyzed for possible inclusion in that tract. Additional information on surface ownership and current land uses can be found in Section 3.11 of this EIS. All of these federally owned lands administered by the USFS are within the TBNG.

H-1.4 Description of General Analysis Areas

The BLM study area for each of these six LBA tracts is defined as the original tract as applied for, plus all lands that BLM is considering adding to the tract. The general analysis area for each of these six LBA tracts is defined as the BLM study area plus surrounding lands within a ¼-mile perimeter that could be disturbed by mining the coal within the BLM study area where future mining disturbance could occur. The general analysis area for the North Hilight Field LBA Tract does not include lands within Black Thunder Mine's current permit area. The general analysis area for the South Hilight Field LBA Tract includes some lands within Black Thunder Mine's current permit area. The general analysis area for the West Hilight Field LBA Tract does not include lands within Black Thunder Mine's current permit area. The general analysis area for the West Jacobs Ranch LBA Tract does not include lands within Jacobs Ranch Mine's current permit area. The general analysis area for the North Porcupine LBA Tract is almost entirely within North Antelope Rochelle Mine's current permit area. The general analysis area for the South Porcupine LBA Tract is almost entirely within North Antelope Rochelle Mine's current permit area. For the purpose of this sensitive species evaluation, the general Wright analysis area is defined as the area encompassing all six of these LBA tracts' general analysis areas.

The minerals within the general analysis area for each of these six LBA tracts are managed by BLM, and the federally owned surface within these general analysis areas are administered by the USFS; therefore, both BLM and USFS sensitive species evaluations must be completed as part of this EIS.

H-2.0 BLM SENSITIVE SPECIES EVALUATION

H-2.1 Introduction

BLM Wyoming has prepared a list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. The authority for this policy and guidance comes from the Endangered Species Act (ESA), as amended; Title II of the Sikes Act, as amended; the Federal Land Policy Management Act of 1976 (FLPMA) (43 U.S.C. 1716); Department Manual 235.1.1A; and BLM Manual 6840.06 E. Sensitive Species.

The goals of BLM's sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the ESA.
- Prioritize needed conservation work with an emphasis on habitat.

H-2.2 Species Habitat and Occurrence

BLM sensitive species were listed for their ranges within the BLM Buffalo Field Office (24 species total). Some sensitive species could or do occur within one or more of the general analysis areas for these six LBA tracts. Specialized habitat requirements (i.e., caves, cliffs, coniferous forests, calcareous rock outcrops) make occupation for other sensitive species unlikely.

Tables H-1 through H-6 list BLM sensitive species, summarize their habitat requirements, and indicate if they have been observed on or around the general analysis areas for the LBA tracts. These tables represent the most current sensitive species lists (BLM 2002), and observations were based on field surveys and file searches completed in 2007 and 2008. Additional information on occurrences of these species on the tracts and surrounding wildlife survey areas can be found in Section 3.10 of this EIS.

H-3.0 USFS REGION 2 SENSITIVE SPECIES EVALUATION

H-3.1 Introduction

Species that have been identified by the Regional Forester as sensitive species must be considered for the Wright Area Coal Lease Applications because the general analysis areas for North Hilight Field, South Hilight Field, West Hilight

Table H-1. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the North Hilight Field LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	No[1]
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	Yes, Uncommon Breeder
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Common Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Historic Common Breeder, Recent Occasional Breeder
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Forager
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Infrequent Migrant
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No[1]
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No[1]
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No[1]
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-1. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the North Hilight Field LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	No
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited
[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Table H-2. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the South Hilight Field LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	No[1]
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No[1]
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	No
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Common Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	No
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Potential Breeder
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Infrequent Migrant
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No[1]
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No[1]
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No[1]
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-2. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the South Hilight Field LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	No[1] (one sighting in 24 years of annual monitoring)
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited
[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Table H-3. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the West Hilight Field LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	No
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	No (one nest burrow just beyond general analysis area)
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Common Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	No, Infrequent Breeder
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Potential Breeder
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Infrequent Migrant
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No[1]
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No[1]
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-3. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the West Hilight Field LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat (*Euderma maculatum*)	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	No[1]
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited
[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Table H-4. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the West Jacobs Ranch LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	Yes, Breeder
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	Yes, Breeder
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Common Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Historic Breeder
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Rare Spring Migrant, Uncommon Potential Breeder
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No, Limited Habitat, Migrant
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No[1]
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-4. BLM Sensitive Species for the Buffalo Field Office, Habitat Requirements, and Observations within the General Analysis Area for the West Jacobs Ranch LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat *(Euderma maculatum)*	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	Yes, Opportunistic Sightings (Spring and Fall, 2007)
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No[1]
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited
[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Table H-5. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations within the General Analysis Area for the North Porcupine LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	No[1]
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	Yes, Uncommon Breeder
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Common Breeder
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Infrequent Migrant
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No[1]
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No[1]
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No[1]
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-5. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations within the General Analysis Area for the North Porcupine LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat *(Euderma maculatum)*	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	No[1]
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited

[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Table H-6. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations within the General Analysis Area for the South Porcupine LBA Tract.

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Amphibians		
Northern leopard frog (*Rana pipiens*)	Beaver ponds, permanent water in plains and foothills	No[1]
Spotted frog (*Ranus pretiosa*)	Ponds, sloughs, small streams	No[1]
Birds		
Baird's sparrow (*Ammodramus bairdii*)	Grasslands, weedy fields	No[1]
Brewer's sparrow (*Spizella breweri*)	Basin-prairie shrub	Yes, Common Breeder
Burrowing owl (*Athene cunicularia*)	Grasslands, basin-prairie shrub	No
Ferruginous hawk (*Buteo regalis*)	Basin-prairie shrub, grasslands, rock outcrops	Yes, Historic Breeder
Greater sage-grouse (*Centrocercus urophasianus*)	Basin-prairie shrub, mountain-foothill shrub	No
Loggerhead shrike (*Lanius ludovicianus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Long-billed curlew (*Numenius americanus*)	Grasslands, plains, foothills, wet meadows	Yes, Infrequent Migrant
Northern goshawk (*Accipiter gentilis*)	Conifer and deciduous forests	No[1]
Peregrine falcon (*Falco peregrinus*)	Cliffs usually along waterways	No[1]
Sage sparrow (*Amphispiza billneata*)	Basin-prairie shrub, mountain-foothill shrub	No[1]
Sage thrasher (*Oreoscoptes montanus*)	Basin-prairie shrub, mountain-foothill shrub	Yes, Uncommon Breeder
Trumpeter swan (*Cygnus buccinator*)	Lakes, ponds, rivers	No[1]
White-faced ibis (*Plegadis chihi*)	Marshes, wet meadows	No[1]
Yellow-billed cuckoo (*Coccyzus americanus*)	Open woodlands, streamside willow and alder groves	No[1]

Table H-6. BLM Sensitive Species for the Buffalo Field Office and Habitat Requirements and Observations within the General Analysis Area for the South Porcupine LBA Tract (Continued).

Common Name (*scientific name*)	**Habitat**	**Field Observations**
Fish		
Yellowstone cutthroat trout (*Oncoryhynchus clarki*)	Cold water streams and lakes	No[1]
Mammals		
Fringed myotis (*Myotis thysanodes*)	Conifer forests, woodland chaparral, caves and mines	No[1]
Long-eared myotis (*Myotis evotis*)	Conifer and deciduous forest, caves and mines	No[1]
Spotted bat *(Euderma maculatum)*	Cliffs over perennial water, basin-prairie shrub	No[1]
Swift fox (*Vulpes velox*)	Grasslands	No
Townsend's big-eared bat (*Corynorhinus townsendii*)	Forests, basin-prairie shrub, caves and mines	No
Plants		
Porter's sagebrush (*Artemisia porteri*)	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes; 5,300-6,500 ft. elev.	No
William's wafer parsnip (*Cymopterus williamsii*)	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides; 6,000-8,300 ft. elev.	No[1]

[1] Habitat generally lacking or very limited

[2] Former listed or candidate species under the ESA automatically revert to BLM Sensitive Species upon delisting or removal from the ESA listing process.

Field, North Porcupine, and South Porcupine LBA Tracts include federal lands administered by the USFS. There is no USFS administered surface within the general analysis area for the West Jacobs Ranch LBA Tract. The purpose of this section of this Appendix is to provide information about the potential environmental effects that leasing the USFS administered lands would have on USFS Region 2 Sensitive wildlife and vegetative species (terrestrial and aquatic).

USFS classifies species as "sensitive" when they meet one or more of the following three criteria: 1) the species is declining in numbers or occurrences, and evidence indicates it could be proposed for federal listing as threatened or endangered if action is not taken to reverse or stop the downward trend; 2) the species' habitat is declining and continued loss could result in population declines that lead to federal listing as threatened or endangered if action is not taken to reverse or stop the decline; and 3) the species' population or habitat is stable but limited. In addition to these criteria, a ranking system is used to identify species for sensitive status, which is outlined in USFS Manual 2670-2671. Table H-7 lists species that have been identified as "sensitive" for USFS Region 2, TBNG (USFS 2007). This table also provides information about the status of the species on the TBNG as a whole (not exclusive to USFS lands within the general analysis areas for the North Hilight Field, South Hilight Field, West Hilight Field, North Porcupine, and South Porcupine LBA Tracts).

The USFS Douglas Ranger District has reviewed the entire list of animal and plant sensitive species for USFS Region 2 and eliminated from further review those species that occur on the TBNG but are geographically or biologically outside of any effects of the Wright Area Coal Lease Applications. Tables H-8 and H-9 list the current status of USFS Region 2 sensitive species and species of local concern on TBNG and on USFS lands in the general Wright analysis area. These tables also indicate suitability of habitat for each species specific only to the USFS lands in the general Wright analysis area. The seven plant species that are listed in Table H-9 were moved off the Region 2 sensitive species list and are now species that are of local concern (Roche 2009). The species listed in Tables H-8 and H-9 have been identified as definitely or potentially inhabiting the USFS lands within the general Wright analysis area, either seasonally or year-round, and therefore may be potentially affected by one or more of the Proposed Actions or Alternatives.

H-3.2 Species Habitat and Occurrence on USFS Lands Within the General Wright Analysis Area, and the Direct and Indirect Direct Effects on Those Species

Site-specific data on the occurrence of USFS Region 2 Sensitive Species on USFS lands within the general Wright analysis area were obtained from the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) permit applications and annual reports for the Black Thunder, Jacobs Ranch, and North Antelope Rochelle mines, the Rocky Mountain Herbarium, the Wyoming Natural Diversity Database, and the USFS.

Table H-7. USFS Region 2 Sensitive Species List and Status for the Entire Thunder Basin National Grassland (USFS 2007).

Status Code:
K = Known occurrence in vicinity. Date of last observation indicates that species still occur in area.
N = No recent observations; surveys recently completed; may be historic records; potential habitat possible.
S = Suspected occurrence. May be historic records but no recent observations. Suitable habitat likely.
U = Unknown occurrence, more surveys may be needed, may be historic records, potential habitat possible.
D = Dismissed from further analysis. The proposed project area is located outside of the species current and historic distribution.

Scientific Name	**Common Name**	**Status on TBNG**
Plants: Ferns and Allies		
Botrychium ascendens	Trianglelobe moonwort	U
Botrychium campestre	Prairie moonwort	S
Botrychium furcatum	Forkleaved moonwort	U
Botrychium lineare	Narrow-leaved moonwort	S
Botrychium paradoxum	Peculiar moonwort	U
Lycopodium complanatum	Crowfoot clubmoss	U
Selaginella selaginoides	Northern spike-moss	U
Plants: Monocots		
Amerorchis rotundifolia	Round leaved orchid	U
Calochortus flexuosus	Weakstem mariposalily	U
Carex alopecoidea	Foxtail sedge	S
Carex diandra	Lesserpanicled sedge	U
Carex livida	Livid sedge	U
Cypripedium montanum	Mountain lady's slipper	U
Cypripedium parvijlorum	Smallyellow ladyslipper	U
Eleocharis elliptica	Elliptic spikerush	S
Epipactis gigantea	Giant helle borine	U
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	U
Eriophorum chamissonis	Chamisso cottonsedge	U
Eriophorum gracile	Slender cottonsedge	U
Festuca hallii	Hall's Fescue	S
Kobresia simpliciuscula	Simple Kobresia	U
Liparis loeselii	Loesel's twayblade	U
Malaxis brachypoda	Adder's-mouth	U
Platanthera orbiculata	Large roundleafed orchid	U
Ptilagrostis porteri	Colorado Falseneedlegrass	U
Schoenoplectus hallii	Hall's bulrush	U
Triteleia grandiflora	Largeflower triteleia	S

Table H-7. USFS Region 2 Sensitive Species List and Status for the Entire Thunder Basin National Grassland (Continued).

Scientific Name	**Common Name**	**Status on TBNG**
Plants: Dicots		
Aquilegia chrysantha var. *rydbergii*	Golden Columbine	U
Aquilegia laramiensis	Laramie Columbine	U
Armeria maritima var. *siberica*	Sea pink	U
Asclepias uncialis	Dwarf milkweed	U
Astragalus barrii	Barr's milkvetch	K
Astragalus leptaleus	Park milkvetch	U
Astragalus missouriensis var. *humistratus*	Missouri milkvetch	U
Astragalus proximus	Aztec milkvetch	U
Astragalus ripleyi	Ripleys milkvetch	U
Astragalus wetherillii	Wetherill milkvetch	U
Braya glabella	Smooth rockcress	U
Chenopodium cycloides	Sandhill goosefoot	U
Cirsium perplexans	Rocky Mountain thistle	U
Descurainia torulosa	Wind River tansymustard	U
Draba exunguiculata	Grays Peak whitlowgrass	U
Draba grayana	Hitchcock Gray's Peak whitlowgrass	U
Draba smithii	Smiths whitlowgrass	U
Drosera anglica	English sundew	U
Drosera rotundifolia	Roundleaf sundew	U
Eriogonum brandegeei	Brandegee wildbuckwheat	U
Eriogonum exilifolium	Drop-leaf wild buckwheat	S
Eriogonum visheri	Visher's buckwheat	S
Gilia sedifolia	Purple false gily-flower	U
Ipomopsis aggregata ssp. *weberi*	Weber's scarlet gilia	U
Ipomopsis globularis	Globe gilia	U
Ipomopsis polyantha	Pagosa skyrocket	U
Lesquerella fremontii	Fremont's bladderpod	U
Lesquerella pruinosa	Pagosa Springs bladderpod	U
Machaeranthera coloradoensis	Colorado tansymustard	U
Mimulus gemmiparus	Weber's monkeyflower	U
Neoparrya lithophila	Rock-loving aletes	U
Oenothera harringtonii	Harrington's oenothera	U
Oreoxis humilis	Pikes Peak spring parsley	U
Parnassia kotzebuei	Kotzebue's grass-of-Parnassus	U
Penstemon absarokensis	Absaroka penstemon	U

Table H-7. USFS Region 2 Sensitive Species List and Status for the Entire Thunder Basin National Grassland (Continued).

Scientific Name	**Common Name**	**Status on TBNG**
Plants: Dicots (continued)		
Penstemon caryi	Cary beardtongue	U
Penstemon degeneri	Degener's penstemon	U
Penstemon harringtonii	Harrington's beardtongue	S
Phacelia scopulina var. *submutica*	Debeque scorpionweed	U
Physaria didymocarpa var. *lanata*	Woolly twinpod	S
Physaria pulvinata	Cushion bladderpod	U
Potentilla rupincola	Front Range cinquefoil	U
Primula egaliksensis	Greenland primrose	U
Pyrrocoma carthamoides var. *subsquarrosa*	Absoroka goldenweed	U
Pyrrocoma clementis var. *villosa*	Tranquil goldenweed	U
Pyrrocoma integrifolia	Many-stemmed goldenweed	U
Ranunculus karelinii	Frosty buttercup	U
Rubus arcticus ssp. *acaulis*	Arctic bramble	U
Salix arizonica	Arizona willow	U
Salix barrattiana	Barrat willow	U
Salix candida	Sage willow	U
Salix myrtillifolia	Myrtleleaf willow	U
Salix serissima	Autumn willow	U
Sanguinaria canadensis	Bloodroot	U
Shoshonea pulvinata	Shoshonia	U
Thalictrum heliophilum	Sun-loving meadowrue	U
Townsendia condensata var. *anomala*	Cushion townsenddaisy	U
Utricularia minor	Lesser bladderpod	U
Viburnum opulus var. *americanum*	Highbush-cranberry	S
Viola selkirkii	Great-spurred violet	U
Fish		
Nocomis biguttatus	Hornyhead chub	D
Couesius plumbeus	Lake chub	U
Gila pandora	Rio Grande chub	D
Gila robusta	Roundtail chub	D
Macrhybopsis gelida	Sturgeon chub	U
Phoxinus neogaeus	Finescale dace	U
Margariscus margarita	Pearl dace	U

Table H-7. USFS Region 2 Sensitive Species List and Status for the Entire Thunder Basin National Grassland (Continued).

Scientific Name	**Common Name**	**Status on TBNG**
Fish (continued)		
Phoxinus eos	Northern redbelly dace	D
Phoxinus erythrogaster	Southern redbelly dace	D
Platygobio gracilis	Flathead chub	K
Hybognathus placitus	Plains minnow	K
Catostomus discobulus	Bluehead sucker	D
Catostomus latipinnis	Flannelmouth sucker	D
Catostomus platyrynchus	Mountain sucker	D
Catostomus plebeius	Rio Grande sucker	D
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	D
Oncorhynchus clarki bouvieri	Yellowstone cutthroat trout	D
Oncorhynchus clarki virginalis	Rio Grande cutthroat trout	D
Invertebrates		
Somatochlora hudsonica	Hudsonian emerald butterfly	U
Speyeria nokomis nokomis	Great Basin silverspot butterfly	U
Hesperia ottoe	Ottoe skipper butterfly	U
Speyeria idalia	Regal fritillary	S
Reptiles and Amphibians		
Rana pipiens	Northern leopard frog	K
Storeria occipitomaculata pahasapae	Black Hills redbelly snake	S
Mammals		
Euderma maculatum	Spotted bat	K
Corynorhinus townsendii	Townsend's big-eared bat	K
Myotis thysanodes	Fringed myotis	K
Cynomys ludovicianus	Black-tailed prairie dog	K
Vulpes velox	Swift fox	K
Birds		
Cygnus buccinator	Trumpeter swan	U
Botaurus lentiginosus	American bittern	U
Coccyzus americanus	Yellow-billed cuckoo	K
Numenius americanus	Long-billed curlew	K
Buteo regalis	Ferruginous hawk	K
Accipiter gentilis	Northern goshawk	K

Table H-7. USFS Region 2 Sensitive Species List and Status for the Entire Thunder Basin National Grassland (Continued).

Scientific Name	**Common Name**	**Status on TBNG**
Birds (continued)		
Circus cyaneus	Northern harrier	K
Athene cunicularia	Burrowing owl	K
Asio flammeus	Short-eared owl	K
Calcarius ornatus	Chestnut-collared longspur	K
Calcarius mccownii	McCown's longspur	K
Centrocercus urophasianus	Greater sage-grouse	K
Haliaeetus leucocephalus	Bald eagle	K
Charadrius montanus	Mountain plover	K
Lanius ludovicianus	Loggerhead shrike	K
Spizella breweri	Brewer's sparrow	K
Ammodramus savannarum	Grasshopper sparrow	K
Amphispiza billneata	Sage sparrow	U
Chlidonias niger	Black tern	K
Melanerpes lewis	Lewis' Woodpecker	K

Table H-8. USFS Region 2 Sensitive Species Status on TBNG and on USFS Lands Within the General Wright Analysis Area, and Habitat Suitability on USFS Lands Within the General Wright Analysis Area (Provided by USFS Douglas Ranger District, July 2007).

Common Name (*Scientific Name*)	**Status on TBNG/Status on USFS Lands in General Wright Analysis Area**	**Suitability of Habitat on USFS Lands in General Wright Analysis Area**
Plants: Ferns and Allies		
Prairie moonwort (*Botrychium campestre*)	Undocumented/Undocumented	Very Poor to Unsuitable Habitat
Narrowleaf moonwort (*Botrychium lineare*)	Undocumented/Undocumented	Unsuitable Habitat
Plants: Monocots		
Foxtail sedge (*Carex alopecoidea*)	Undocumented/Undocumented	Unsuitable Habitat
Elliptic spikerush (*Eleocharis elliptica*)	Undocumented/Undocumented	Unsuitable Habitat
Hall's fescue (*Festuca hallii*)	Undocumented/Undocumented	Unsuitable Habitat
Largeflower triteleia (*Triteleia grandiflora*)	Undocumented/Undocumented	Unsuitable Habitat

Table H-8. USFS Region 2 Sensitive Species Status on TBNG and on USFS Lands Within the General Wright Analysis Area, and Habitat Suitability on USFS Lands Within the General Wright Analysis Area (Provided by USFS Douglas Ranger District, July 2007) (Continued).

Common Name (*Scientific Name*)	**Status on TBNG/Status on USFS Lands in General Wright Analysis Area**	**Suitability of Habitat on USFS Lands in General Wright Analysis Area**
Plants: Dicots		
Barr's milkvetch (*Astragalus barrii*)	Documented/Undocumented	Suitable Habitat
Woolly twinpod (*Physaria didymocarpa* var. *lanata*)	Undocumented/Undocumented	Marginal Habitat
Visher's buckwheat (*Eriogonum visheri*)	Tentatively Documented/Undocumented	Unsuitable Habitat
Highbush-cranberry (*Viburnum opulus* var. *americanum*)	Undocumented/Undocumented	Unsuitable Habitat
Amphibians		
Northern leopard frog (*Rana pipiens*)	Documented/No Observations	Poor to Unsuitable Habitat
Fish		
Flathead Chub (*Platygobio gracilis*)	Documented/Undocumented	Unsuitable Habitat
Plains minnow (*Hybognathus placitus*)	Documented/Undocumented	Unsuitable Habitat
Mammals		
Black-tailed prairie dog (*Cynomys ludovicianus*)	Documented/Documented	Limited to Unsuitable Habitat
Swift fox (*Vulpes velox*)	Documented/No Observations	Suitable to Unsuitable Habitat
Birds		
Long-billed curlew (*Numenius americanus*)	Documented/No Observations	Foraging Habitat
Ferruginous hawk (*Buteo regalis*)	Documented/Documented	Suitable Habitat
Burrowing owl (*Athene cunicularia*)	Documented/Documented	Limited Suitable Habitat

Table H-8. USFS Region 2 Sensitive Species Status on TBNG and on USFS Lands Within the General Wright Analysis Area, and Habitat Suitability on USFS Lands Within the General Wright Analysis Area (Provided by USFS Douglas Ranger District, July 2007) (Continued).

Common Name (*Scientific Name*)	**Status on TBNG/Status on USFS Lands in General Wright Analysis Area**	**Suitability of Habitat on USFS Lands in General Wright Analysis Area**
Birds (Continued)		
Chestnut-collared longspur (*Calcarius ornatus*)	Documented/Documented	Limited Suitable Habitat
McCown's longspur (*Calcarius mccownii*)	Documented/Documented	Poor to Marginal Habitat
Greater sage-grouse (*Centrocercus urophasianus*)	Documented/Documented	Suitable to Unsuitable Habitat
Bald eagle (*Haliaeetus leucocephalus*)	Documented/Documented	Suitable Rangeland Foraging Habitat
Mountain Plover (*Charadrius montanus*)	Documented/No Observations	Suitable to Unsuitable Habitat
Loggerhead shrike (*Lanius ludovicianus*)	Documented/Documented	Marginal Habitat
Brewer's sparrow (*Spizella breweri*)	Documented/Documented	Suitable to Unsuitable Habitat
Plants: Ferns and Allies		
Leathery grapefern (*Botrychium multifidum* var. *coulteri*)	Undocumented/Undocumented	Unsuitable Habitat

Baseline and annual wildlife surveys have been conducted for the three applicant mines (Black Thunder, Jacobs Ranch and North Antelope Rochelle) since the early 1980s. WDEQ/LQD guidelines and regulations specify different wildlife survey areas for different species and for different survey purposes (baseline studies or annual monitoring). Those surveys included the mine permit area and surrounding perimeter ranging from 0.5 to 2.0 miles (depending on the purpose of the surveys). The larger survey perimeters for the mines' annual monitoring programs coincidentally encompassed all USFS administered lands within the general analysis areas for the North and South Porcupine tracts and the North Hilight Field tract, all but the southwestern-most corner (roughly 15 percent) of the general analysis area for the South

Table H-9. USFS Region 2 Species of Local Concern Status on TBNG and on USFS Lands Within the General Wright Analysis Area, and Habitat Suitability on USFS Lands Within the General Wright Analysis Area (provided by Roche 2009).

Common Name (*Scientific Name*)	**Status on TBNG/Status on USFS Lands in General Wright Analysis Area**	**Suitability of Habitat on USFS Lands in General Wright Analysis Area**
Plants: Monocots		
Wood (wild) lily (*Lilium philadelphicum*)	Undocumented/Undocumented	Unsuitable Habitat
Plants: Dicots		
Smooth goosefoot (*Chenopodium subglabrum*)	Undocumented/Undocumented	Unsuitable Habitat
Flat-top (fragrant) goldentop (goldenrod) (*Euthamia graminifolia*)	Undocumented/Undocumented	Unsuitable Habitat
Rosy palafox (*Palafoxia rosea* var. *macrolepis*)	Documented/Undocumented	Suitable Habitat
Lemonscent (crown-seed fetid-marigold) (*Pectis angustifolia*)	Documented/Undocumented	Suitable Habitat
Larchleaf beardtongue (*Penstemon laricifolius* ssp. *exifolius*)	Undocumented/Undocumented	Marginal Habitat

Hilight Field tract, and all but the southwestern quarter (roughly 25 percent) of the general analysis area for West Hilight Field tract.

Regular surveys conducted in and near USFS lands over the years included raptors, mountain plovers (*Charadrius montanus*), upland game birds, migratory bird species of management concern, lagomorphs (rabbits), and big game. Supplemental specific surveys for bald eagles, herptiles, waterfowl, fish, and other species were conducted periodically during baseline studies for the applicant mines and adjacent mines (i.e., Antelope Mine). Efforts included a variety of approved survey methods, such as fixed-wing aerial, remote observation via spotting scopes and binoculars, pedestrian, nocturnal spotlighting, belt transects, point counts, and trapping. All incidental sightings of those species were also recorded during each site visit, including notes on species, number of individuals, sex/age (when possible), habitat, and location. Specific details regarding survey methods and results from annual monitoring and baseline inventories for the Black Thunder, Jacobs Ranch and North Antelope Rochelle mines, dating back to the early 1980s, are provided in

reports on file with the WDEQ-LQD and/or USFS, and thus are not provided in this document.

USFS typically assesses impacts to resources on its managed lands and, when applicable, adjacent lands that could also be impacted by the Proposed Action. For wildlife, the USFS is interested in knowing what resources and potential impacts occur within a 1- or 2-mile perimeter surrounding their lands, depending on the species. As discussed in Section 3.10 of this EIS, the wildlife survey areas for this analysis includes the LBA tracts' general analysis areas plus a surrounding perimeter that varies in extent depending on the species. Thunder Basin Coal Company conducted baseline investigations during 2006 and early 2007 specifically for the West Hilight Field LBA Tract with additional surveys targeting the North and South Hilight Field LBA Tracts in 2007 and 2008; Jacobs Ranch Coal Company conducted baseline investigations in 2007 and 2008 expressly for the West Jacobs Ranch LBA Tract; and Powder River Coal, Inc. conducted baseline investigations during 2007 and early 2008 specifically for the North and South Porcupine LBA Tracts. These surveys covered the respective general analysis areas, and surveys for selected wildlife information such as raptor nest, Greater sage-grouse lek, and prairie dog colony locations covered the respective wildlife survey areas (2-mile perimeter surrounding the general analysis areas). Figures H-1 through H-5 depict the wildlife survey area and the USFS lands within the general analysis area for the North Hilight Field, South Hilight Field, West Hilight Field, North Porcupine, and South Porcupine LBA Tracts, respectively.

The entire list of Region 2 Sensitive Species was reviewed and every vertebrate species was considered for full evaluation. However, only those species that might potentially be affected directly or indirectly by implementation of the Proposed Actions or Alternatives on USFS lands were selected for evaluation (Table H-8). For example, if a vertebrate species was known to occur on or near USFS lands, or suitable but unoccupied habitat was present in that area and would be disturbed, then potential effects were evaluated. If suitable habitat was not present in the area, no further analysis was conducted.

Thirteen vertebrate species were identified that could potentially be affected by implementation of the Proposed Actions or Alternatives (Table H-8). Many other sensitive vertebrates and one invertebrate that had been documented elsewhere on the TBNG were not evaluated further because of a lack of suitable habitat on or near USFS lands, or because no such habitat would be physically disturbed or otherwise affected by implementation of the Proposed Actions or Alternatives.

Vegetation baseline inventories have been completed on each mine's current permit area in accordance with the current WDEQ/LQD mine permitting requirements. As a result, all or portions of the LBA tracts' general analysis areas were covered during various vegetation baseline inventories, as well as for prior EIS analyses. Vegetation assessments were completed for the balance of the tracts' general analysis areas in 2007 and 2008. There is no suitable

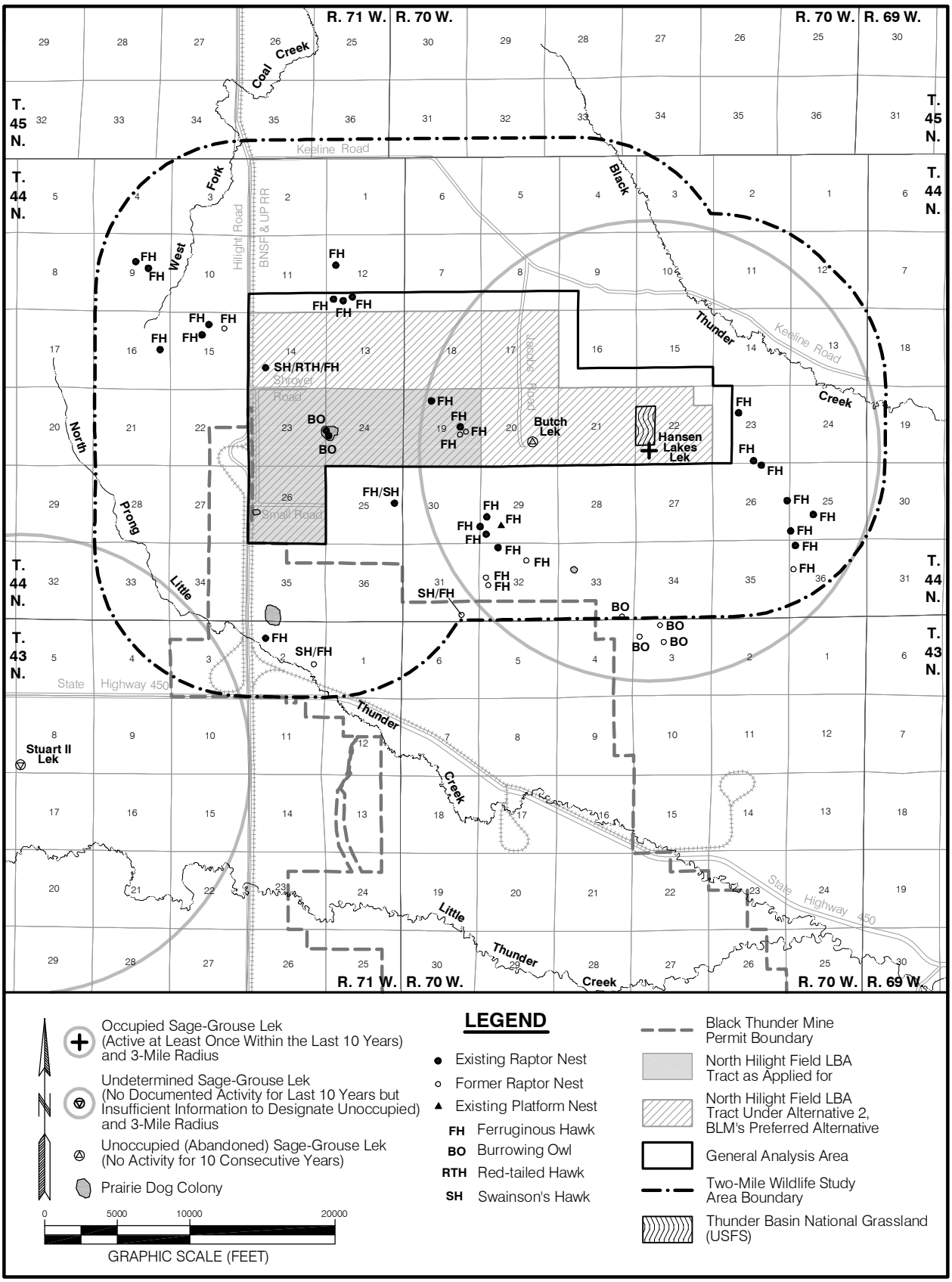

Figure H-1. USFS Region 2 Sensitive Wildlife Species Survey Area for the North Hilight Field LBA Tract.

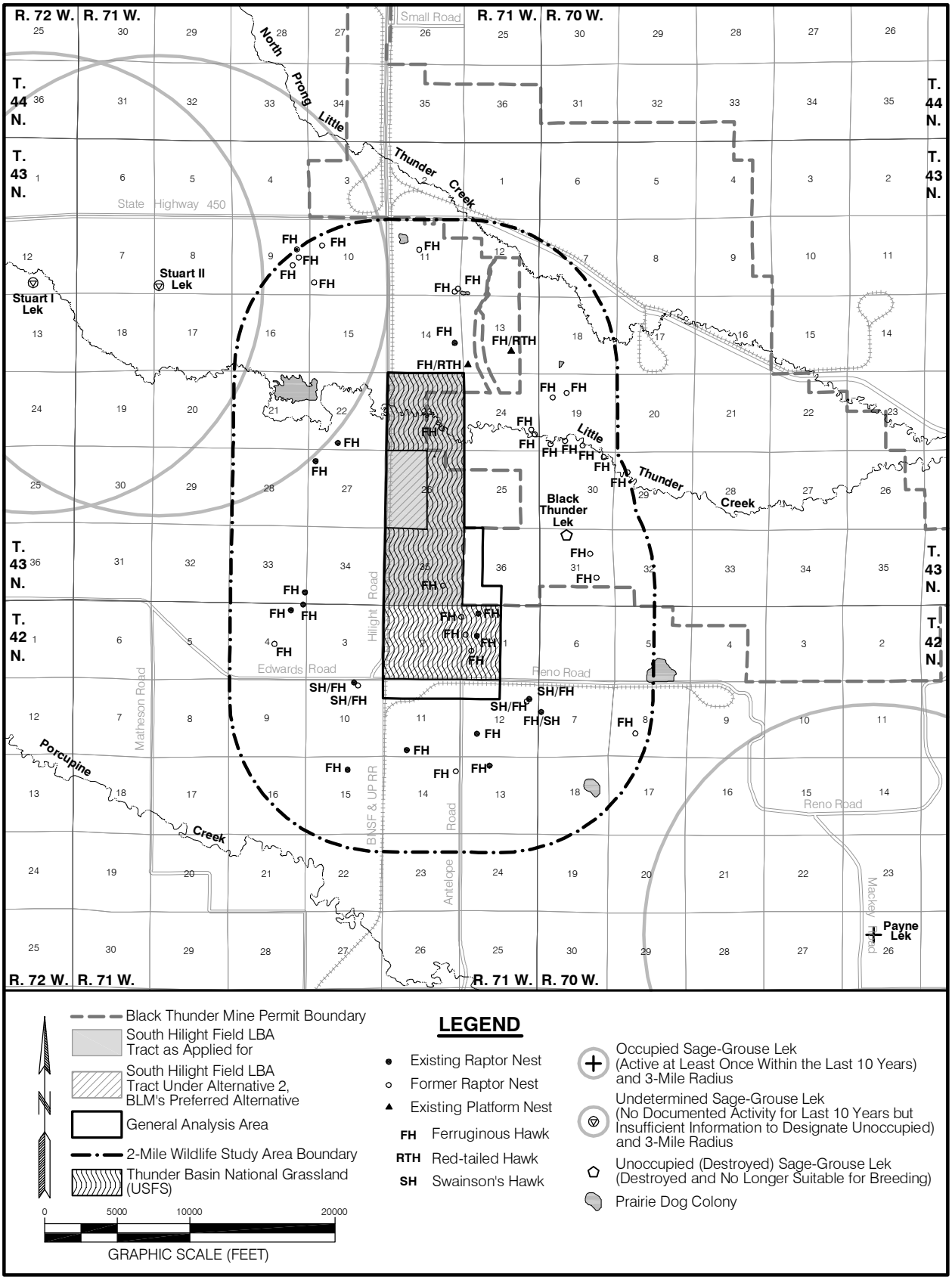

Figure H-2. USFS Region 2 Sensitive Wildlife Species Survey Area for the South Hilight Field LBA Tract.

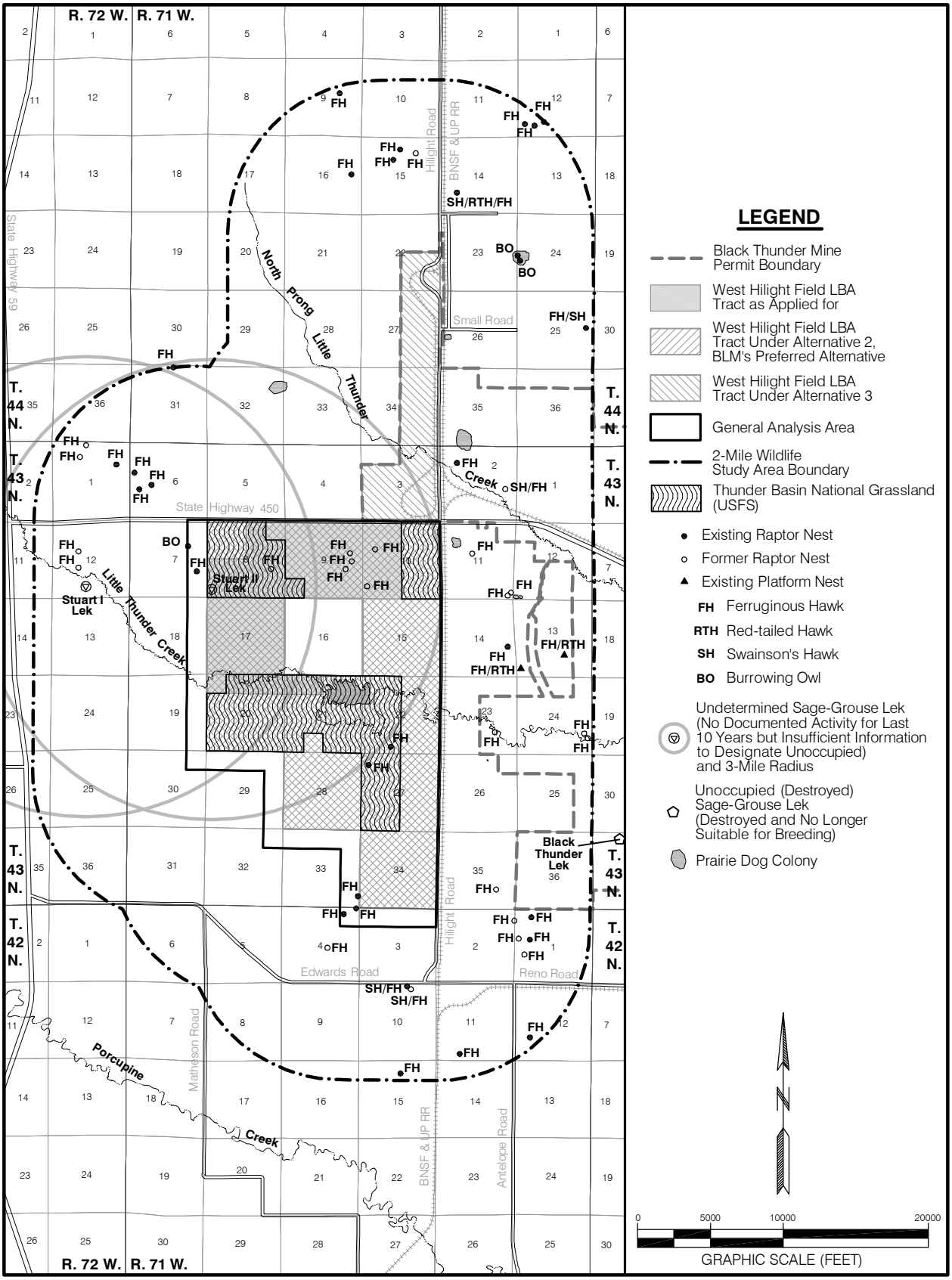

Figure H-3. USFS Region 2 Sensitive Wildlife Species Survey Area for the West Hilight Field LBA Tract.

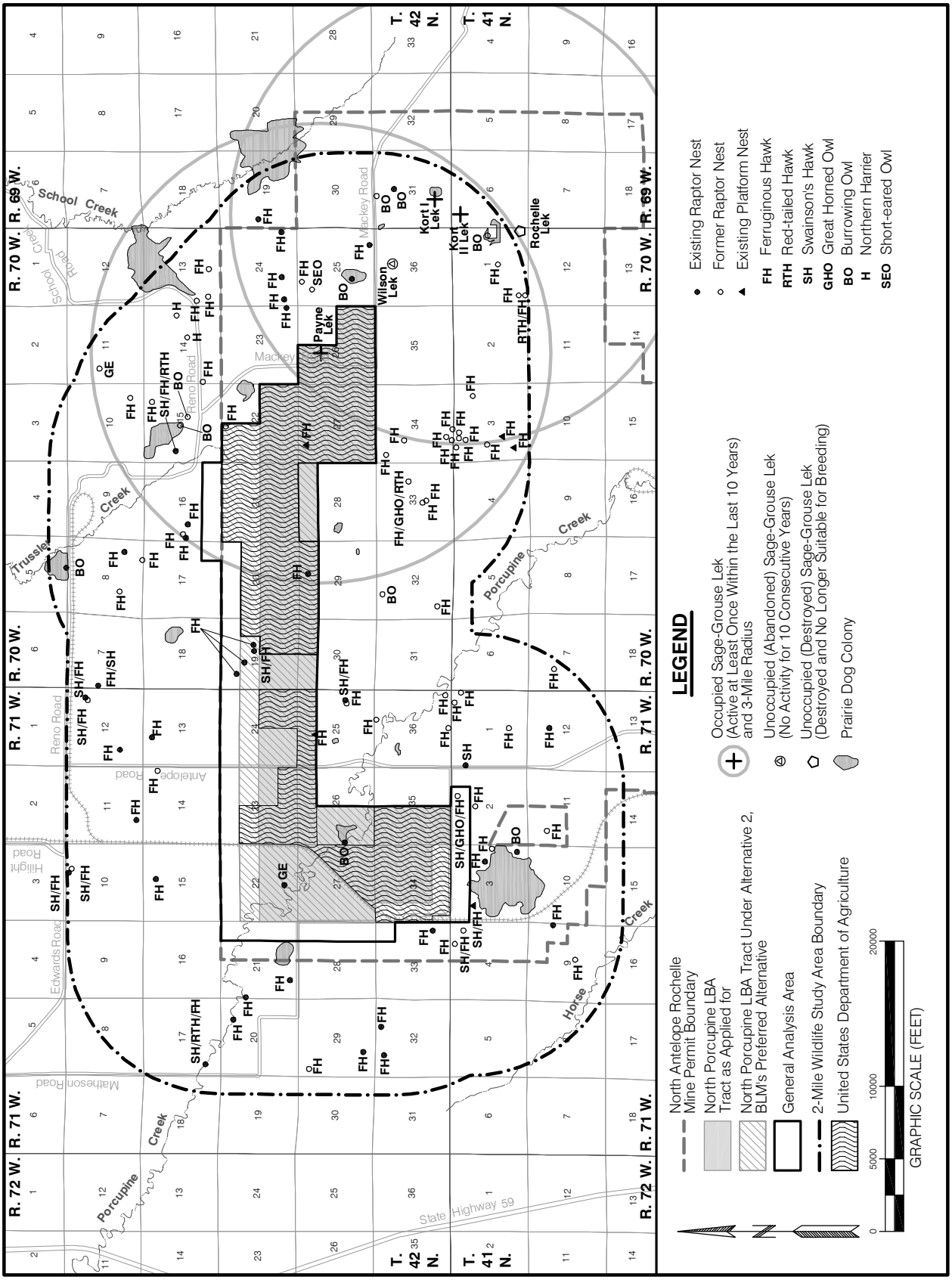

Figure H-4. USFS Region 2 Sensitive Wildlife Species Survey Area for the North Porcupine LBA Tract.

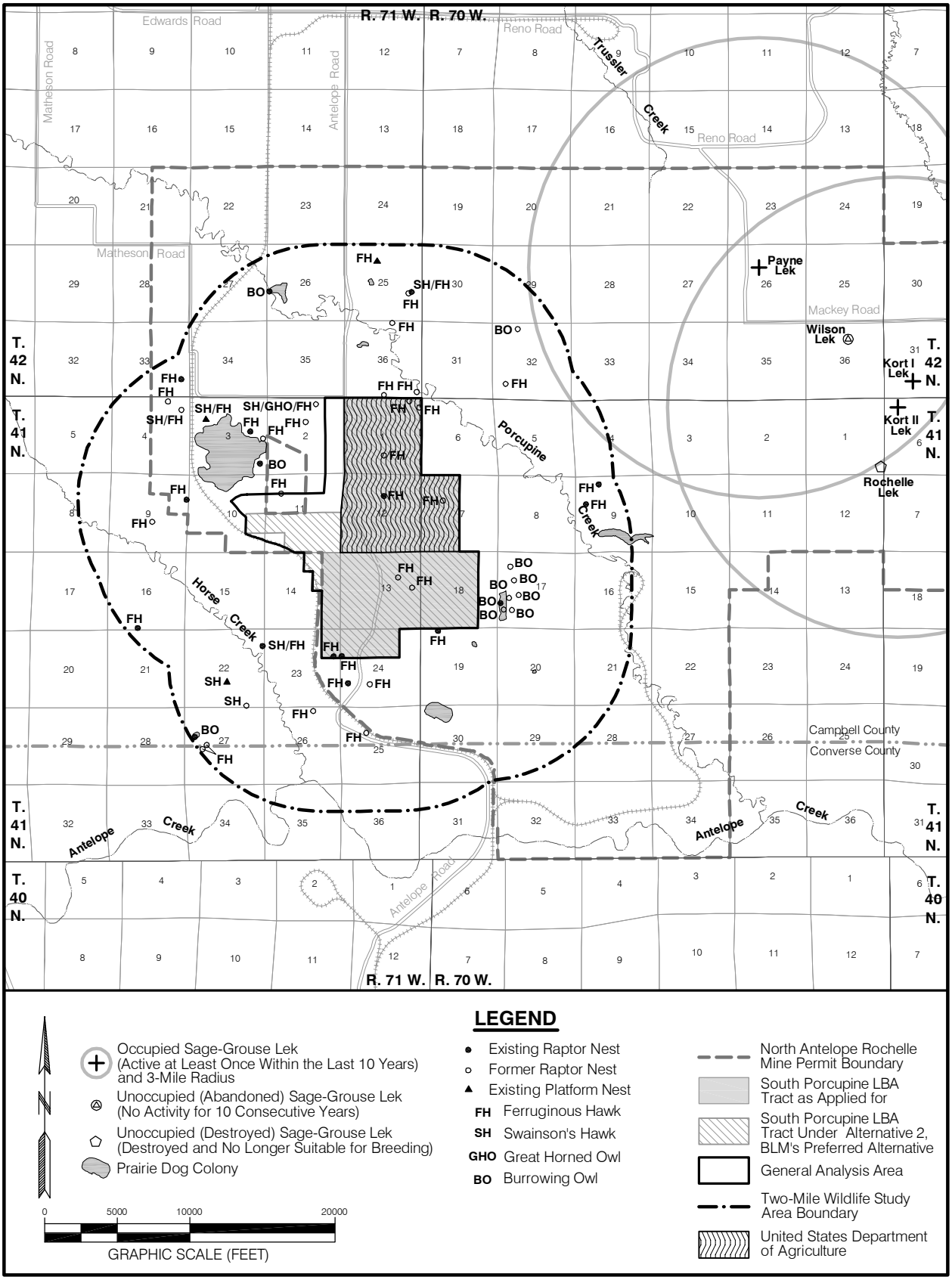

Figure H-5. USFS Region 2 Sensitive Wildlife Species Survey Area for the South Porcupine LBA Tract.

habitat on USFS lands within the general analysis areas for 12 of the 17 plant species listed in Tables H-8 and H-9. All of the 17 plant species will be discussed here because potential habitat may be present on other portions of the general analysis areas even if suitable habitat is not present on the USFS lands.

The following discussions summarize the results of these surveys, including brief descriptions of the habitat and occurrence of each evaluated USFS Region 2 sensitive species and species of local concern, which are identified in Tables H-8 and H-9 as inhabiting or potentially inhabiting USFS lands within the general analysis areas for the North Hilight Field, South Hilight Field, West Hilight Field, North Porcupine, and South Porcupine LBA Tracts. The general analysis area for the West Jacobs Ranch LBA Tract does not include any TBNG lands administered by the USFS. The potential direct and indirect environmental effects on the respective species as a result of leasing and mining the LBA tracts follow the habitat and occurrence descriptions. Cumulative impacts are discussed for all evaluated Region 2 Sensitive Species at the end of this section.

H-3.3 North Hilight Field LBA Tract

H-3.3.1 Prairie moonwort (*Botrychium campestre*) The prairie moonwort, a sensitive plant species, has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species was only recorded in Wyoming in a semi-shady mixed deciduous and ponderosa pine forest on sandy soils in the Black Hills. Prairie moonworts are known to exist in a variety of other habitats such as those underlain by Pierre shale, the Laramie Formation, calcareous sedimentary rocks, calcareous soils underlain by limestone, sandy soils and loess prairie. These habitats are generally limited on the North Hilight Field general analysis area, with only some areas dominated by sandy soils present.

Existing Conditions

Prime habitats for the prairie moonwort are not present on the USFS lands within the general analysis area for the North Hilight Field tract. Sites with sandy soils are present on USFS lands and other portions of the general Wright analysis area, but these areas are rather sparsely vegetated and do not provide habitat preferred by this plant species. Prairie moonworts have not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is very low.

H-3.3.2 Narrowleaf moonwort (*Botrychium lineare*) The narrowleaf moonwort, a sensitive plant species, has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species has an affinity for riparian areas and is associated with spruce/fir forests, lodgepole pine forests, and forest meadows.

Existing Conditions

Habitats for the narrowleaf moonwort are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The narrowleaf moonwort has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is very low.

H-3.3.3 Leathery grapefern (*Botrychium multifidum* var. *coulteri*) The leathery grapefern, a plant species of local concern, has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for meadows, wetlands, floodplains and other wet areas in open to forested habitats within forests.

Existing Conditions

Habitats for the leathery grapefern are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area.

Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The leathery grapefern has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the leathery grapefern. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.4 Foxtail sedge (*Carex alopecoidea*) The foxtail sedge, a sensitive plant species, is a perennial plant species and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. The foxtail sedge generally has an affinity for wet meadows and willow-sedge communities along wet, shady creek bottoms and springs.

Existing Conditions

Habitats for the foxtail sedge are not present on the USFS lands within the general Wright analysis area. Suitable wet meadows or willow-sedge communities are not present on these USFS lands. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The foxtail sedge has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the foxtail sedge. As indicated, the general analysis area for the North Hilight Field does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is not expected.

H-3.3.5 Elliptic spikerush (*Eleocharis elliptica*) The elliptic spikerush, a sensitive plant species, is a perennial and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable

habitat is present. This species generally has an affinity for wetland areas created by seeps or springs but may also be found in temporarily flooded areas.

Existing Conditions

Habitats for the elliptic spikerush are not present on the USFS lands within the general Wright analysis area. Suitable wetland habitats are not present on these USFS lands. Few wetland sites associated with various ephemeral drainages and playas are present on portions of the general Wright analysis area, but these sites do not appear to provide optimum habitat for this species. The elliptic spikerush has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to lack of abundant suitable habitat the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field does not provide abundant habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.3.6 Hall's fescue (*Festuca hallii*) The Hall's fescue, a sensitive plant species, is a tufted perennial grass and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for montane meadows, slopes and edges of open coniferous woods and meadows above 6,000 feet in Wyoming.

Existing Conditions

Habitats for the Hall's fescue are not present on the USFS lands within the general Wright analysis area. Suitable montane habitats above 6,000 feet are not present on these USFS lands within the general Wright analysis area, and the Hall's fescue has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the Hall's fescue. As indicated, the general analysis area for the North

Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is not expected.

H-3.3.7 Wood lily (*Lilium philadelphicum*) The wood lily, a plant species of local concern, is a perennial herb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for woodland meadows and woodland grasslands.

Existing Conditions

Habitats for the wood lily are not present on the USFS lands within the general Wright analysis area. Suitable woodland meadow or grassland habitats are not present on these USFS lands within the general Wright analysis area, and the wood lily has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the wood lily. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.8 Largeflower triteleia (*Triteleia grandiflora*) The largeflower triteleia, a sensitive plant species, is a perennial herb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and in pinon-juniper woodlands to pine forests and hills.

Existing Conditions

Habitats for the largeflower triteleia are not present on the USFS lands within the general Wright analysis area. Suitable grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and pinon-juniper woodlands or pine forests and hills are not present on these USFS lands within the general Wright analysis area, and the largeflower triteleia has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the largeflower triteleia. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.9 Barr's milkvetch (*Astragalus barrii*) The Barr's milkvetch, a sensitive plant species, is a matt-forming perennial forb that is known from numerous occurrences on the USFS lands within the TBNG. As more surveys are completed, new occurrences are reported. The Barr's milkvetch is found primarily on dry, sparsely-vegetated rocky prairie breaks, knolls, hillsides and ridges. Parent material is calcareous soft shale, siltstone or silty sandstone. Most populations appear to be stable, although populations may decline under drought conditions.

Existing Conditions

Astragalus barrii is a regional endemic plant of the plains in southwestern South Dakota, eastern Wyoming, southeastern Montana, and northwestern Nebraska. According to USFS, this plant species is known to occur in six counties in Wyoming, and there are eleven known occurrences of *A. barrii* in the USFS TBNG.

Suitable habitat for the Barr's milkvetch is present on the USFS lands within the general analysis area for the North Hilight Field LBA Tract as well as other lands within the general Wright analysis area. Populations and individuals have not been documented in the general Wright analysis area, but have been identified in surrounding areas. A pedestrian survey of the tract's general analysis area was conducted in April 2008, when the Barr's milkvetch is in bloom, and no individuals of this species were found. Barr's milkvetch has been collected and positively identified approximately 23 miles south of the general analysis area for the North Hilight Field LBA Tract, in the Section 21 of T.40N., R.71W., based on specimens on file with the Rocky Mountain Herbarium in Laramie, Wyoming.

Indirect and Direct Impacts

If lands within the general analysis area for the North Hilight Field LBA Tract are leased and mined, potential habitat, individuals, and *A. barrii* populations could be lost due to surface disturbances caused by mining activities. These losses would most likely be permanent unless disturbed lands are reclaimed to habitats that would support this plant species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing* because there are *Astragalus barrii* occurrences outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.3.10 Smooth goosefoot (*Chenopodium subglabrum*) The smooth goosefoot, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for sand bars and sandy blowouts in riparian areas.

Existing Conditions

Habitats for the smooth goosefoot are not present on the USFS lands within the general Wright analysis area. Suitable riparian areas are not present on the USFS lands within the general Wright analysis area. A few riparian areas associated with various ephemeral drainages are present on portions of the general Wright analysis area, but these areas do not contain the required sand bar or sandy blowout habitats required for this plant species. The smooth goosefoot has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the smooth goosefoot. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.11 Flat-top goldentop (*Euthamia graminifolia*) The flat-top goldentop, a plant species of local concern, is a rhizomatous perennial forb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for stony sandbars and streambanks but may also be found on moist or drying sites along open streambanks or roadside ditches.

Existing Conditions

Habitats for the flat-top goldentop are not present on the USFS lands within the general Wright analysis area. Suitable wetland or streambank areas are not present on the USFS lands within the general Wright analysis area. Streambanks and a few wetland areas in association with various ephemeral drainages are present within portions of the general Wright analysis area, but these areas generally do not contain the typical habitats required for this plant species, but marginal habitats are present. The flat-top goldentop has not been recorded on the general Wright analysis areas or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.3.12 Rosy palafox (*Palafoxia rosea* var. *macrolepis*) The rosy palafox, a plant species of local concern, is an annual forb that has not been documented on USFS lands within the North Hilight Field general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for sagebrush and mixed-grass prairie habitats on sandy soils.

Existing Conditions
Habitats utilized by the rosy palafox are present on the USFS lands within the general Wright analysis area and on other surrounding lands. Sagebrush and mixed-grass prairie plant communities are present on sandy soils in the general Wright analysis area. However, rosy palafox has not been recorded on these lands but is potentially present. This plant species has been documented southeast of the general Wright analysis area.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the North Hilight Field tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does contain some suitable habitat for this plant species but the rosy palafox has not been documented. This species has been documented southeast of the general Wright analysis area and abundant habitat is present on other sites that would not be affected

H-3.3.13 Lemonscent (*Pectis angustifolia*) The lemonscent, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the North Hilight Field general analysis area but has been

recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for gravel hills and scoria slopes. Lemonscent is also known to occur in low areas in sandy ravines and on sandbars.

Existing Conditions

Habitats utilized by lemonscent are present on the USFS lands within the general Wright analysis area and on other surrounding lands. However, lemonscent has not been recorded in the general Wright analysis area but could potentially be present. This plant species has been documented south of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the North Hilight Field tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does contain some suitable habitat for this plant species but the lemonscent has not been documented. This species has been documented south of the general Wright analysis area and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.3.14 Larchleaf beardtongue (*Penstemon laricifolius* spp. *exifolius*)

The larchleaf beardtongue (penstemon), a plant species of local concern, is a perennial forb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry, rocky, gravelly or sandy slopes, ridgetops and upland flats with shallow soils. Most populations in Wyoming are found at elevations above 6,000 feet, but this species has been documented at lower elevations in the state.

Existing Conditions

Habitats utilized by larchleaf beardtongue are marginally present on the USFS lands within the general Wright analysis area. A few rocky, gravelly hill slopes and rough breaks provide potential habitat, but the larchleaf beardtongue has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does contain marginal habitat for this plant species but the larchleaf beardtongue has not been documented. This species has been documented and is common in southern Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.3.15 Wooly twinpod (*Physaria didymocarpa* var. *lanata*) The wooly twinpod, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry redbed clay-shale slopes, limey-sandstone outcrops, roadcuts and other exposed rock-cliff substrates. Most populations in Wyoming have been documented in the foothills of the Big Horn Mountains.

Existing Conditions

Habitats utilized by the wooly twinpod are marginally present on the USFS lands within the general Wright analysis area. A few sandstone outcrops and exposed rock-cliff substrates provide potential habitat, but the wooly twinpod has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Hilight Field tract does contain marginal habitat for this plant species but the wooly twinpod has not been documented. This species has been documented and is common in north-central Wyoming and abundant habitat is present on other

sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.3.16 Visher's buckwheat (*Eriogonum visheri*) The Visher's buckwheat, a sensitive plant species, has not been documented on USFS lands within the North Hilight Field general analysis area but has been tentatively identified elsewhere within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for gullied ridges and eroded badland hills. These sites generally consist of barren shale and clay outcrops with at least 50 percent bare soil, high salt content and shrink/swell clay soils. Typical habitat includes badland islands in grasslands.

Existing Conditions

Habitats for the Visher's buckwheat are not present on the USFS lands within the general Wright analysis area. A few areas of highly eroded gullies consisting of barren shale or clay outcrops may be found in portions of the general Wright analysis area, but these sites do not appear to provide suitable habitat for this species. The Visher's buckwheat has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the Visher's buckwheat. As indicated, the general analysis area for the North Hilight Field tract does not provide optimum suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.17 Highbush-cranberry (*Viburnum opulus* var. *americanum*) The highbush-cranberry, a sensitive plant species, has not been documented on USFS lands within the North Hilight Field general analysis area or within the TBNG. In Wyoming, this plant species is found within Crook County and is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for moist sites including wooded hillsides, thickets or low woodlands. The highbush-cranberry is found all across northern North America.

Existing Conditions

Habitats for the highbush-cranberry are not present on the USFS lands within the general Wright analysis area. Suitable moist, wooded habitats are not present on these USFS lands within the general Wright analysis area. The highbush-cranberry has not been recorded within the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the highbush-cranberry. As indicated, this species has not been documented in the general Wright analysis area and the general analysis area for the North Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.3.18 Northern leopard frog (*Rana pipiens*) Northern leopard frogs range from the Great Slave Lake and Hudson Bay, south to Kentucky and New Mexico (NatureServe 2007). This species is considered relatively common within Wyoming (Baxter and Stone 1980, Cerovski et al. 2004). Northern leopard frogs require shallow, permanent, or semi-permanent standing water with at least some emergent vegetation for breeding (Wagner 1997). Conversely, they use deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom as overwintering habitat (Wagner 1997). Leopard frogs must have good quality water to successfully reproduce, as degraded or turbid water has the potential to negatively affect development of eggs and tadpoles. Overcrowding and changes in water temperature and pH (5.5 or lower) can increase the incidence of disease and mortality (NatureServe 2007) in this species. Adult frogs feed upon a variety of insects and other invertebrates, tadpoles, snakes, and fish (Cerovski et al. 2004), while tadpoles feed primarily upon small invertebrates, plant tissue, and organic debris. Adults also forage within aquatic and upland habitats, whereas tadpoles are restricted to aquatic habitats. Although their overall range remains essentially undiminished in size, many populations are declining. Major factors affecting leopard frog populations are habitat loss in some portions of their range, habitat degradation, overexploitation, interactions with non-native species, climate change, disease, and other unknown causes (Wagner 1997).

Existing Conditions

The northern leopard frog has been observed in southern Campbell County, but has not officially been recognized as breeding there (Cerovski et al. 2004). Although formal anuran surveys were not required or conducted at the adjacent Black Thunder, Jacobs Ranch, or North Antelope Rochelle mines, annual monitoring efforts for other species conducted in overlapping survey areas from 1983 through 2007 have not revealed the presence of northern leopard frogs or anuran egg masses on USFS lands or elsewhere within the general analysis area for the North Hilight Field LBA Tract. Those surveys occurred during all seasons, with biologists watching and listening for northern leopard frogs and other herptiles while conducting all other surveys throughout the area. It is unlikely that northern leopard frogs would have remained undetected during multiple surveys conducted during that long-term period if they were present in the area. Results from annual wildlife monitoring and

baseline studies for the three mines are on file with, and available from, the WDEQ/LQD in Sheridan or Cheyenne, Wyoming and USFS Douglas Ranger District; those reports also include detailed descriptions of survey areas (including maps), methods, and dates for each year.

Habitat conditions on USFS and non-USFS lands within the tract's general analysis area are classified as unsuitable, as there are no available permanent or semi-permanent water sources. Water levels in drainages are typically too temporary and/or shallow to support tadpoles until metamorphosis, or allow frogs to successfully overwinter, respectively. All drainages throughout the tract's general analysis area are ephemeral in nature and only carry water during or immediately following high intensity precipitation events, resulting in low quality or unsuitable habitat conditions for this frog species. The general lack of emergent vegetation near temporary water bodies limits their value to northern leopard frogs.

Direct and Indirect Effects

Wetland and aquatic habitats for northern leopard frogs are considered very poor to unsuitable on USFS lands and elsewhere in the general analysis area for the North Hilight Field LBA Tract, as described above. Furthermore, no frog sightings have been recorded on USFS lands during baseline surveys or annual monitoring completed between 1983 and 2007. Consequently, northern leopard frogs and their aquatic and terrestrial habitats are not expected to be impacted if the USFS lands in this LBA tract were leased. In the unlikely event that this species is present in the future, direct loss of, or injury to, foraging and dispersing frogs could result from encounters with mine vehicles or heavy equipment during topsoil stripping or other surface disturbance, although such risks are minimal due to the lack of frog sightings to date.

It is possible that existing reservoirs and ponds (natural and those enhanced by CBNG discharge water), and those created for flood control, sedimentation, water storage purposes, or wetland mitigation measures could provide suitable foraging or breeding habitat for northern leopard frogs in the future. However, most artificial water structures would still be limited to relatively shallow, seasonal waters with little emergent vegetation that would not provide for the year-round habitat needs of this frog species. Should those efforts result in improved aquatic habitats, adult frogs, tadpoles, and/or egg masses present in the area could be injured or killed during activities associated with additional construction of diversion dikes or associated channels, or the dewatering of potential habitats downstream of a dike. Under those limited circumstances, potential impacts could include loss of individuals and foraging habitat, increased predation, and changes in stream morphology and hydrology. Standard mining procedures such as the use of silt barriers across affected stream channels and other similar efforts would minimize any negative impacts that might result from mine-related operations. Likewise, adherence to the Thunder Basin National Grassland Plan Standards and Guidelines (USFS 2002) pertaining to water and wetlands would ensure that leopard frogs and other aquatic organisms present on USFS lands would not be negatively

affected by increased sedimentation, degraded water chemistry, or otherwise damaged aquatic habitats.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, USFS lands and adjacent non-federal lands within the North Hilight Field general analysis area do not contain suitable habitat for northern leopard frogs. Water sources in the drainages in that area are too temporary and shallow to support tadpoles until metamorphosis, or to allow frogs to successfully overwinter. If present, individual adult leopard frogs may be incidentally killed by vehicles or equipment. Habitat may be enhanced or created during certain mine operations, but water flow and depth associated with existing structures at the adjacent Black Thunder and Jacobs Ranch mines have not resulted in adequate conditions to support the life cycle needs of this species, and they are not expected to create those conditions anywhere in this LBA tract. As no northern leopard frogs have ever been documented on USFS lands within the overall general analysis area for the North Hilight Field LBA Tract, potential effects are expected to be negligible, if they occur at all. Furthermore, northern leopard frogs have been documented at other sites outside of the tract's general analysis area that will not be affected by coal leasing actions.

H-3.3.19 Black-tailed prairie dog (*Cynomys ludovicianus*) The black-tailed prairie dog was removed from the USFWS federal listing process in 2004. The agency ruled that listing this species may be warranted, but was precluded by higher priority considerations. Consequently, the black-tailed prairie dog is no longer considered a candidate species under the Endangered Species Act (ESA).

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). The TBNG, which includes USFS lands in the general analysis area for the North Hilight Field LBA Tract, harbors one of the seven major colony complexes remaining in North America. Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. This species has the ability to rapidly expand its distribution and population if not limited by pest control practices or disease, and will readily spread into recently disturbed areas. Many species such as the black-footed ferret, mountain plover, burrowing owl, and swift fox are dependent on prairie dogs during a portion of their life cycle. Black-tailed prairie dog occupied range and abundance has declined dramatically, and continues to exhibit a slow decline (NatureServe 2007). Major factors contributing to the decline include disease (sylvatic plague), urbanization, habitat conversion, and control efforts.

Existing Conditions

No prairie dog colonies were present on USFS lands within the North Hilight Field LBA Tract general analysis area or its 2-mile perimeter in 2007. Four prairie dog colonies (approximately 53.8 total acres) were found on non-federal surface in the wildlife survey area for the North Hilight Field tract (Figure H-1). Of which, two colonies occurred within the general analysis area for the tract and are approximately 3.4 and 19.5 acres in size. The other two colonies were in the surrounding 2-mile perimeter, and are about 3.7 and 27.2 acres in size.

None of these four colonies meet the 80-acre minimum for black-footed ferret habitat (USFWS 1989). However, the focus area for ferret reintroduction efforts is outside the coal mine region of the PRB of northeast Wyoming (refer to Management Area 3.63) (USFS 2002, Grenier 2003). That coal region includes all USFS and surrounding lands within the general analysis area for the North Hilight Field LBA Tract. Additionally, some prairie dog colonies in that coal region were recently infested with the plague, while others are currently exposed to year-round disturbance associated with conventional oil and gas, CBNG, and coal (including open pits) resources, as well as seasonal recreational shooting and vehicular travel.

Direct and Indirect Effects

The current mining plans for the Black Thunder and Jacobs Ranch mines do not project any new surface disturbance in the two prairie dog colonies located within the general analysis area for the North Hilight Field LBA Tract. Nevertheless, those two colonies would be affected by the proposed leasing action at some point in time. As stated above, neither colony is located on USFS lands. Such impacts could have immediate results on prairie dogs if an occupied colony is suddenly subjected to the effects of a soil salvage operation, or is otherwise impacted in a short timeframe that precludes the dispersal of individuals prior to surface disturbance. However, as those activities typically occur incrementally across various portions of future mining areas, some individuals could disperse to undisturbed portions of the affected colony, or create one or more new colonies within the area.

Smaller-scale disturbances associated with both the mining and CBNG industries can also impact prairie dog colonies and surrounding vegetation through fragmentation or loss of foraging and burrowing habitat. Linear disturbances associated with mining infrastructure, such as roads, power lines, fences, and pipelines will occur within narrow corridors over relatively short distances, and would be completed within shorter timeframes than the advancement of a surface mine pit. However, such disturbances would still pose some level of risks due to vehicular collisions or by enhancing habitat for mammalian and avian species that prey on prairie dogs.

Some linear impacts could be minimized or mitigated through the consolidation of roads and electric utilities within common corridors, applying perch deterrents on overhead power poles, and reseeding pipeline disturbances

quickly with appropriate seed mixes for the region. Minor surface disturbance near existing colonies would provide recently upturned soils that could facilitate the expansion of the existing colonies or the establishment of new ones, as prairie dogs will readily move into recently disturbed areas. Post-mining reclamation could have similar potential benefits; prairie dogs have already demonstrated their ability to inhabit reclaimed lands at the nearby Antelope Mine (BLM 2008).

All USFS Standards and Guidelines applicable to black-tailed prairie dogs outlined in the TBNG Plan (USFS 2002, page 1-20) would be implemented. To reduce risks and habitat loss for prairie dogs and other wildlife species closely associated with prairie dog colonies, new roads will be aligned outside colony boundaries where possible. If it is necessary to place a new road within a prairie dog colony, the amount of road in the colony will be minimized to the extent that soil, drainage, topographical and other physical factors will allow.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Only two of the four black-tailed prairie dog colonies within the wildlife survey area for the North Hilight Field LBA Tract would be physically disturbed by mining activities within the tract's general analysis area, if the lease is issued. Those two colonies encompassed less than 23 acres, and neither of which were on USFS lands in 2007. Given the fact that two of the four colonies within the wildlife survey area for the North Hilight Field LBA Tract were outside of the general analysis area (area of potential surface disturbance) associated with this proposed lease, the tendency of prairie dogs to disperse and expand their boundaries, and the incremental nature of surface coal mining relative to some other disturbance activities, the potential impacts to prairie dog colonies on and near USFS lands in the North Hilight Field LBA Tract would not have adverse consequences for the viability of the local or regional population. Disturbance and reclamation efforts will occur incrementally in varying locations throughout the permit area as mining progresses through the approved lease.

H-3.3.20 Swift Fox (*Vulpes velox*) The swift fox was removed from the USFWS federal listing process in 1995, after extensive field surveys demonstrated that the population was greater than expected. This species is considered to be common within the eastern Great Plains grasslands of Wyoming (Cerovski et al. 2004), though it typically occurs at very low densities. The exact status of the population is unknown but believed to be increasing, especially in the Northern Plains. Swift foxes are largely nocturnal and typically prefer flat to gently rolling, short- or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). This species uses multiple den sites year-round for shelter, protection from predators, and rearing young. Burrows of other mammals such as badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), and prairie dogs are often used or modified for those purposes. Small to mid-sized mammals constitute the bulk of their diet. Swift

foxes have little fear of humans and may den in proximity to human disturbances (residences and busy roadways). This tolerance also makes them susceptible to trapping, vehicle collisions, and attacks by dogs. Major threats faced by the swift fox include habitat loss and degradation, interspecific competition with red fox and coyote (*Canis latrans*), and vehicle collisions.

Existing Conditions

Swift fox have been observed in large grassland blocks in southern Campbell County with more frequency in recent years, and are presumed to breed there. This species has also been documented within the overall TBNG. However, sagebrush communities dominate the general analysis area for the North Hilight Field LBA Tract, as well as USFS lands in that area. The prevalence of sagebrush throughout the tract's wildlife survey area largely explains the extremely limited sightings of this grassland fox over the last 25 years, as described below. Burrows within the existing black-tailed prairie dog colonies and scattered badger or red fox burrows could be used by swift foxes as den or shelter sites, and swift fox could forage in the area.

No specific surveys for swift fox were conducted for this analysis. However, such efforts were completed in 2002 using USFS survey protocols for other unrelated projects. Those surveys occurred within 13.5 miles of USFS lands in the North Hilight Field tract's general analysis area. Nocturnal spotlight surveys for rabbits and hares were conducted as part of annual wildlife monitoring at adjacent existing mines every year since at least 1994, with diurnal surveys for a variety of vertebrate species occurring across all seasons annually since the early 1980s. All of those survey efforts overlapped significant portions of the North Hilight Field tract's wildlife survey area.

As a result of those combined efforts, one swift fox sighting was made approximately 5 miles south of this LBA tract along Little Thunder Creek between 1995 and 1997 in T.43N., R.71W., SE¼ Section 23 (USFS 2003). A lone fox was also observed on adjacent lands in T.43N., R.71W., SW¼ Section 14 (approximately 4 miles south of this tract) during that period. No swift foxes have ever been recorded on USFS or other lands within the general analysis area for the North Hilight Field LBA Tract. No swift foxes have been recorded elsewhere in the overall Black Thunder Mine annual monitoring area since surveys began in 1983.

Few other swift fox sightings have been recorded elsewhere within the surrounding region during specific surveys or incidental to other searches at local mines over the last 25 years. Those efforts were conducted as part of annual wildlife monitoring by contract and USFS biologists on private and federal lands in the area. One swift fox was documented approximately 11 miles south of USFS lands within the general analysis areas for the North Hilight Field tract in March 2002. The fox was observed in T.42N., R.70W., SE¼ Section 15 during spotlight trapping efforts for sage-grouse at the nearby North Antelope Rochelle Mine. The nearest other sighting occurred in T.43N., R.72W., SE¼ Section 20 between 1995 and 1997, approximately 15 miles

southwest of USFS lands in the North Hilight Field tract general analysis area. Reports from all annual monitoring and special studies are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Direct and Indirect Effects

Due to the overall poor quality habitat conditions on USFS and adjacent lands in the North Hilight Field LBA Tract's general analysis area, and the sightings of just two swift fox 4 and 5 miles south of that area over the last 25 years of annual monitoring (including spotlight searches for other species), no direct or indirect impacts are anticipated for this species. Given these circumstances, species-specific Standards and Guidelines outlined in the TBNG Plan (USFS 2002, page 1-20) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Habitat conditions in the North Hilight Field tract's general analysis area are considered poor quality due to the prevalence of sagebrush shrublands and limited presence of grassland expanses. Only two observations of swift fox have been recorded in the general region despite annual monitoring surveys in all or most of those areas over the last 25 years, and both were 4 to 5 miles south of this LBA tract. Furthermore, sufficient suitable habitat (grasslands) is present elsewhere within the general vicinity that could sustain swift foxes as project activities disturb the general analysis area for the North Hilight Field LBA tract. Existing and future reclaimed grasslands will create or enhance potential swift fox habitat once mining has been completed in the tracts.

H-3.3.21 Long-billed curlew (*Numenius americanus*) Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California, and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003a). The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Cerovski et al. 2004). Curlews are ground nesters, and require large open expanses of grassland, with relatively low vegetation and few shrubs in which to nest (Hill 1998). The nest is typically a shallow scrape or depression, thinly lined with grass, weeds or cow dung, typically near water or moist areas.

Curlews use historically occupied sites each year, and some individual birds may reuse the same territories from year to year (Dechant et al. 2003a). Curlews primarily feed upon insects but also eat other invertebrates, small crustaceans, toads, and eggs and nestlings of other birds. This species forages in grasslands, wet meadows, prairie dog colonies, and occasionally along the margins of wetlands. Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998). Although some populations may be

declining, overall population trends suggest long-billed curlew numbers are stable or increasing slightly. The major factor affecting curlew populations is habitat destruction and fragmentation.

Existing Conditions

Long-billed curlews are uncommon summer residents within the TBNG. The areas evaluated for this analysis include USFS and adjacent lands within the general analysis area for the North Hilight Field LBA Tract. As described for the northern leopard frog and swift fox, above, those areas are dominated by sagebrush habitats with scattered stands of upland grasslands and little water. Consequently, habitat conditions in the tract's general analysis area and surrounding lands would be suitable for foraging migrants, but they do not provide large expanses of grassland areas for nesting activities. No long-billed curlews have ever been documented on USFS lands or adjacent lands in the general analysis area or larger wildlife survey area for the North Hilight Field LBA Tract. Likewise, few curlews have been observed in the surrounding region during annual wildlife monitoring in the area over the last 24 or more years. Most of those sightings occurred during spring months and beyond USFS lands, and were likely individual migrants or non-breeding adults. No significant wetlands (i.e., large lakes) or other persistent conditions that might attract large numbers of curlews during migration exist within the North Hilight Field wildlife survey area.

No nesting occurrences have been documented for long-billed curlews in southern Campbell County (Cerovski et al. 2004), including USFS lands in the North Hilight Field tract's general analysis area and adjacent lands. Potential foraging habitat is present on USFS and adjacent lands in those areas, and elsewhere within the 2-mile wildlife survey perimeter, but nesting habitat conditions are poor to unsuitable. CBNG development activities are increasing throughout the region, with active mining (including open pits) also occurring in the near vicinity. Therefore, potential foraging habitats would be disturbed by the Proposed Action and Alternatives for this LBA tract.

Direct and Indirect Effects

Given the lack of sightings of long-billed curlews in the North Hilight Field LBA Tract general analysis area and surrounding perimeters since 1983, and the fact that habitat conditions in those areas are only suitable for foraging migrants or non-breeding adults, the Proposed Action and Alternatives for this LBA tract are unlikely to cause any direct injury or mortality to this species. However, if present, future mining activities could result in injuries or mortalities to foraging individuals. Foraging individuals may also be displaced by human activities and noise associated with mining. Potential foraging habitats may be disturbed, removed, or fragmented by mining activities. The type, timing, location, and extent of habitat disturbance will vary throughout the tract's general analysis area as operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine, and will eventually mitigate impacts to some degree. The Black Thunder Mine's reclamation plan would incorporate the replacement of

jurisdictional wetland acreages existing prior to mining with at least equal types and numbers of wetland acreages. The creation of wetland habitats, especially where adjacent to native or reclaimed grassland habitats, could provide additional (although limited) foraging areas for curlews.

As no long-billed curlews have been documented within USFS lands or other lands in or near the North Hilight Field LBA Tract general analysis area, and habitat conditions do not provide quality nesting areas, species-specific Standards and Guidelines outlined in the Grassland Plan (USFS 2002) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As this species appears to be an infrequent visitor to the tract's general analysis area, and good quality foraging and nesting habitat is not present within the area, impacts to this species are likely to be minimal. Loss, degradation, or fragmentation of potential foraging habitat and potential collisions with vehicles may occur. Reclamation of wetlands and grasslands may create limited foraging or nesting habitat.

H-3.3.22 Ferruginous hawk (*Buteo regalis*) Ferruginous hawks breed throughout much of the western United States and portions of three Canadian provinces (Johnsgard 1990). This species nests throughout Wyoming (Cerovski et al. 2004) and occupies portions of the state during winter. Large expanses of grassland and shrubland, where livestock grazing (vs. cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Most ferruginous hawks in the PRB nest on the ground (usually elevated sites, though some pairs nest in small trees). Typical nest sites include hilltops, rock outcrops, eroded creek banks, small trees, and even relatively level ground. The ferruginous hawk relies primarily on two mammalian families for the majority of its prey: *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs). Numerous nests can occur within the territory of a single pair, and ferruginous hawks often reuse nests for many years.

This species may be sensitive to human disturbance, especially during the nesting period (White and Thurow 1985). This sensitivity can be heightened in years of low prey abundance. Accurate information regarding the trend for the ferruginous hawk is limited and mixed. Some populations may be declining (Bechard and Schmutz 1995); however, overall population trends suggest numbers are stable or increasing (NatureServe 2007). Major factors affecting ferruginous hawk populations include habitat destruction and fragmentation, and human disturbance.

Existing Conditions

Annual monitoring has documented that ferruginous hawks nested in the vicinity of the Black Thunder Mine during each of the last 25 years, and fledged

young in all but one of those years. Similar long-term nesting has occurred at the neighboring Jacobs Ranch and North Antelope Rochelle mines. Many of those nests were located on USFS lands. Details describing the number of intact and active nests within the mine monitoring survey areas in a given year are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

The presence or absence of nest material does not determine whether the USFS considers a site as "active" (occupied during at least 1 of the last 7 years). No ferruginous hawk nest sites have been documented on USFS lands within the North Hilight Field tract's general analysis area or surrounding 2-mile wildlife survey area during annual wildlife monitoring surveys conducted through 2007. Seven nest sites in two territories have been recorded on non-federal surface within the general analysis area through 2007; five of the seven sites still had nest material present that year (Figure H-1). Through 2007, 24 individual ferruginous hawk nests plus 3 multi-species sites used by ferruginous hawks and at least one other raptor species over the years have been identified within the tract's 2-mile wildlife survey area. The 27 nests represented at least 10 different territories. All but 9 of the 27 sites still had nest material present in 2007.

Direct and Indirect Effects

Over time, the Black Thunder Mine has avoided, where possible, or mitigated mining impacts on raptor nests through a variety of means. The mine has voluntarily monitored nesting raptor populations in a perimeter larger than required annually since 1983, maintained and implemented current USFWS approved Raptor Mitigation Plans, adjusted operations to provide temporal and spatial buffers around raptor nests, and ensured that new power lines at the mine conform to current Avian Power Line Interaction Commission (APLIC) guidelines. Provided those practices are continued, direct impacts on ferruginous hawks and their active nest sites will be minimized, both on and near USFS lands. Due to restrictions on disturbance near active nest sites, the most probable source of potential impact to ferruginous hawks themselves would be an increase in injuries and fatalities of individuals foraging within the general analysis area due to vehicle collisions associated with ongoing or future mining and other activities. The use of existing roads in the area, when possible, would help to minimize this risk.

Habitat loss, degradation, and fragmentation would result from a variety of large- and small-scale mining operations such as soil salvaging and reservoir/flood construction, among others. Potential nesting and foraging habitat might also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are

often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances would shift throughout the expanded permit area as operations progress. Reclamation of disturbed areas would occur incrementally as resource recovery is completed in a given portion of the mine, and would mitigate impacts to some degree. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (lagomorphs and rodents) for ferruginous hawks. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

USFS Standards and Guidelines would be implemented and offer additional protections for active nests; they would apply only to activities outside of the lease area. These protocols should help ensure that the Proposed Action and Alternatives do not significantly degrade the quality of existing ferruginous hawk territories and nest sites. Standards and Guidelines specific to ferruginous hawks outlined in the TBNG Plan (USFS 2002, page 1-20-21) are as follows:

73. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within 0.25 mile (or line of sight) of active ferruginous hawk nests. For the ferruginous hawk, a nest is no longer considered active if it is known to have been unoccupied for the last seven years. This does not apply to pipelines, fences and underground utilities.

74. To help reduce disturbances to nesting ferruginous hawks, prohibit the following activities within 0.5 mile (or line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.

75. To help reduce disturbances to nesting ferruginous hawks, do not authorize the following activities within 0.5 mile (line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., pipelines, utilities, fencing), seismic exploration, and workover operations for maintenance of oil and gas wells.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Mine-related activities will not physically disturb any ferruginous hawk nest sites on USFS lands in the North Hilight Field general analysis area. Many nests have alternate sites within the same territories that are beyond the North Hilight Field tract's general analysis area, and thus are less likely to be impacted by future mining disturbance associated with the

proposed leasing action. Some individuals or pairs may experience disturbance, destruction, or fragmentation of nesting and foraging habitat. Increased disturbance to individuals due to human activity may also occur. However, several factors should minimize the potential mining-related impacts on this species, including the availability of alternate nest sites located further away from pending disturbance in each affected territory, implementation of USFWS and USFS approved mitigation measures, reclaiming habitats as soon as feasible, encouraging nesting within mine reclamation lands through artificial nest structures and habitat features such as rock piles and tree plantings that attract prey species, and continued monitoring of this species to ensure that mitigation methods are applied when necessary.

H-3.3.23 Burrowing owl (*Athene cunicularia*) Burrowing owls breed from southern Alberta to southwestern Saskatchewan, south through east-central Washington, central Oregon, and southern California, and east to eastern North Dakota, west-central Kansas, and Texas (Klute et al. 2003, pg 7). The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Cerovski et al. 2004). This species requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Klute et al. 2003, pg 12).

Most burrowing owl nests within the TBNG are located within prairie dog colonies (USFS 2003). Burrowing owls typically reuse traditional nesting areas. Burrow mounds, shrubs, fence posts or boulders may be used as observation perches. This species is usually tolerant of human activity but is vulnerable to predation by pets (cats, dogs). Burrowing owls forage within a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. This species is often active during daylight hours. Insects and small mammals (mice and voles) are the owls' primary prey items. Burrowing owl populations have been declining throughout its range, primarily due to habitat loss.

Existing Conditions

Burrowing owls are common summer residents within the TBNG (Cerovski et al. 2004). This species was first recorded nesting in the Black Thunder Mine annual monitoring 2-mile perimeter in 1988. Despite the presence of potential nesting habitat (prairie dog and badger burrows) in the monitoring area, this species nested in only 5 of the subsequent 19 years. All known burrowing owl nest sites in the mine monitoring area have been in prairie dog burrows. Four artificial nest boxes have been constructed in the mine's 2-mile perimeter wildlife survey area for mitigation purposes over the years, but no owls have ever been observed at or near them.

No burrowing owl nest sites have been documented on USFS lands within the North Hilight Field tract's general analysis area or the tract's surrounding wildlife survey area through 2007. Two nest sites in one territory have been identified in a small (18 acres) prairie dog colony on non-federal lands located within the tract's general analysis area (Figure H-1). The colony is

approximately 4 miles west of the nearest USFS lands within the tract's general analysis area, and 3 miles northwest of the nearest USFS lands in the surrounding 2-mile perimeter. The USFS buffer for this species is 0.25 mile. A smaller (3 acres) colony is also present in the general analysis area, but no burrowing owls have been recorded there. One artificial nest box (BO5) was created in the LBA tract's 2-mile wildlife survey area, but it has never been used by burrowing owls.

Direct and Indirect Effects

No known burrowing owl nest sites are present on USFS lands in the general analysis area for the North Hilight Field LBA Tract, or within 0.25 mile of those lands (the USFS buffer for that species). Potential nesting habitat in the vicinity of this LBA tract is largely limited to the two relatively small prairie dog colonies located in the tract's general analysis area. Therefore, leasing the North Hilight Field LBA Tract would not result in any direct or indirect effects to nesting burrowing owls. Both USFS Standards and Guidelines (USFS 2002) and Black Thunder Mine's mine permit (TBCC 2005) stipulate that clearance surveys will be conducted and approved by the appropriate agencies before any colony is disturbed during the breeding season. That process will preclude most direct impacts to new nesting burrowing owls in that area.

Due to the strong (but not exclusive) relationship between burrowing owls and prairie dog colonies, many of the indirect effects described above for the black-tailed prairie dog, would also apply to burrowing owls and, thus, will not be repeated in full detail here. Because burrowing owls are active during daylight hours, the most probable source of direct impacts would be the death of, or injury to, individuals fleeing heavy equipment, or being killed or injured by equipment while feeding or moving through the mine area. Burrowing owls are generally tolerant of human activities, but increased presence and noise, especially during the nest initiation period, may displace individuals or inhibit nesting proximate to mine operations. Foraging could also be hindered within these areas, especially where mining activities occur near prairie dog colonies.

As described previously, mining could eventually disturb or eliminate prairie dog colonies (potential nesting habitat) in the general analysis area for the North Hilight Field LBA Tract (21 total acres). However, the limited presence or long-term absence of nesting burrowing owls in those colonies, in combination with the presence of other non-disturbed colonies in the area and the ability for prairie dogs to recolonize reclamation, would mitigate those losses to a large extent. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (rodents, non-flying insects) for burrowing owls. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

Additionally, the tendency of prairie dogs to quickly colonize nearby areas when their colonies are disturbed would create new nesting habitat for burrowing owls. Overall, nesting and foraging habitats will be incrementally affected by a

variety of large-and small-scale operations. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress, thus providing opportunities for burrowing owls to relocate to other suitable habitat within the immediate area.

Reclamation will proceed incrementally as areas are mined and activities move to new locations within the mine area. Both activities will create loose soil that should be attractive to dispersing prairie dogs (potential habitat source), at least in the short term. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine, and will eventually mitigate habitat impacts to some degree. However, to date, burrowing owls have rarely been documented nesting within reclaimed habitats at surface mines in the PRB of northeast Wyoming.

If nesting burrowing owls are documented on or near USFS lands in the North Hilight Field LBA Tract, USFS Standards and Guidelines applicable to this species would be implemented on applicable lands to offer additional protections beyond those outlined in the USFWS approved Raptor Mitigation Plan for the Black Thunder Mine. Annual monitoring of known burrowing owl nest sites within the 2-mile wildlife survey area for the mine, including USFS and adjacent lands, and other nearby colonies will continue through the life of the mine to document their histories of occupancy and production.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No burrowing owl nests have been documented on or near USFS lands in the North Hilight Field tract's general analysis area during many years of annual monitoring; only two nests in a single territory are located within the tract's general analysis area. Disturbance, fragmentation, and alteration of foraging and nesting habitats would occur if this tract is leased and mined. However, few prairie dog colonies occur in the general vicinity of this LBA tract, and most are located outside of the tract's general analysis area where future surface disturbance would occur.

The Black Thunder Mine has avoided, where possible, and mitigated such impacts in the past through intensive monitoring of both populations and specific nest sites, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests (including burrowing owl nests). Mining activities and noise may disturb individuals inhabiting the lease area, thus inhibiting potential nesting or foraging in proximity to lands with ongoing development. Potential collisions with vehicles might also occur, though none have been recorded in the area to date.

H-3.3.24 Chestnut-collared longspur (*Calcarius ornatus*) The breeding range of the chestnut-collared longspur extends from southern Alberta to southern Manitoba, south to west-central Colorado, and east through North

Dakota and South Dakota to western Minnesota (Dechant et al. 2003b). The chestnut-collared longspur is a common summer resident of the eastern plains of Wyoming (Cerovski et al. 2004). This species prefers native grasslands as breeding sites, inhabiting open prairie and avoiding excessively shrubby areas. Grasslands with dense litter accumulations are also avoided (Dechant et al. 2003b). Scattered shrubs are often used as singing perches. Nests are typically placed in areas of sparse vegetation (less than 50-75 inches or 20-30 centimeters), but usually with a taller grass component than sites preferred by McCown's longspurs. Nests are on the ground in depressions and often placed beside cattle dung, small shrubs, or under a clump of grass (Hill and Gould 1997). Male fidelity to breeding areas has been observed. Chestnut-collared longspurs feed primarily on seeds (especially grasses), insects, and spiders. This species is generally tolerant of short-term intrusion at the nest site but may desert if disturbed during nest building or egg-laying (Hill and Gould 1997). High rates of predation on eggs and nestlings have been reported and pesticides have been shown to reduce hatching success. The chestnut-collared longspur breeding range has contracted and long-term data suggests population declines (Hill and Gould 1997). These declines have been attributed to loss of native prairie habitat, and conversion to cropland and urban development.

Existing Conditions

Chestnut-collared longspurs are common summer residents within the TBNG. This species has not been recorded on USFS or other lands in the North Hilight Field tract's general analysis area during annual monitoring in recent years. As described previously, sagebrush habitats dominate USFS and adjacent lands in the general analysis area for the North Hilight Field LBA Tract. Grassland areas are present in the form of prairie dog colonies, upland grasslands, and agricultural pasture grasslands, but they occur in isolated parcels scattered throughout the area rather than in contiguous and/or sizeable blocks that would be attractive to nesting chestnut-collared longspurs. Consequently, only limited suitable habitat conditions exist for this species on USFS lands in the North Hilight Field LBA Tract general analysis area and adjacent lands.

Direct and Indirect Effects

Due to the similarity of potential impacts from future mining on chestnut-collared longspurs and other grassland species previously discussed (e.g., prairie dog and swift fox), detailed descriptions of those impacts are not repeated here. Chestnut-collared longspurs have not been documented as nesting in the North Hilight Field tract's general analysis area. Equipment operations associated with future mining operations could result in fatalities or injury to individuals, nests and eggs, and/or young. Increased human activity and noise could inhibit foraging or nesting within suitable habitats on USFS lands or displace individuals during periods of intense activities. Over the life of the mine, potential nesting and foraging habitats in the general analysis area could be disturbed, destroyed, altered, or fragmented, though the type, timing, location, and extent of habitat disturbance will vary throughout the general

analysis area as mining operations progress. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine. Within 1 to 2 years, newly reclaimed areas may create good quality, short-duration nesting habitat for chestnut-collared longspurs. However, as these sites mature, they would become less suitable as nesting habitat for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the North Hilight Field tract's general analysis area are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. No individuals have been documented in the North Hilight Field tract's general analysis area. Potential and documented alternative habitats for chestnut-collared longspurs are present elsewhere in the vicinity in areas not currently scheduled for mining disturbance.

H-3.3.25 McCown's Longspur (*Calcarius mccownii*) McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north-central Colorado, and east to western Nebraska, north-central South Dakota, and southwestern North Dakota (Dechant et al. 2003c). This species is a common summer resident of the eastern plains and great basin-foothills grasslands, basin-prairie shrublands, and agricultural areas throughout most of Wyoming (Cerovski et al. 2004). Specifically, this species requires open habitats such as sparsely vegetated, low structured grasslands, and heavily grazed pastures containing a moderate bare ground component for nesting and foraging. Nest sites are typically a natural or shallow scraped depression on the ground placed in the open or beside vegetation such as bunch grasses, cacti, or shrubs. McCown's longspurs feed on seeds of grasses and forbs, insects, and other arthropods. No strong data suggests breeding site fidelity although some individuals may return to the general nesting area in subsequent years.

Individuals vary in response to human intrusion at nest sites, but appear to be relatively more tolerant than most grassland songbird species. High rates of predation on eggs and nestlings occur especially where nests are associated with vegetative structure. Nestlings may also be directly poisoned where insecticides are sprayed in nest areas (With 1994). Populations are declining, especially within the northern portion of the range. Factors directly affecting the McCown's longspur include the reduction of breeding habitat due to overgrazing, control of prairie fires, plowing, development, and excessive use of pesticides. Conversion of short-grass prairie to agriculture and urban development is the most important factor (With 1994).

Existing Conditions

McCown's longspurs are also common summer residents within the TBNG. Observations of the McCown's longspur mirror those of the chestnut-collared

longspur; neither species has been documented in the North Hilight Field tract's general analysis area. The nearest observation to this area occurred on non-federal lands in NE¼SW¼ Section 13, T.43N., R.71W. in May 2000. The height and composition of vegetation (i.e., sagebrush) on most USFS lands in the North Hilight Field tract's general analysis area is generally too tall and dense, respectively, to provide suitable habitat for McCown's longspurs.

Direct and Indirect Effects

The direct and indirect effects to McCown's longspurs would be the same as those described above for the chestnut-collared longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the North Hilight Field tract's general analysis area are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. No individuals have been documented in the North Hilight Field general analysis area. Potential and documented alternative habitats for McCown's longspurs are present nearby in more appropriate habitats not currently scheduled for mining disturbance.

H-3.3.26 Greater sage-grouse (*Centrocercus urophasianus*) The Greater sage-grouse occurs year-round throughout non-forested regions of Wyoming (Cerovski et al. 2004). Sage-grouse rely on a variety of habitats within sagebrush dominated landscapes to reproduce and survive throughout the year. Early in the spring, grouse gather at breeding display sites called leks. Leks are usually in open areas (playas, ridge tops, sparse sagebrush, or burned areas) that are surrounded by dense sagebrush and escape cover. The surrounding area also typically represents nesting, loafing, and foraging habitat.

After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nests in some portions of sage-grouse range are typically placed under sagebrush with average height of 36-79 centimeters (Schroeder et al. 1999). However, research conducted within the Southern PRB (Brown and Clayton 2004) indicated that, although shorter sagebrush was present at nest sites, grouse selected shrubs ranging from 55-61 centimeters in height under which to place nests. Re-nesting may occur if the nest is destroyed early during the laying or incubation period. Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). Sage-grouse exhibit high fidelity to seasonal ranges, and may return to the same area to nest in subsequent years.

For the first month after hatching, the young depend on relatively open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late-season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support

greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse feed upon sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense, exposed sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes or windblown ridges are preferred.

Breeding populations of this species have declined by at least 17 to 47 percent throughout much of its range (Connelly et al. 2004). Within Wyoming, sage-grouse populations have generally declined over the past 4 decades. However, sage-grouse population estimates specifically pertaining to the TBNG suggest an overall increase in individuals since 1995. This same general trend was observed both statewide and within the Northeast Wyoming Sage-Grouse Local Working Group (NWSGWG) area.

The NWSGWG identified habitat fragmentation and degradation, disturbance and direct mortality as major influences affecting sage-grouse (NWSGWG 2006). The group identified oil and gas development, vegetation management, invasive plants, and weather as those factors with the most influence on the northeast Wyoming sage-grouse populations and those that may most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming (NWSGWG 2006).

Existing Conditions

As described above, USFS lands on and adjacent to the general analysis areas for the North, South, and West Hilight Field LBA Tracts are dominated by a sagebrush-grassland community, primarily big sagebrush, with shrub cover ranging from 55 to 60 percent. Those areas provide potential year-round habitat for sage-grouse, though habitat quality varies. Sagebrush stands range from sparse to moderately dense throughout the areas, with only a marginal grassy understory in many areas.

Despite the prevalence of sagebrush in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts, sage-grouse numbers were never especially high in the area. Five sage-grouse leks are located on and within 2 miles of the North, South, and West Hilight Field tracts' general analysis areas: Stuart I, Stuart II, Black Thunder, Butch, and Hansen Lakes (Figures H-1, H-2 and H-3).

No sage-grouse leks are present on USFS lands in the North Hilight Field tract's general analysis area. Two leks are present on non-federal surface in the tract's general analysis area: Butch and Hansen Lakes. The Hansen Lakes lek is immediately south of USFS surface in that area (Figure H-1). The Hansen Lakes lek is classified as "occupied" by the WGFD (active in at least 1 of the last 10 years). The Butch lek was first recorded in 1990. The peak male count (15) occurred in 1991, after which numbers declined dramatically. No grouse were recorded at the Butch lek during annual checks conducted over

the last 14 years (1994 through 2007). The Butch lek is classified as "unoccupied/abandoned" by the WGFD (no activity for 10 consecutive years).

The Butch lek was discovered in 1990, and was active every year through 1993. The Hansen Lakes lek was discovered in 1993, coincidently at the same time peak male counts were dramatically declining at the Butch lek; the leks are approximately 1.5 miles apart. Peak male counts at the Hansen Lakes lek ranged from 14 to 24 birds from 1993 through 2000, but dropped markedly to only 3 birds in 2001. Grouse were present at the lek for the next 2 years, but no birds were observed there after 2003. No other grouse leks are present within 3 miles of the North Hilight Field tract's general analysis area. The next nearest lek is the Stuart II lek, approximately 4.1 miles southwest of the North Hilight Field tract's general analysis area (Figure H-1).

No sage-grouse leks are present on USFS lands in the general analysis area for the South Hilight Field LBA Tract or within that tract's 2-mile wildlife survey area (Figure H-2). Likewise, no lek sites have been documented on non-federal surface in South Hilight Field tract's general analysis area. The former Black Thunder lek was located on non-federal surface approximately 1 mile east of the South Hilight Field tract's general analysis area. The Black Thunder lek was first documented in 1984, when a peak male count of 21 was recorded. Grouse numbers gradually declined over the next several years of annual monitoring, with only one bird observed at the lek in 1993. No grouse were recorded at the Black Thunder lek during annual checks conducted over the subsequent 12 years (1994 through 2005), prior to any mine-related disturbance occurring within several miles. Due to the consistently low counts, WGFD authorized the mine to reduce searches for grouse leks in the permit area and 1-mile perimeter to every third year beginning in 2004 (i.e., 2004, 2007, etc.). That lek was classified as "unoccupied/abandoned" after 10 consecutive years of inactivity, and it was then impacted by topsoil stripping in 2007 and is now officially classified as "unoccupied/destroyed" by WGFD. The Stuart II lek is located on USFS lands approximately 3 miles northwest of the tract's general analysis area (Figure H-2).

The Stuart II lek lies within the general analysis area for the West Hilight Field LBA Tract (Figure H-3), and is the only lek on USFS lands in the combined wildlife survey areas for the three Hilight Field LBA Tracts. Two leks are present on non-federal surface in the vicinity of the West Hilight Field area. The Stuart I lek is approximately 1.25 miles west of the tract's general analysis area, and the next nearest lek is the former Black Thunder site, approximately 2.25 miles east of the tract's general analysis area (Figure H-3).

The Stuart I lek was first recorded in 1977. The peak male count (29) occurred in 1979, with reduced numbers in the subsequent 2 years. The lek was monitored by the WGFD at approximately 3-year intervals from 1982 through 2003; annual monitoring was conducted by private consultants for unrelated projects each year from 2004 through 2007. Grouse were observed at the lek during only 1 of the 11 survey years from 1982 through 2007. The last

sighting occurred in 1991, when two males were recorded at the Stuart I lek. The Stuart II lek was discovered in 1979. Few grouse were seen at the lek over the next 28 years, with a maximum of seven males observed in any survey year. The Stuart II lek was also surveyed primarily at 3-year intervals since its discovery, with annual checks conducted from 2005 through 2007. Because the two Stuart leks were not monitored annually, their management status is "undetermined", despite consistently low counts when surveys did occur.

Grouse counts at these five leks in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts were consistently low since their respective discoveries, with few birds observed at any location in the last 7 to 20 years, depending on the lek site. Additionally, records from the WGFD (obtained from D. Thiele, Regional Biologist, WGFD, Buffalo, Wyoming), and USFS have not documented any new sage-grouse leks within the approximately 131 square mile area that encompasses the combined wildlife survey areas for the three Hilight Field LBA Tracts. Telemetry data collected on radio-collared grouse at the nearby North Antelope Rochelle Mine throughout the last 7 years (2001-2007) shows no sage-grouse locations within several miles of the three Hilight Field LBA Tracts during that period (Brown and Clayton 2004, North Antelope Rochelle Mine Annual Wildlife Report 2006, 2007). It is important to note that the reduction in grouse attendance at these five leks, and most others in the PRB, preceded physical mining disturbance and, thus, cannot be directly attributable to mine-related activities (Orpet 2007, McKee 2007). Annual counts for each lek are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Annual surveys for sage-grouse broods were conducted in native and reclaimed stream channels at and around the Black Thunder Mine from 1994 through 1999; such surveys were no longer required by WGFD and WDEQ/LQD after that year due to the consistent lack of grouse broods at coal mines throughout the PRB. No new leks or broods were seen during recent baseline inventories conducted for the three Hilight Field LBA Tracts. All grouse broods that have been recorded over the years occurred as incidental sightings during other wildlife surveys.

Areas of suitable habitat for nesting and strutting grounds are widely known as necessary to sustain sage-grouse populations. One recent study suggests that availability of winter habitat may also affect sage-grouse populations (Naugle et al. 2006). Nesting and winter surveys for sage-grouse are not required as part of the annual wildlife programs for the Black Thunder Mine or other applicant mines discussed in this EIS, though winter surveys have been conducted as part of baseline inventories for previous mine expansions. Additionally, periodic winter surveys for other species (i.e., big game, bald eagle roosts) have occurred at all three applicant mines in recent years. Due to their proximity to existing mine permit areas, most USFS lands in the North and South Hilight Field tracts' general analysis areas, and those in the eastern half of the West Hilight Field tract's general analysis area, have been included in a minimum of

seven consecutive years (big game surveys 1993-1999) of some level of winter surveys, with additional surveys conducted in some subsequent years. No sage-grouse were ever documented in or near those LBA tracts during those winter surveys.

Direct and Indirect Effects

Three of the five sage-grouse leks located in the combined wildlife survey areas for the three Hilight Field LBA Tracts occur in an area likely to be disturbed by future mining, if the three proposed leasing actions are approved. One lek (Stuart II in the West Hilight Field tract's general analysis area) is on USFS lands and the other two (Hansen Lakes and Butch) are on non-federal surface in the North Hilight Field tract's general analysis area.

Due to the consistently low number of sage-grouse documented in these LBA tracts' wildlife survey areas over the last 3 decades, despite the presence of apparently suitable habitat, leasing and mining USFS lands and adjacent lands within the general analysis areas for the North, South, and West Hilight Field LBA Tracts would have limited effects on individual birds. Some potential impacts of mineral development (including coal mining and oil and gas development) on sage-grouse that might inhabit the area, as well as on known and potential sage-grouse habitat include: alteration of plant and animal communities; loss or degradation of important seasonal habitats; increased human activity and noise which could cause animals to avoid the area and/or reduce their breeding efficiency; increased road traffic and related injuries or mortalities; increased risk of predation from raptors perched on existing or future power poles and/or grouse avoidance of areas with overhead power lines; potential illegal harvest; and reduced water tables resulting in the loss of herbaceous vegetation. Following reclamation, there may be a long term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining. Sagebrush is a component of both the Sagebrush/Grassland and Big Sagebrush vegetation communities, which occupy approximately 55 to 60 percent of the combined vegetation analysis areas for the three Hilight Field LBA Tracts. WDEQ/LQD reclamation standards call for restoration of sagebrush on at least 20 percent of the reclaimed area. Estimates for the time it would take to restore shrubs, including sagebrush, to pre-mining density levels range from 20 to 100 years. Until sagebrush returns to its pre-mining density levels, a reduction in potential sage-grouse nesting habitat and winter habitat on the three Hilight Field LBA Tracts would persist.

Due to the documented long-term lack of sage-grouse use on USFS lands and adjacent lands in the North, South, and West Hilight Field tracts' general analysis areas and surrounding wildlife survey areas, USFS Standards and Guidelines (USFS 2002, page 1-18; Appendix D) would have limited applications toward controlling the type, timing, and location of disturbance activities within the three Hilight Field LBA Tract areas. The use of existing roads, when possible, could minimize additional impacts related to traffic hazards and the use of new travel corridors by mammalian predators. Raptor

predation does not seem to be a primary source of mortality for the local sage-grouse population (Brown and Clayton 2004). Nevertheless, new overhead power lines could be fitted with perch deterrents to limit opportunities for avian predators to target any grouse that might be in the area. The use of underground power lines to the extent possible would also reduce this risk, and would minimize new vertical structures that could affect grouse use or movements in the area. If precautions are taken to avoid direct mortalities and disturbances to nests and leks during the breeding season, grouse might have the opportunity to disperse away from mine activities.

Mine operations and oil and gas development have requirements for reclamation of disturbed areas as recovery of energy resources is completed. Those reclamation efforts can work in concert with Standards and Guidelines toward mitigating impacts to wildlife species and habitats, though reclamation standards are widely variable among industries. New areas disturbed by mining in the general analysis areas for the three Hilight Field LBA Tracts will be reclaimed incrementally, but they may not be attractive to sage-grouse for many years due to slow establishment and growth rates of important sagebrush species. Information gleaned from the multi-year telemetry study at a neighboring coal mine could also be helpful in reclamation efforts for the three Hilight Field LBA Tracts. In the meantime, the presence of known and apparently suitable sage-grouse habitat elsewhere within the immediate area could provide alternate areas for dispersing grouse to use until reclaimed sagebrush stands have matured adequately to support a local population.

In keeping with the Direction Objectives for the Hilight Bill Geographic Area (USFS 2002, page 1-25), impacts to sage-grouse habitat in the general analysis areas for the three Hilight Field LBA Tracts could be further mitigated off-site by efforts to preserve and enhance habitat on adjoining and nearby private lands, such as those currently under way through the Thunder Basin Grasslands Prairie Ecosystem Association. Management planning and processes that are developed through this combined effort among landowners and federal representatives will presumably provide suitable habitat for sage-grouse that disperse from the three Hilight Field LBA Tracts general analysis areas during the interim between habitat disturbance and completed reclamation.

Should sage-grouse move onto USFS lands analyzed in this EIS in the future, agency Standards and Guidelines would offer appropriate protections for the species and its important habitats. However, under the current conditions, and the documented absence or consistently low presence of this species in the area, mining USFS lands within the North, South, and West Hilight Field LBA Tracts would not adversely impact sage-grouse populations in the region, nor would it conflict with the current TBNG Plan or any future objectives to manage the area for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. The sage-grouse is a common year-round resident throughout much of the PRB and TBNG, but has declined on and within 2 miles of the general analysis areas for the North, South, and West Hilight Field LBA Tracts over the last 30 years. Three decades of regular monitoring have documented that sage-grouse have not consistently inhabited the USFS lands analyzed for the North or South Hilight Field LBA Tracts, nor have they been confirmed as occupying USFS lands analyzed for the West Hilight Field LBA Tract since 1991. Currently, the nearest lek (Payne lek) with regular activity is more than 5.0 miles to the southeast of the USFS lands in the South and West Hilight Field LBA Tracts. Consequently, if the North, South and West Hilight Field LBA Tracts are leased, anticipated mining-related disturbances would not affect any identified and actively used seasonal sage-grouse habitats on or near USFS lands in the combined general analysis areas for these three tracts. Annual monitoring will continue for the life of the Black Thunder Mine, and would include new permit expansions and a one-mile perimeter. Should sage-grouse be observed on USFS lands in any of the three Hilight Field LBA Tracts' wildlife survey areas, appropriate monitoring and mitigation measures would be implemented to minimize impacts to birds, habitats, and populations.

H-3.3.27 Bald eagle (Haliaeetus leucocephalus) Bald eagles occur throughout North America, from Alaska and Canada south to Florida, the Gulf Coast, and northern Mexico. The northwest coast of North America serves as the stronghold for this species, with approximately one-half of the population inhabiting Alaska.

The USFWS officially listed the bald eagle as an endangered species in 43 of the lower 48 states on July 4, 1976. The listing was due to a combination of several factors, including widespread habitat loss, negative effects of pesticide use on reproductive success, indiscriminant shooting, and others. The status of the bald eagle was downgraded to threatened throughout the lower 48 states in 1995. Bald eagle population trends began increasing throughout most of the species' range in the early 1990's, and it was proposed for de-listing in 1999.

On July 9, 2007, USFWS published a Federal Register notice (72 FR 37346) announcing that the bald eagle would be removed from the list of threatened and endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C 1531 *et* seq.) on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, will remain in place. The bald eagle is now recognized as a BLM and USFS Sensitive Species.

Bald eagles typically nest in large trees within a stand of mature, similarly sized trees either beside or in proximity (within 0.7 mile) to rivers, lakes, or

reservoirs that harbor adequate fish populations. Those areas tend to be remote and experience little disturbance (Johnsgard 1990). Typically, the nest is placed in the crown of a large cottonwood or pine, but if the topography allows, eagles will nest on cliff edges or escarpments. Open-canopied trees and snags provide required perches in nesting and foraging areas.

All verified bald eagle nests in northeastern Wyoming (BLM Buffalo Field Office GIS database) are situated in significant, mature cottonwood stands along larger streams or rivers (i.e., Tongue River, Powder River, Clear Creek, and Little Thunder Creek). Nesting attempts are rare on the TBNG (Beske 1994). Fish and waterfowl are the primary source of food for nesting bald eagles. Where available, large to mid-size carrion and large rodents (e.g., prairie dogs) can also be an important dietary component.

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant in the northeastern portion of the state. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004), and has often been documented during winter and early spring at nearby coal mines (various coal mine annual reports are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne). Most eagles that migrate through or winter in Campbell County roost communally in stands of large ponderosa pine, along wooded cottonwood-riparian corridors, or in isolated stands of large trees. As water is scarce in that region, especially during winter, those birds likely forage widely for lagomorphs or carrion.

Existing Conditions

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in the PRB, but only rarely nest in that region. Potential bald eagle nesting and winter roosting habitat, being primarily scattered stands of mature cottonwood trees, are present on USFS and adjacent lands along Little Thunder Creek, which flows through the general analysis areas for the South and West Hilight Field LBA Tracts; no streams flow through the North Hilight Field tract's general analysis area.

In general, the combined wildlife survey areas for the three Hilight Field LBA Tracts do not contain unique or sizeable concentrated prey sources (e.g., fisheries, waterfowl wintering areas) that would be expected to attract bald eagles. As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3).

Sheep and their lambs are present in this area in the spring, when bald eagles have typically left the region, and flocks are pastured there infrequently in the winter. The area does not support a large big game herd, though some groups do winter in the area.

Ground surveys for bald eagle winter roost sites were most recently conducted within the combined wildlife survey areas for the three Hilight Field tracts during baseline surveys beginning in 2006. Previous winter roost surveys also encompassed all or most potential habitat within that overall survey area. All winter roost surveys were conducted between ½ hour before and 1 hour after sunrise or between 1 hour before and ½ hour after sunset, per current BLM guidelines for survey timing and frequency. Biologists also watched for nesting bald eagles within the survey area while conducting surveys for other nesting raptors.

No bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the North Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began in the late 1970s and early 1980s, respectively. Similarly, no bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the South Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began during those same timeframes.

The BLM and USFS wildlife databases indicate that the nearest potential bald eagle nest was identified in 2003 in T.43N., R.71W., NE¼NW¼ Section 29, which is in the southwestern corner of the West Hilight Field tract's general analysis area (Figure H-3). Although the nest has been labeled as a bald eagle site for that year, the circumstances of the sighting were less than definitive. The lone observation of the nest was made from approximately 1 mile away late in the nesting season, when young golden eagles are fully feathered except for their heads. It is possible that an inexperienced observer could have mistaken a young golden eagle for an adult bald eagle under those circumstances. Additionally, golden eagles were confirmed nesters at the same site location in both 2002 and 2004. Nevertheless, the site could be treated as a potential bald eagle nest for management purposes.

Direct and Indirect Effects

As no winter roost sites or large groups of bald eagles have been documented in the general analysis area for any of the three Hilight Field LBA Tracts, potential impacts would be limited to occasional foraging individuals rather than a large segment of the population. The increased human presence and noise associated with construction activities, if conducted while eagles are wintering within the area, could harass or displace individual eagles during that period. Nesting eagles could also be distressed to the point of abandoning eggs or young, or their hunting efforts and success impacted. If necessary, the majority of direct effects could be mitigated by controlling the timing and

location of disturbance activities, and/or through approved nest relocation efforts.

Indirect effects include additional disturbance and fragmentation of already limited foraging habitat within the geographic area. These impacts could result from a variety of large- and small-scale activities described previously for other species, including, but not limited to: topsoil stripping; overburden and coal removal; reclamation activities; and construction of roads, reservoirs, power lines (above ground and buried), fences, and pipelines. The locations of operations would shift throughout the expanded permit area as mining occurred, with habitats disturbed and reclaimed incrementally. Conversely, the addition of fences and raptor-safe power poles could possibly benefit foraging bald eagles by providing additional perch sites. Due to the limited presence of potential nesting or roosting sites, and lack of concentrated sources of prey, the direct and indirect effects of the Proposed Action and Alternative 2 to bald eagles are expected to be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No bald eagle nests have been documented on or within 1 mile of the North or South Hilight Field LBA Tracts' general analysis areas, and only one dubious nesting event was recorded in the West Hilight Field LBA Tract's general analysis area over time. Bald eagle winter roost sites are absent from all three Hilight Field LBA Tracts' wildlife survey areas, and little potential nesting or roosting habitat is present. Therefore, potential hazards for this species would be limited to foraging individuals during winter. Disturbance, fragmentation, and alteration of potential foraging habitat would occur. However, the Black Thunder Mine has avoided, where possible, and mitigated raptor impacts in the past through intensive raptor monitoring, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests.

H-3.3.28 Mountain plover (*Charadrius montanus*) The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004). Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003d). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate

habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined and recent data suggests that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Existing Conditions

Mountain plovers are summer residents within portions of the TBNG. Most observations of mountain plovers in northeast Wyoming have been associated with prairie dog colonies. Approximately 86 percent of recently (since 1993) occupied mountain plover habitat in that region occurred within prairie dog colonies (Byer 2001). As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3).

As previously described for other short-grass species, the dominance of sagebrush in the North, South, and West Hilight Field LBA Tract's general analysis and wildlife survey areas provides only poor to marginal or unsuitable habitat for mountain plovers. The height and composition of vegetation on most USFS lands in the three Hilight Field tracts' general analysis areas is generally too tall and dense to provide suitable habitat for mountain plovers. The lack of occurrence of this species at the Black Thunder Mine and surrounding area, including all USFS lands in the analysis areas, is well documented. The nearest known population of nesting mountain plovers occurs at the Antelope Mine, approximately 9 miles south of the South Hilight Field tract's general analysis area, and even farther from the other two Hilight Field LBA Tracts.

Direct and Indirect Effects

The direct and indirect effects to mountain plovers in all three general analysis areas for the Hilight Field LBA Tracts would be the same as those described above for the McCown's longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the North, South, and West Hilight Field tracts' general analysis areas are dominated by sagebrush communities that are not attractive to short-grass species such as the mountain plover. No individuals

of this species have been documented in any of the three Hilight Field tracts' general analysis areas, though limited potential habitat is present there. Documented alternative habitats for mountain plovers are present in portions of the general area that are more appropriate for this species and are not currently scheduled for mining disturbance.

H-3.3.29 Loggerhead shrike (*Lanius ludovicianus*) Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan, and southern Manitoba, south to California and Florida, and east to southwestern Minnesota, southern Wisconsin, southern Michigan, and Maryland. This species is a common summer resident throughout Wyoming (Cerovski et al. 2004). Shrikes prefer relatively open, heterogeneous habitats characterized by grasses and forbs of low stature interspersed with bare ground and shrubs or low trees with perches for hunting. This species will use a wide variety of trees and shrubs, particularly thick or thorny species, as nesting substrates and hunting perches (Prescott and Bjorge 1999).

Although some shrike nests are used in subsequent years, fidelity to a nest site is limited. This species forages over relatively open habitats, feeding primarily upon arthropods, amphibians, small to medium-sized reptiles, small mammals, and birds (Yosef 1996). Shrikes may also feed upon road kill and carrion. This species is generally tolerant of human activity near a nest, although they will abandon if disturbed during egg-laying or early in incubation. The loggerhead shrike is declining in both number and overall range. Declines have been attributed to habitat loss and conversion, urbanization, pesticide contamination, and loss of insect prey as a result of pesticide use (Yosef 1996).

Existing Conditions

Loggerhead shrikes are common summer residents within the TBNG, though they are not often observed on or adjacent to USFS lands within the North Hilight Field LBA Tract. Shrikes have occasionally been seen in the 1-mile perimeter wildlife survey area for the adjacent Black Thunder Mine. No actual shrike nests or recently fledged young have been documented on or near USFS lands in the general analysis area for the North Hilight Field LBA Tract, but this species could potentially nest in the general vicinity. Over time, most sightings have occurred in cottonwood-riparian corridors along primary streams in the general Wright analysis area, or in taller greasewood stands. Neither habitat type is common in the general analysis area for the North Hilight Field LBA Tract. Shrikes have also been infrequently recorded perched on various fences or on overhead power lines at other nearby mines. Shrike foraging habitat is present throughout the North Hilight Field tract's general analysis area, including USFS lands. As indicated, existing utility and fence lines currently provide good quality hunting perches.

Direct and Indirect Effects

Implementation of the Proposed Action or Alternatives could result in direct and indirect impacts to loggerhead shrikes, though such impacts would likely be uncommon. No known nest sites have been documented on or adjacent to

USFS lands in the North Hilight Field tract's general analysis area or elsewhere in the wildlife monitoring area for the adjacent Black Thunder Mine. The most probable direct impact would be the mortality of, or injury to, individuals foraging within or passing through the USFS lands due to collisions with future mine-related vehicles, or dispersal of foraging individuals due to active mining.

The relatively slow movement of mining equipment and the noise associated with the activity would decrease direct impacts associated with vehicle collisions. As loggerhead shrikes are not especially common in the North Hilight Field tract's general analysis area, indirect impacts would be limited despite the fragmentation, degradation, or loss of habitat in the short and mid-term. Any birds that would be displaced would be forced to travel to other locations with acceptable habitat. This could result in stress to individual birds, as well as potential decreased nesting effort and success. Prey numbers reduced by mining would be expected to rebound following reclamation due to generally high reproductive potential and prey tendencies to re-establish and adapt to disturbed and reclaimed areas. The locations of mine-related habitat disturbances and reclamation efforts would proceed incrementally throughout the expanded mining area as operations progressed. Additionally, this mining activity would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for this species. USFS Standards and Guidelines would offer additional protections for any active nest sites that may be present in the area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Such impacts would be minimized by the lack of regular sightings and known nesting attempts, as well as the relative paucity of suitable nesting habitat on or adjacent to the USFS lands analyzed in this EIS and their surrounding region. Degradation, fragmentation, or loss of potential foraging habitat, reduction in prey populations, and potential collisions with vehicles may occur. Given the lack of birds recorded in the area, and the composition of the shrike's prey base (insects, small mammals, etc.), impacts to shrikes would be minimal. USFS Standards and Guidelines would apply for active nests during the breeding season. Additionally, mining the USFS lands would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for loggerhead shrikes.

H-3.3.30 Brewer's sparrow (*Spizella breweri*) The breeding range of the Brewer's sparrow extends from southwestern Yukon, southern Alberta, and southwestern Saskatchewan, south (east of the Cascades and Sierras) to southern California, central Arizona, and northern New Mexico (Rotenberry et al. 1999). The Brewer's sparrow is a common summer resident of the basin-prairie and mountain-foothills throughout Wyoming (Cerovski et al. 2004). Brewer's sparrow is a sagebrush obligate species (Rotenberry et al. 1999).

This species is an uncommon cowbird (*Molothrus ater*) host and typically builds a small cup nest low in sagebrush shrubs. Brewer's sparrows prefer to nest in medium-sized (48-90 centimeters, or 19-35 inches) live sagebrush within relatively dense (26-42 percent canopy cover) stands (Walker 2004). Grass height and density are important factors for nest concealment. Although tolerant of human visitation, this species may abandon a nest if disturbed during the construction process.

Brewer's sparrows feed primarily on small insects and, to a lesser extent, seeds from grasses and forbs. Throughout areas where they have been surveyed, the species appears to have undergone and continues to undergo statistically significant declines (Rotenberry et al. 1999). Major threats to Brewer's sparrow populations are similar to those faced by other declining sagebrush-obligate species and include habitat conversion and fragmentation, invasion by non-native plants, altered fire regimes, livestock overgrazing, conifer encroachment, energy development, and conversion to urban or residential housing (Walker 2004).

Existing Conditions

Brewer's sparrows are common summer residents within the TBNG and southern Campbell County (Cerovski et al. 2004). Breeding bird survey data from annual monitoring and baseline studies conducted for the Black Thunder Mine, and incidental observations over time, have shown that the Brewer's sparrow is a common but limited breeder in the area. This species has been recorded in sagebrush habitats near the mine during many of the last 14 years (1994-2007). Although no nests have been encountered in the general analysis area for the North Hilight Field LBA Tract, the presence and behavior (singing) of birds throughout spring and summer suggest that Brewer's sparrows nest in the sagebrush stands common to that area.

Direct and Indirect Effects

As described for the ferruginous hawk, above, habitat loss, degradation, and fragmentation of sagebrush communities in the general analysis area for the North Hilight Field LBA Tract would result from a variety of large- and small-scale mining operations such as topsoil stripping, drilling, and reservoir construction, among others. Potential nesting and foraging habitat would also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances and reclamation efforts would shift throughout the expanded permit area as operations progress.

The use of existing roads, when possible, could minimize impacts related to traffic hazards and predator travel corridors. Increased activity and noise, especially during the nest initiation period, could inhibit nesting proximate to mining activities. Foraging could also be hindered within these areas, especially where active mining occurs. Additional infrastructure and activity associated with the expansion of the mine, in combination with other ongoing disturbances (e.g., CBNG operations), could displace Brewer's sparrows from any historical use areas that might occur in the area. Those birds could potentially move into other sagebrush stands in the general vicinity, assuming they are not already occupied.

Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine and will eventually mitigate impacts to sagebrush habitats to some degree, though such efforts could take decades to benefit sagebrush obligates such as the Brewer's sparrow. Impacts to sagebrush habitat on USFS lands could be further mitigated off-site by efforts to preserve and enhance such habitat on adjacent and nearby private lands, as described above. Standards and Guidelines for sagebrush habitats outlined in the TBNG Plan (USFS 2002, pages 1-18; Appendix D) would be implemented as necessary, and could serve to sustain regional populations of this sparrow. Those management guidelines would apply only to activities beyond the North Hilight Field LBA Tract.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Some habitat loss, degradation, and fragmentation would occur on and near USFS lands in the general analysis area for the North Hilight Field LBA Tract, along with potential impacts to individuals. However, the presence of large stands of sagebrush elsewhere in the general vicinity suggests that Brewer's sparrows would remain viable within the TBNG for at least the short-term. Additionally, the Proposed Action or Alternative 2 would not conflict with the current TBNG Plan (USFS 2002) or future objectives to manage the area for this species. Application of appropriate USFS Standards and Guidelines, successful reclamation efforts, and proper land management on adjoining lands could mitigate potential impacts, to some degree.

H-3.4 South Hilight Field LBA Tract

H-3.4.1 Prairie moonwort (*Botrychium campestre*) The prairie moonwort, a sensitive plant species, has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species was only recorded in Wyoming in a semi-shady mixed deciduous and ponderosa pine forest on sandy soils in the Black Hills. Prairie moonworts are known to exist in a variety of other habitats such as those underlain by Pierre shale, the Laramie Formation, calcareous sedimentary rocks, calcareous soils underlain by limestone, sandy soils and loess prairie.

These habitats are generally limited on the South Hilight Field general analysis area, with only some areas dominated by sandy soils present.

Existing Conditions

Prime habitats for the prairie moonwort are not present on the USFS lands within the general analysis area for the South Hilight Field tract. Sites with sandy soils are present on USFS lands and other portions of the general Wright analysis area, but these areas are rather sparsely vegetated and do not provide habitat preferred by this plant species. Prairie moonworts have not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is very low.

H-3.4.2 Narrowleaf moonwort (*Botrychium lineare*) The narrowleaf moonwort, a sensitive plant species, has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species has an affinity for riparian areas and is associated with spruce/fir forests, lodgepole pine forests, and forest meadows.

Existing Conditions

Habitats for the narrowleaf moonwort are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The narrowleaf moonwort has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the

planning area. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is very low.

H-3.4.3 Leathery grapefern (*Botrychium multifidum* var. *coulteri*) The leathery grapefern, a plant species of local concern, has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for meadows, wetlands, floodplains and other wet areas in open to forested habitats within forests.

Existing Conditions

Habitats for the leathery grapefern are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The leathery grapefern has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the leathery grapefern. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.4 Foxtail sedge (*Carex alopecoidea*) The foxtail sedge, a sensitive plant species, is a perennial plant species and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. The foxtail sedge generally has an affinity for wet meadows and willow-sedge communities along wet, shady creek bottoms and springs.

Existing Conditions

Habitats for the foxtail sedge are not present on the USFS lands within the general Wright analysis area. Suitable wet meadows or willow-sedge communities are not present on these USFS lands. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The foxtail sedge has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *should have no impact* on the foxtail sedge. As indicated, the general analysis area for the South Hilight Field does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is not expected.

H-3.4.5 Elliptic spikerush (*Eleocharis elliptica*) The elliptic spikerush, a sensitive plant species, is a perennial and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for wetland areas created by seeps or springs but may also be found in temporarily flooded areas.

Existing Conditions
Habitats for the elliptic spikerush are not present on the USFS lands within the general Wright analysis area. Suitable wetland habitats are not present on these USFS lands. Few wetland sites associated with various ephemeral drainages and playas are present on portions of the general Wright analysis area, but these sites do not appear to provide optimum habitat for this species. The elliptic spikerush has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to lack of abundant suitable habitat the impacts to this species overall would be minimal.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field does not provide abundant habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.4.6 Hall's fescue (*Festuca hallii*) The Hall's fescue, a sensitive plant species, is a tufted perennial grass and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for montane meadows, slopes and edges of open coniferous woods and meadows above 6,000 feet in Wyoming.

Existing Conditions

Habitats for the Hall's fescue are not present on the USFS lands within the general Wright analysis area. Suitable montane habitats above 6,000 feet are not present on these USFS lands within the general Wright analysis area, and the Hall's fescue has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the Hall's fescue. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is not expected.

H-3.4.7 Wood lily (*Lilium philadelphicum*) The wood lily, a plant species of local concern, is a perennial herb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for woodland meadows and woodland grasslands.

Existing Conditions

Habitats for the wood lily are not present on the USFS lands within the general Wright analysis area. Suitable woodland meadow or grassland habitats are not present on these USFS lands within the general Wright analysis area, and the wood lily has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the wood lily. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.8 Largeflower triteleia (*Triteleia grandiflora*) The largeflower triteleia, a sensitive plant species, is a perennial herb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity

for grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and in pinon-juniper woodlands to pine forests and hills.

Existing Conditions

Habitats for the largeflower triteleia are not present on the USFS lands within the general Wright analysis area. Suitable grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and pinon-juniper woodlands or pine forests and hills are not present on these USFS lands within the general Wright analysis area, and the largeflower triteleia has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the largeflower triteleia. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.9 Barr's milkvetch (*Astragalus barrii*) The Barr's milkvetch, a sensitive plant species, is a matt-forming perennial forb that is known from numerous occurrences on the USFS lands within the TBNG. As more surveys are completed, new occurrences are reported. The Barr's milkvetch is found primarily on dry, sparsely-vegetated rocky prairie breaks, knolls, hillsides and ridges. Parent material is calcareous soft shale, siltstone or silty sandstone. Most populations appear to be stable, although populations may decline under drought conditions.

Existing Conditions

Astragalus barrii is a regional endemic plant of the plains in southwestern South Dakota, eastern Wyoming, southeastern Montana, and northwestern Nebraska. According to USFS, this plant species is known to occur in six counties in Wyoming, and there are eleven known occurrences of *A. barrii* in the USFS TBNG.

Suitable habitat for the Barr's milkvetch is present on the USFS lands within the general analysis area for the South Hilight Field LBA Tract as well as other lands within the general Wright analysis area. Populations and individuals have not been documented in the general Wright analysis area, but have been identified in surrounding areas. A pedestrian survey of the tract's general analysis area was conducted in April 2008, when the Barr's milkvetch is in bloom, and no individuals of this species were found. Barr's milkvetch has been collected and positively identified approximately 15 miles south of the general analysis area for the South Hilight Field LBA Tract, in the Section 21 of

T.40N., R.71W., based on specimens on file with the Rocky Mountain Herbarium in Laramie, Wyoming.

Indirect and Direct Impacts

If lands within the general analysis area for the South Hilight Field LBA Tract are leased and mined, potential habitat, individuals, and *A. barrii* populations could be lost due to surface disturbances caused by mining activities. These losses would most likely be permanent unless disturbed lands are reclaimed to habitats that would support this plant species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing* because there are *Astragalus barrii* occurrences outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.4.10 Smooth goosefoot (*Chenopodium subglabrum*) The smooth goosefoot, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for sand bars and sandy blowouts in riparian areas.

Existing Conditions

Habitats for the smooth goosefoot are not present on the USFS lands within the general Wright analysis area. Suitable riparian areas are not present on the USFS lands within the general Wright analysis area. A few riparian areas associated with various ephemeral drainages are present on portions of the general Wright analysis area, but these areas do not contain the required sand bar or sandy blowout habitats required for this plant species. The smooth goosefoot has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the smooth goosefoot. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.11 Flat-top goldentop (*Euthamia graminifolia*) The flat-top goldentop, a plant species of local concern, is a rhizomatous perennial forb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring

on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for stony sandbars and streambanks but may also be found on moist or drying sites along open streambanks or roadside ditches.

Existing Conditions

Habitats for the flat-top goldentop are not present on the USFS lands within the general Wright analysis area. Suitable wetland or streambank areas are not present on the USFS lands within the general Wright analysis area. Streambanks and a few wetland areas in association with various ephemeral drainages are present within portions of the general Wright analysis area, but these areas generally do not contain the typical habitats required for this plant species, but marginal habitats are present. The flat-top goldentop has not been recorded on the general Wright analysis areas or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.4.12 Rosy palafox (*Palafoxia rosea* var. *macrolepis*) The rosy palafox, a plant species of local concern, is an annual forb that has not been documented on USFS lands within the South Hilight Field general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for sagebrush and mixed-grass prairie habitats on sandy soils.

Existing Conditions

Habitats utilized by the rosy palafox are present on the USFS lands within the general Wright analysis area and on other surrounding lands. Sagebrush and mixed-grass prairie plant communities are present on sandy soils in the general Wright analysis area. However, rosy palafox has not been recorded on these lands but is potentially present. This plant species has been documented southeast of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the South Hilight Field tract, and the fact that this

plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does contain some suitable habitat for this plant species but the rosy palafox has not been documented. This species has been documented southeast of the general Wright analysis area and abundant habitat is present on other sites that would not be affected

H-3.4.13 Lemonscent (*Pectis angustifolia*) The lemonscent, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the South Hilight Field general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for gravel hills and scoria slopes. Lemonscent is also known to occur in low areas in sandy ravines and on sandbars.

Existing Conditions

Habitats utilized by lemonscent are present on the USFS lands within the general Wright analysis area and on other surrounding lands. However, lemonscent has not been recorded in the general Wright analysis area but could potentially be present. This plant species has been documented south of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the South Hilight Field tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does contain some suitable habitat for this plant species but the lemonscent has not been documented. This species has been documented south of the general Wright analysis area and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.4.14 Larchleaf beardtongue (*Penstemon laricifolius* spp. *exifolius*)
The larchleaf beardtongue (penstemon), a plant species of local concern, is a perennial forb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry, rocky, gravelly or sandy slopes, ridgetops and upland flats with shallow soils. Most populations in Wyoming are found at elevations above 6,000 feet, but this species has been documented at lower elevations in the state.

Existing Conditions
Habitats utilized by larchleaf beardtongue are marginally present on the USFS lands within the general Wright analysis area. A few rocky, gravelly hill slopes and rough breaks provide potential habitat, but the larchleaf beardtongue has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does contain marginal habitat for this plant species but the larchleaf beardtongue has not been documented. This species has been documented and is common in southern Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.4.15 Wooly twinpod (*Physaria didymocarpa* var. *lanata*) The wooly twinpod, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry redbed clay-shale slopes, limey-sandstone outcrops, roadcuts and other exposed rock-cliff substrates. Most populations in Wyoming have been documented in the foothills of the Big Horn Mountains.

Existing Conditions
Habitats utilized by the wooly twinpod are marginally present on the USFS lands within the general Wright analysis area. A few sandstone outcrops and exposed rock-cliff substrates provide potential habitat, but the wooly twinpod

has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Hilight Field tract does contain marginal habitat for this plant species but the wooly twinpod has not been documented. This species has been documented and is common in north-central Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.4.16 Visher's buckwheat (*Eriogonum visheri*) The Visher's buckwheat, a sensitive plant species, has not been documented on USFS lands within the South Hilight Field general analysis area but has been tentatively identified elsewhere within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for gullied ridges and eroded badland hills. These sites generally consist of barren shale and clay outcrops with at least 50 percent bare soil, high salt content and shrink/swell clay soils. Typical habitat includes badland islands in grasslands.

Existing Conditions

Habitats for the Visher's buckwheat are not present on the USFS lands within the general Wright analysis area. A few areas of highly eroded gullies consisting of barren shale or clay outcrops may be found in portions of the general Wright analysis area, but these sites do not appear to provide suitable habitat for this species. The Visher's buckwheat has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the Visher's buckwheat. As indicated, the general analysis area for the South Hilight Field tract does not provide optimum suitable habitat for this

plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.17 Highbush-cranberry (*Viburnum opulus* var. *americanum*) The highbush-cranberry, a sensitive plant species, has not been documented on USFS lands within the South Hilight Field general analysis area or within the TBNG. In Wyoming, this plant species is found within Crook County and is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for moist sites including wooded hillsides, thickets or low woodlands. The highbush-cranberry is found all across northern North America.

Existing Conditions

Habitats for the highbush-cranberry are not present on the USFS lands within the general Wright analysis area. Suitable moist, wooded habitats are not present on these USFS lands within the general Wright analysis area. The highbush-cranberry has not been recorded within the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the highbush-cranberry. As indicated, this species has not been documented in the general Wright analysis area and the general analysis area for the South Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.4.18 Northern leopard frog (*Rana pipiens*) Northern leopard frogs range from the Great Slave Lake and Hudson Bay, south to Kentucky and New Mexico (NatureServe 2007). This species is considered relatively common within Wyoming (Baxter and Stone 1980, Cerovski et al. 2004). Northern leopard frogs require shallow, permanent, or semi-permanent standing water with at least some emergent vegetation for breeding (Wagner 1997). Conversely, they use deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom as overwintering habitat (Wagner 1997). Leopard frogs must have good quality water to successfully reproduce, as degraded or turbid water has the potential to negatively affect development of eggs and tadpoles. Overcrowding and changes in water temperature and pH (5.5 or lower) can increase the incidence of disease and mortality (NatureServe 2007) in this species. Adult frogs feed upon a variety of insects and other invertebrates, tadpoles, snakes, and fish (Cerovski et al. 2004), while tadpoles feed primarily upon small invertebrates, plant tissue, and organic debris. Adults also forage within aquatic and upland habitats, whereas tadpoles are restricted to aquatic habitats. Although their overall range remains essentially

undiminished in size, many populations are declining. Major factors affecting leopard frog populations are habitat loss in some portions of their range, habitat degradation, overexploitation, interactions with non-native species, climate change, disease, and other unknown causes (Wagner 1997).

Existing Conditions

The northern leopard frog has been observed in southern Campbell County, but has not officially been recognized as breeding there (Cerovski et al. 2004). Although formal anuran surveys were not required or conducted at the adjacent Black Thunder, Jacobs Ranch, or North Antelope Rochelle mines, annual monitoring efforts for other species conducted in overlapping survey areas from 1983 through 2007 have not revealed the presence of northern leopard frogs or anuran egg masses on USFS lands or elsewhere within the general analysis area for the South Hilight Field LBA Tract. Those surveys occurred during all seasons, with biologists watching and listening for northern leopard frogs and other herptiles while conducting all other surveys throughout the area. It is unlikely that northern leopard frogs would have remained undetected during multiple surveys conducted during that long-term period if they were present in the area. Results from annual wildlife monitoring and baseline studies for the three mines are on file with, and available from, the WDEQ/LQD in Sheridan or Cheyenne, Wyoming and USFS Douglas Ranger District; those reports also include detailed descriptions of survey areas (including maps), methods, and dates for each year.

Habitat conditions on USFS and non-USFS lands within the tract's general analysis area are classified as poor potential to unsuitable, as there are only limited seasonal water sources available. No permanent or semi-permanent waters are present anywhere on those USFS lands. Little Thunder Creek passes through USFS lands within the South Hilight Field tract. In its natural state, this ephemeral stream is typically dry by mid to late summer, and without flow to maintain open water, any pools persisting until winter freeze solid, thus limiting overwintering habitat for this species. Like Little Thunder Creek, all other drainages throughout the tract's general analysis area are ephemeral in nature and only carry water during or immediately following high intensity precipitation events, resulting in low quality or unsuitable habitat conditions for this frog species. Water discharged from CBNG wells has enhanced the water supply within some portions of Little Thunder Creek and its tributaries, which has increased potential habitat for some aquatic and semi-aquatic species. However, those enhanced areas are still relatively limited and/or isolated in nature. Water levels in drainages are typically too temporary and/or shallow to support tadpoles until metamorphosis, or allow frogs to successfully overwinter, respectively. The general lack of emergent vegetation near temporary water bodies limits their value to northern leopard frogs.

Direct and Indirect Effects

Wetland and aquatic habitats for northern leopard frogs are considered very poor to unsuitable on USFS lands and elsewhere in the general analysis area

for the South Hilight Field LBA Tract, as described above. Furthermore, no frog sightings have been recorded on USFS lands during baseline surveys or annual monitoring completed between 1983 and 2007. Consequently, northern leopard frogs and their aquatic and terrestrial habitats are not expected to be impacted if the USFS lands in this LBA Tract were leased. In the unlikely event that this species is present in the future, direct loss of, or injury to, foraging and dispersing frogs could result from encounters with mine vehicles or heavy equipment during topsoil stripping or other surface disturbance near Little Thunder Creek, although such risks are minimal due to the lack of frog sightings to date.

It is possible that existing reservoirs and ponds (natural and those enhanced by CBNG discharge water), and those created for flood control, sedimentation, water storage purposes, or wetland mitigation measures could provide suitable foraging or breeding habitat for northern leopard frogs in the future. However, most artificial water structures would still be limited to relatively shallow, seasonal waters with little emergent vegetation that would not provide for the year-round habitat needs of this frog species. Should those efforts result in improved aquatic habitats, adult frogs, tadpoles, and/or egg masses present in the area could be injured or killed during activities associated with additional construction of diversion dikes or associated channels, or the dewatering of potential habitats downstream of a dike. Under those limited circumstances, potential impacts could include loss of individuals and foraging habitat, increased predation, and changes in stream morphology and hydrology. Standard mining procedures such as the use of silt barriers across affected stream channels and other similar efforts would minimize any negative impacts that might result from mine-related operations. Likewise, adherence to the Thunder Basin National Grassland Plan Standards and Guidelines (USFS 2002) pertaining to water and wetlands would ensure that leopard frogs and other aquatic organisms present on USFS lands would not be negatively affected by increased sedimentation, degraded water chemistry, or otherwise damaged aquatic habitats.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, USFS lands and adjacent non-federal lands within the South Hilight Field general analysis area do not contain suitable habitat for northern leopard frogs. Water sources in the drainages in that area are too temporary and shallow to support tadpoles until metamorphosis, or to allow frogs to successfully overwinter. If present, individual adult leopard frogs may be incidentally killed by vehicles or equipment. Habitat may be enhanced or created during certain mine operations, but water flow and depth associated with existing structures at the adjacent Black Thunder Mine have not resulted in adequate conditions to support the life cycle needs of this species, and they are not expected to create those conditions anywhere in this LBA tract. As no northern leopard frogs have ever been documented on USFS lands within the overall general analysis area for the South Hilight Field LBA Tract, potential

effects are expected to be negligible, if they occur at all. Furthermore, northern leopard frogs have been documented at other sites outside of the tract's general analysis area that will not be affected by coal leasing actions.

H-3.4.19 Black-tailed prairie dog (*Cynomys ludovicianus*) The black-tailed prairie dog was removed from the USFWS federal listing process in 2004. The agency ruled that listing this species may be warranted, but was precluded by higher priority considerations. Consequently, the black-tailed prairie dog is no longer considered a candidate species under the Endangered Species Act (ESA).

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). The TBNG, which includes USFS lands in the general analysis area for the South Hilight Field LBA Tract, harbors one of the seven major colony complexes remaining in North America. Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. This species has the ability to rapidly expand its distribution and population if not limited by pest control practices or disease, and will readily spread into recently disturbed areas. Many species such as the black-footed ferret, mountain plover, burrowing owl, and swift fox are dependent on prairie dogs during a portion of their life cycle. Black-tailed prairie dog occupied range and abundance has declined dramatically, and continues to exhibit a slow decline (NatureServe 2007). Major factors contributing to the decline include disease (sylvatic plague), urbanization, habitat conversion, and control efforts.

Existing Conditions

A total of seven prairie dog colonies (approximately 177.2 total acres) were found within 2 miles of the general analysis area for the South Hilight Field LBA Tract in 2007, four of which were present on USFS lands. One colony (approximately 0.1 acre in size) on USFS lands was in the general analysis area itself, while the other three colonies on USFS lands were in the surrounding 2-mile perimeter, and ranged in size from 7.7 to 89.1 acres, for a total of approximately 118 acres. Three additional prairie dog colonies were recorded on non-federal surface within or overlapping the 2-mile wildlife survey area (Figure H-2) in 2007, all three of which were outside of the tract's general analysis area. The total area for those three colonies was approximately 59 non-contiguous acres, and the sizes range from about 2 to 54 acres.

Only the 89.1-acre colony meets the 80-acre minimum for black-footed ferret habitat (USFWS 1989). As noted above, that colony is not on USFS lands nor is it within the general analysis area for the South Hilight Field LBA Tract. However, the focus area for ferret reintroduction efforts is outside the coal mine region of the PRB of northeast Wyoming (refer to Management Area 3.63) (USFS 2002, Grenier 2003). That coal region includes all USFS and surrounding

lands within the general analysis area for the South Hilight Field LBA Tract. Additionally, some prairie dog colonies in that coal region were recently infested with the plague, while others are currently exposed to year-round disturbance associated with conventional oil and gas, CBNG, and coal (including open pits) resources, as well as seasonal recreational shooting and vehicular travel.

Direct and Indirect Effects

The current mining plans for the Black Thunder Mine does not project any new surface disturbance in the one prairie dog colony that is located within the general analysis area for the South Hilight Field LBA Tract. Nevertheless, that colony would be affected by the proposed leasing action at some point in time. As stated above, that very small colony (approximately 0.1 acre in size) is located on USFS lands. Such impacts could have immediate results on prairie dogs if an occupied colony is suddenly subjected to the effects of a soil salvage operation, or is otherwise impacted in a short timeframe that precludes the dispersal of individuals prior to surface disturbance. However, as those activities typically occur incrementally across various portions of future mining areas, some individuals could disperse to undisturbed portions of the affected colony, or create one or more new colonies within the area.

Smaller-scale disturbances associated with both the mining and CBNG industries can also impact prairie dog colonies and surrounding vegetation through fragmentation or loss of foraging and burrowing habitat. Linear disturbances associated with mining infrastructure, such as roads, power lines, fences, and pipelines will occur within narrow corridors over relatively short distances, and would be completed within shorter timeframes than the advancement of a surface mine pit. However, such disturbances would still pose some level of risks due to vehicular collisions or by enhancing habitat for mammalian and avian species that prey on prairie dogs.

Some linear impacts could be minimized or mitigated through the consolidation of roads and electric utilities within common corridors, applying perch deterrents on overhead power poles, and reseeding pipeline disturbances quickly with appropriate seed mixes for the region. Minor surface disturbance near existing colonies would provide recently upturned soils that could facilitate the expansion of the existing colonies or the establishment of new ones, as prairie dogs will readily move into recently disturbed areas. Post-mining reclamation could have similar potential benefits; prairie dogs have already demonstrated their ability to inhabit reclaimed lands at the nearby Antelope Mine (BLM 2008).

All USFS Standards and Guidelines applicable to black-tailed prairie dogs outlined in the TBNG Plan (USFS 2002, page 1-20) would be implemented. To reduce risks and habitat loss for prairie dogs and other wildlife species closely associated with prairie dog colonies, new roads will be aligned outside colony boundaries where possible. If it is necessary to place a new road within a prairie dog colony, the amount of road in the colony will be minimized to the extent that soil, drainage, topographical and other physical factors will allow.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Only one of the seven black-tailed prairie dog colonies within the wildlife survey area for the South Hilight Field LBA Tract would be physically disturbed by mining activities within the tract's general analysis area, if the lease is issued. That colony encompassed less than 1 acre in 2007, and it was on USFS lands. Given the fact that six of the seven colonies within the wildlife survey area for the South Hilight Field LBA Tract were outside of the general analysis area (area of potential surface disturbance) associated with this proposed lease, the tendency of prairie dogs to disperse and expand their boundaries, and the incremental nature of surface coal mining relative to some other disturbance activities, the potential impacts to prairie dog colonies on and near USFS lands in the South Hilight Field LBA Tract would not have adverse consequences for the viability of the local or regional population. Disturbance and reclamation efforts will occur incrementally in varying locations throughout the permit area as mining progresses through the approved lease.

H-3.4.20 Swift Fox (*Vulpes velox*) The swift fox was removed from the USFWS federal listing process in 1995, after extensive field surveys demonstrated that the population was greater than expected. This species is considered to be common within the eastern Great Plains grasslands of Wyoming (Cerovski et al. 2004), though it typically occurs at very low densities. The exact status of the population is unknown but believed to be increasing, especially in the Northern Plains. Swift foxes are largely nocturnal and typically prefer flat to gently rolling, short- or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). This species uses multiple den sites year-round for shelter, protection from predators, and rearing young. Burrows of other mammals such as badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), and prairie dogs are often used or modified for those purposes. Small to mid-sized mammals constitute the bulk of their diet. Swift foxes have little fear of humans and may den in proximity to human disturbances (residences and busy roadways). This tolerance also makes them susceptible to trapping, vehicle collisions, and attacks by dogs. Major threats faced by the swift fox include habitat loss and degradation, interspecific competition with red fox and coyote (*Canis latrans*), and vehicle collisions.

Existing Conditions

Swift fox have been observed in large grassland blocks in southern Campbell County with more frequency in recent years, and are presumed to breed there. This species has also been documented within the overall TBNG. However, sagebrush communities dominate the general analysis area for the South Hilight Field LBA Tract, as well as USFS lands in that area. The prevalence of sagebrush throughout the tract's wildlife survey area largely explains the extremely limited sightings of this grassland fox over the last 25 years, as described below. Burrows within the existing black-tailed prairie dog colonies

and scattered badger or red fox burrows could be used by swift foxes as den or shelter sites, and swift fox could forage in the area.

No specific surveys for swift fox were conducted for this analysis. However, such efforts were completed in 2002 using USFS survey protocols for other unrelated projects. Those surveys occurred within 2 miles of USFS lands in the South Hilight Field tract's wildlife survey area, and within 3.5 miles of the tract's general analysis area. Nocturnal spotlight surveys for rabbits and hares were conducted as part of annual wildlife monitoring at adjacent existing mines every year since at least 1994, with diurnal surveys for a variety of vertebrate species occurring across all seasons annually since the early 1980s. All of those survey efforts overlapped significant portions of the South Hilight Field tract's wildlife survey area.

Despite those combined efforts, only one swift fox has ever been recorded on USFS lands in the South Hilight Field tract's general analysis area during annual monitoring and other surveys conducted over the last 25 years. One sighting was made along Little Thunder Creek between 1995 and 1997 in T.43N., R.71W., SE¼ Section 23 (USFS 2003). A lone fox was also observed on adjacent lands in T.43N., R.71W., SW¼ Section 14 during that period. No swift foxes have been recorded elsewhere in the overall Black Thunder Mine annual monitoring area since surveys began in 1983.

Few other swift fox sightings have been recorded elsewhere within the surrounding region during specific surveys or incidental to other searches at local mines over the last 25 years. Those efforts were conducted as part of annual wildlife monitoring by contract and USFS biologists on private and federal lands in the area. One swift fox was documented approximately 4 to 6 miles south of USFS lands within the general analysis areas for the South Hilight Field LBA Tract in March 2002. The fox was observed in T.42N., R.70W., SE¼ Section 15 during spotlight trapping efforts for sage-grouse at the nearby North Antelope Rochelle Mine. The nearest other sighting occurred in T.43N., R.72W., SE¼ Section 20 between 1995 and 1997, approximately 8 miles west of USFS lands in the South Hilight Field tract's general analysis area. Reports from all annual monitoring and special studies are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Direct and Indirect Effects

Due to the overall poor quality habitat conditions on USFS and adjacent lands in the South Hilight Field LBA tract's general analysis area, and the lone sighting of a swift fox in that area over the last 25 years of annual monitoring (including spotlight searches for other species), no direct or indirect impacts are anticipated for this species. Given these circumstances, species-specific Standards and Guidelines outlined in the TBNG Plan (USFS 2002, page 1-20) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Habitat conditions in the South Hilight Field tract's general analysis area are considered poor quality due to the prevalence of sagebrush shrublands and limited presence of grassland expanses. The only swift fox observation ever recorded on USFS in the South Hilight Field Tract occurred along a creek channel 11 to 13 years ago, despite annual monitoring surveys in all or most of those areas during and subsequent to that time. Only one other observation of a swift fox has been recorded in the tract's wildlife survey area during that period, although it was outside of the tract's general analysis area. Furthermore, sufficient suitable habitat (grasslands) is present elsewhere within the general vicinity that could sustain swift foxes as project activities disturb the general analysis area for this LBA tract. Existing and future reclaimed grasslands will create or enhance potential swift fox habitat once mining has been completed in the tract.

H-3.4.21 Long-billed curlew (*Numenius americanus*) Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California, and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003a). The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Cerovski et al. 2004). Curlews are ground nesters, and require large open expanses of grassland, with relatively low vegetation and few shrubs in which to nest (Hill 1998). The nest is typically a shallow scrape or depression, thinly lined with grass, weeds or cow dung, typically near water or moist areas.

Curlews use historically occupied sites each year, and some individual birds may reuse the same territories from year to year (Dechant et al. 2003a). Curlews primarily feed upon insects but also eat other invertebrates, small crustaceans, toads, and eggs and nestlings of other birds. This species forages in grasslands, wet meadows, prairie dog colonies, and occasionally along the margins of wetlands. Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998). Although some populations may be declining, overall population trends suggest long-billed curlew numbers are stable or increasing slightly. The major factor affecting curlew populations is habitat destruction and fragmentation.

Existing Conditions

Long-billed curlews are uncommon summer residents within the TBNG. The areas evaluated for this analysis include USFS and adjacent lands within the general analysis area for the South Hilight Field LBA Tract. As described for the northern leopard frog and swift fox, above, those areas are dominated by sagebrush habitats with scattered stands of upland grasslands and little water. Consequently, habitat conditions in the tract's general analysis area and surrounding lands would be suitable for foraging migrants, but they do not

provide large expanses of grassland areas for nesting activities. No long-billed curlews have ever been documented on USFS lands or adjacent lands in the general analysis area or larger wildlife survey area for the South Hilight Field LBA Tract. Likewise, few curlews have been observed in the surrounding region during annual wildlife monitoring in the area over the last 24 or more years. Most of those sightings occurred during spring months and beyond USFS lands, and were likely individual migrants or non-breeding adults. No significant wetlands (i.e., large lakes) or other persistent conditions that might attract large numbers of curlews during migration exist within the South Hilight Field wildlife survey area.

No nesting occurrences have been documented for long-billed curlews in southern Campbell County (Cerovski et al. 2004), including USFS lands in the South Hilight Field tract's general analysis area and adjacent lands. Potential foraging habitat is present on USFS and adjacent lands in those areas, and elsewhere within the 2-mile wildlife survey perimeter, but nesting habitat conditions are poor to unsuitable. CBNG development activities are increasing throughout the region, with active mining (including open pits) also occurring in the near vicinity. Therefore, potential foraging habitats would be disturbed by the Proposed Action and Alternatives for this LBA tract.

Direct and Indirect Effects

Given the lack of sightings of long-billed curlews in the South Hilight Field LBA Tract general analysis area and surrounding perimeters since 1983, and the fact that habitat conditions in those areas are only suitable for foraging migrants or non-breeding adults, the Proposed Action and Alternatives for this LBA tract are unlikely to cause any direct injury or mortality to this species. However, if present, future mining activities could result in injuries or mortalities to foraging individuals. Foraging individuals may also be displaced by human activities and noise associated with mining. Potential foraging habitats may be disturbed, removed, or fragmented by mining activities. The type, timing, location, and extent of habitat disturbance will vary throughout the tract's general analysis area as operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine, and will eventually mitigate impacts to some degree. The Black Thunder Mine's reclamation plan would incorporate the replacement of jurisdictional wetland acreages existing prior to mining with at least equal types and numbers of wetland acreages. The creation of wetland habitats, especially where adjacent to native or reclaimed grassland habitats, could provide additional (although limited) foraging areas for curlews.

As no long-billed curlews have been documented within USFS lands or other lands in or near the South Hilight Field LBA Tract general analysis area, and habitat conditions do not provide quality nesting areas, species-specific Standards and Guidelines outlined in the Grassland Plan (USFS 2002) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As this species appears to be an infrequent visitor to the tract's general analysis area, and good quality foraging and nesting habitat is not present within the area, impacts to this species are likely to be minimal. Loss, degradation, or fragmentation of potential foraging habitat and potential collisions with vehicles may occur. Reclamation of wetlands and grasslands may create limited foraging or nesting habitat.

H-3.4.22 Ferruginous hawk (*Buteo regalis*) Ferruginous hawks breed throughout much of the western United States and portions of three Canadian provinces (Johnsgard 1990). This species nests throughout Wyoming (Cerovski et al. 2004) and occupies portions of the state during winter. Large expanses of grassland and shrubland, where livestock grazing (vs. cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Most ferruginous hawks in the PRB nest on the ground (usually elevated sites, though some pairs nest in small trees). Typical nest sites include hilltops, rock outcrops, eroded creek banks, small trees, and even relatively level ground. The ferruginous hawk relies primarily on two mammalian families for the majority of its prey: *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs). Numerous nests can occur within the territory of a single pair, and ferruginous hawks often reuse nests for many years.

This species may be sensitive to human disturbance, especially during the nesting period (White and Thurow 1985). This sensitivity can be heightened in years of low prey abundance. Accurate information regarding the trend for the ferruginous hawk is limited and mixed. Some populations may be declining (Bechard and Schmutz 1995); however, overall population trends suggest numbers are stable or increasing (NatureServe 2007). Major factors affecting ferruginous hawk populations include habitat destruction and fragmentation, and human disturbance.

Existing Conditions

Annual monitoring has documented that ferruginous hawks nested in the vicinity of the Black Thunder Mine during each of the last 25 years, and fledged young in all but one of those years. Similar long-term nesting has occurred at the neighboring Jacobs Ranch and North Antelope Rochelle mines. Many of those nests were located on USFS lands. Details describing the number of intact and active nests within the mine monitoring survey areas in a given year are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

The presence or absence of nest material does not determine whether the USFS considers a site as "active" (occupied during at least 1 of the last 7 years). Seven ferruginous hawk nest sites in two territories have been documented on

USFS lands within the South Hilight Field tract's general analysis area during annual wildlife monitoring surveys conducted through 2007 (Figure H-2). Two of the seven sites still had nest material present that year. No nest sites were present on non-federal lands within the general analysis area during any monitoring year.

Nine additional ferruginous hawk nest sites in five territories have been recorded on USFS surface within the tract's 2-mile wildlife survey area through 2007; two of the nine sites had been used by ferruginous hawks and at least one other raptor species over the years. Five nest sites were still physically present in 2007. The remaining 30 nest sites (25 individual nests plus 5 multi-species sites) are located on non-federal lands within the 2-mile wildlife survey area; none of those nests are within the tract's general analysis area itself. The 30 nests were in at least 10 different territories. Only 10 of the 30 sites still had nest material present in 2007.

Direct and Indirect Effects

Over time, the Black Thunder Mine has avoided, where possible, or mitigated mining impacts on raptor nests through a variety of means. The mine has voluntarily monitored nesting raptor populations in a perimeter larger than required annually since 1983, maintained and implemented current USFWS approved Raptor Mitigation Plans, adjusted operations to provide temporal and spatial buffers around raptor nests, and ensured that new power lines at the mine conform to current Avian Power Line Interaction Commission (APLIC) guidelines. Provided those practices are continued, direct impacts on ferruginous hawks and their active nest sites will be minimized, both on and near USFS lands. Due to restrictions on disturbance near active nest sites, the most probable source of potential impact to ferruginous hawks themselves would be an increase in injuries and fatalities of individuals foraging within the general analysis area due to vehicle collisions associated with ongoing or future mining and other activities. The use of existing roads in the area, when possible, would help to minimize this risk.

Habitat loss, degradation, and fragmentation would result from a variety of large- and small-scale mining operations such as soil salvaging and reservoir/flood control construction, among others. Potential nesting and foraging habitat might also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances would shift throughout the expanded permit area as operations progress. Reclamation of disturbed areas would occur incrementally as resource recovery is completed in a given portion of the mine, and would mitigate impacts to some degree. Surface

disturbing activities could also result in a short-term, localized decrease in the prey base (lagomorphs and rodents) for ferruginous hawks. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

USFS Standards and Guidelines would be implemented and offer additional protections for active nests; they would apply only to activities outside of the lease area. These protocols should help ensure that the Proposed Action and Alternatives do not significantly degrade the quality of existing ferruginous hawk territories and nest sites. Standards and Guidelines specific to ferruginous hawks outlined in the TBNG Plan (USFS 2002, page 1-20-21) are as follows:

73. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within 0.25 mile (or line of sight) of active ferruginous hawk nests. For the ferruginous hawk, a nest is no longer considered active if it is known to have been unoccupied for the last seven years. This does not apply to pipelines, fences and underground utilities.

74. To help reduce disturbances to nesting ferruginous hawks, prohibit the following activities within 0.5 mile (or line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.

75. To help reduce disturbances to nesting ferruginous hawks, do not authorize the following activities within 0.5 mile (line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., pipelines, utilities, fencing), seismic exploration, and workover operations for maintenance of oil and gas wells.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. All ferruginous hawk nests located within the South Hilight Field tract's general analysis area are located on federal surface. Many nests on USFS lands have alternate sites within the same territories that are beyond the tract's general analysis area, and thus are less likely to be impacted by future mining disturbance associated with the proposed leasing action. Some individuals or pairs may experience disturbance, destruction, or fragmentation of nesting and foraging habitat. Increased disturbance to individuals due to human activity may also occur. However, several factors should minimize the potential mining-related impacts on this species, including the availability of alternate nest sites located further away from pending disturbance in each affected territory, implementation of USFWS and USFS approved mitigation

measures, reclaiming habitats as soon as feasible, encouraging nesting within mine reclamation lands through artificial nest structures and habitat features such as rock piles and tree plantings that attract prey species, and continued monitoring of this species to ensure that mitigation methods are applied when necessary.

H-3.4.23 Burrowing owl (*Athene cunicularia*) Burrowing owls breed from southern Alberta to southwestern Saskatchewan, south through east-central Washington, central Oregon, and southern California, and east to eastern North Dakota, west-central Kansas, and Texas (Klute et al. 2003, pg 7). The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Cerovski et al. 2004). This species requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Klute et al. 2003, pg 12).

Most burrowing owl nests within the TBNG are located within prairie dog colonies (USFS 2003). Burrowing owls typically reuse traditional nesting areas. Burrow mounds, shrubs, fence posts or boulders may be used as observation perches. This species is usually tolerant of human activity but is vulnerable to predation by pets (cats, dogs). Burrowing owls forage within a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. This species is often active during daylight hours. Insects and small mammals (mice and voles) are the owls' primary prey items. Burrowing owl populations have been declining throughout its range, primarily due to habitat loss.

Existing Conditions

Burrowing owls are common summer residents within the TBNG (Cerovski et al. 2004). This species was first recorded nesting in the Black Thunder Mine annual monitoring 2-mile perimeter in 1988. Despite the presence of potential nesting habitat (prairie dog and badger burrows) in the monitoring area, this species nested in only 5 of the subsequent 19 years. All known burrowing owl nest sites in the mine monitoring area have been in prairie dog burrows. Four artificial nest boxes have been constructed in the mine's 2-mile perimeter wildlife survey area for mitigation purposes over the years, but no owls have ever been observed at or near them.

No burrowing owl nest sites had been documented within the entire South Hilight Field tract's general analysis area or the tract's surrounding wildlife survey area through 2007, including all USFS lands in that area. Only one small (less than 1 acre) prairie dog colony (potential burrowing owl nesting habitat) is present within the tract's general analysis area, though larger colonies do occur in the surrounding 2-mile wildlife survey area. Badger burrows undoubtedly occur in the area, but are not typically recorded.

Direct and Indirect Effects

No known burrowing owl nest sites are present on USFS lands in the general analysis area for the South Hilight Field LBA Tract, or within 0.25 mile of those

lands (the USFS buffer for that species). Potential nesting habitat is largely limited to a lone, very small prairie dog colony in the tract's general analysis area. Therefore, leasing the South Hilight Field LBA Tract would not result in any direct or indirect effects to nesting burrowing owls. Both USFS Standards and Guidelines (USFS 2002) and the Black Thunder Mine's mine permit (TBCC 2005) stipulate that clearance surveys will be conducted and approved by the appropriate agencies before any colony is disturbed during the breeding season. That process will preclude most direct impacts to new nesting burrowing owls in that area.

Because burrowing owls are active during daylight hours, the most probable source of direct impacts would be the death of, or injury to, individuals fleeing heavy equipment, or being killed or injured by equipment while feeding or moving through the mine area. Burrowing owls are generally tolerant of human activities, but increased presence and noise, especially during the nest initiation period, may displace individuals or inhibit nesting proximate to mine operations. Foraging could also be hindered within these areas, especially where mining activities occur near prairie dog colonies.

As described previously, mining could eventually disturb or eliminate prairie dog colonies (potential nesting habitat) in the general analysis area for the South Hilight Field LBA Tract (1 acre). However, the limited presence or long-term absence of nesting burrowing owls in that colony, in combination with the presence of other non-disturbed colonies in the area and the ability for prairie dogs to recolonize reclamation, would mitigate those losses to a large extent. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (rodents, non-flying insects) for burrowing owls. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

Additionally, the tendency of prairie dogs to quickly colonize nearby areas when their colonies are disturbed would create new nesting habitat for burrowing owls. Overall, nesting and foraging habitats will be incrementally affected by a variety of large-and small-scale operations. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress, thus providing opportunities for burrowing owls to relocate to other suitable habitat within the immediate area.

Reclamation will proceed incrementally as areas are mined and activities move to new locations within the mine area. Both activities will create loose soil that should be attractive to dispersing prairie dogs (potential habitat source), at least in the short term. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine, and will eventually mitigate habitat impacts to some degree. However, to date, burrowing owls have rarely been documented nesting within reclaimed habitats at surface mines in the PRB of northeast Wyoming.

If nesting burrowing owls are documented on or near USFS lands in the South Hilight Field LBA Tract, USFS Standards and Guidelines applicable to this species would be implemented on applicable lands to offer additional protections beyond those outlined in the USFWS approved Raptor Mitigation Plan for the Black Thunder Mine. Annual monitoring of known burrowing owl nest sites within the 2-mile wildlife survey area for the mine, including USFS and adjacent lands, and other nearby colonies will continue through the life of the mine to document their histories of occupancy and production.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No burrowing owl nests have been documented on or near USFS lands in the South Hilight Field tract's general analysis area during many years of annual monitoring, nor have any nests been located within the tract's general analysis area itself. Few prairie dog colonies occur in the general vicinity of this LBA tract, and most are located outside of the tract's general analysis area where future surface disturbance would occur.

The Black Thunder Mine has avoided, where possible, and mitigated such impacts in the past through intensive monitoring of both populations and specific nest sites, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests (including burrowing owl nests). Mining activities and noise may disturb individuals inhabiting the lease area, thus inhibiting potential nesting or foraging in proximity to lands with ongoing development. Potential collisions with vehicles might also occur, though none have been recorded in the area to date.

H-3.4.24 Chestnut-collared longspur (*Calcarius ornatus*) The breeding range of the chestnut-collared longspur extends from southern Alberta to southern Manitoba, south to west-central Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et al. 2003b). The chestnut-collared longspur is a common summer resident of the eastern plains of Wyoming (Cerovski et al. 2004). This species prefers native grasslands as breeding sites, inhabiting open prairie and avoiding excessively shrubby areas. Grasslands with dense litter accumulations are also avoided (Dechant et al. 2003b). Scattered shrubs are often used as singing perches. Nests are typically placed in areas of sparse vegetation (less than 20-30 centimeters), but usually with a taller grass component than sites preferred by McCown's longspurs. Nests are on the ground in depressions and often placed beside cattle dung, small shrubs, or under a clump of grass (Hill and Gould 1997). Male fidelity to breeding areas has been observed. Chestnut-collared longspurs feed primarily on seeds (especially grasses), insects, and spiders. This species is generally tolerant of short-term intrusion at the nest site but may desert if disturbed during nest building or egg-laying (Hill and Gould 1997). High rates of predation on eggs and nestlings have been reported and pesticides have been shown to reduce hatching success. The chestnut-collared longspur breeding

range has contracted and long-term data suggests population declines (Hill and Gould 1997). These declines have been attributed to loss of native prairie habitat, and conversion to cropland and urban development.

Existing Conditions

Chestnut-collared longspurs are common summer residents within the TBNG. This species has not been recorded on USFS or other lands in the South Hilight Field tract's general analysis area during annual monitoring in recent years. As described previously, sagebrush habitats dominate USFS and adjacent lands in the general analysis area for the South Hilight Field LBA Tract. Grassland areas are present in the form of prairie dog colonies, upland grasslands, and agricultural pasture grasslands, but they occur in isolated parcels scattered throughout the area rather than in contiguous and/or sizeable blocks that would be attractive to nesting chestnut-collared longspurs. Consequently, only limited suitable habitat conditions exist for this species on USFS lands in the South Hilight Field LBA Tract general analysis area and adjacent lands.

Direct and Indirect Effects

Due to the similarity of potential impacts from future mining on chestnut-collared longspurs and other grassland species previously discussed (e.g., swift prairie dog and swift fox), detailed descriptions of those impacts are not repeated here. Chestnut-collared longspurs have not been documented as nesting in the South Hilight Field tract's general analysis area. Equipment operations associated with future mining operations could result in fatalities or injury to individuals, nests and eggs, and/or young. Increased human activity and noise could inhibit foraging or nesting within suitable habitats on USFS lands or displace individuals during periods of intense activities. Over the life of the mine, potential nesting and foraging habitats in the general analysis area could be disturbed, destroyed, altered, or fragmented, though the type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine. Within 1 to 2 years, newly reclaimed areas may create good quality, short-duration nesting habitat for chestnut-collared longspurs. However, as these sites mature, they would become less suitable as nesting habitat for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the South Hilight Field tract's general analysis areas are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. No individuals have been documented in the South Hilight Field tract's general analysis area. Potential and documented alternative habitats for chestnut-collared longspurs are present elsewhere in the vicinity in areas not currently scheduled for mining disturbance.

H-3.4.25 McCown's Longspur (*Calcarius mccownii*) McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north-central Colorado, and east to western Nebraska, north-central South Dakota, and southwestern North Dakota (Dechant et al. 2003c). This species is a common summer resident of the eastern plains and great basin-foothills grasslands, basin-prairie shrublands, and agricultural areas throughout most of Wyoming (Cerovski et al. 2004). Specifically, this species requires open habitats such as sparsely vegetated, low structured grasslands, and heavily grazed pastures containing a moderate bare ground component for nesting and foraging. Nest sites are typically a natural or shallow scraped depression on the ground placed in the open or beside vegetation such as bunch grasses, cacti, or shrubs. McCown's longspurs feed on seeds of grasses and forbs, insects, and other arthropods. No strong data suggests breeding site fidelity although some individuals may return to the general nesting area in subsequent years.

Individuals vary in response to human intrusion at nest sites, but appear to be relatively more tolerant than most grassland songbird species. High rates of predation on eggs and nestlings occur especially where nests are associated with vegetative structure. Nestlings may also be directly poisoned where insecticides are sprayed in nest areas (With 1994). Populations are declining, especially within the northern portion of the range. Factors directly affecting the McCown's longspur include the reduction of breeding habitat due to overgrazing, control of prairie fires, plowing, development, and excessive use of pesticides. Conversion of short-grass prairie to agriculture and urban development is the most important factor (With 1994).

Existing Conditions

McCown's longspurs are also common summer residents within the TBNG. Observations of the McCown's longspur mirror those of the chestnut-collared longspur; neither species has been documented in the South Hilight Field tract's general analysis area. The nearest observation to this area occurred on non-federal lands in NE¼SW¼ Section 13, T.43N., R.71W. in May 2000. The height and composition of vegetation (i.e., sagebrush) on most USFS lands in the South Hilight Field tract's general analysis area is generally too tall and dense, respectively, to provide suitable habitat for McCown's longspurs.

Direct and Indirect Effects

The direct and indirect effects to McCown's longspurs would be the same as those described above for the chestnut-collared longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the South Hilight Field tract's general analysis area are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. No individuals have been documented in the South Hilight Field general analysis area. Potential and documented

alternative habitats for McCown's longspurs are present nearby in more appropriate habitats not currently scheduled for mining disturbance.

H-3.4.26 Greater sage-grouse (*Centrocercus urophasianus*) The Greater sage-grouse occurs year-round throughout non-forested regions of Wyoming (Cerovski et al. 2004). Sage-grouse rely on a variety of habitats within sagebrush dominated landscapes to reproduce and survive throughout the year. Early in the spring, grouse gather at breeding display sites called leks. Leks are usually in open areas (playas, ridge tops, sparse sagebrush, or burned areas) that are surrounded by dense sagebrush and escape cover. The surrounding area also typically represents nesting, loafing, and foraging habitat.

After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nests in some portions of sage-grouse range are typically placed under sagebrush with average height of 36-79 centimeters (Schroeder et al. 1999). However, research conducted within the Southern PRB (Brown and Clayton 2004) indicated that, although shorter sagebrush was present at nest sites, grouse selected shrubs ranging from 55-61 centimeters in height under which to place nests. Re-nesting may occur if the nest is destroyed early during the laying or incubation period. Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). Sage-grouse exhibit high fidelity to seasonal ranges, and may return to the same area to nest in subsequent years.

For the first month after hatching, the young depend on relatively open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late-season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse feed upon sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense, exposed sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes or windblown ridges are preferred.

Breeding populations of this species have declined by at least 17 to 47 percent throughout much of its range (Connelly et al. 2004). Within Wyoming, sage-grouse populations have generally declined over the past 4 decades. However, sage-grouse population estimates specifically pertaining to the TBNG suggest an overall increase in individuals since 1995. This same general trend was observed both statewide and within the Northeast Wyoming Sage-Grouse Local Working Group (NWSGWG) area.

The NWSGWG identified habitat fragmentation and degradation, disturbance and direct mortality as major influences affecting sage-grouse (NWSGWG 2006). The group identified oil and gas development, vegetation management,

invasive plants, and weather as those factors with the most influence on the northeast Wyoming sage-grouse populations and those that may most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming (NWSGWG 2006).

Existing Conditions

As described above, USFS lands on and adjacent to the general analysis areas for the North, South, and West Hilight Field LBA Tracts are dominated by a sagebrush-grassland community, primarily big sagebrush, with shrub cover ranging from 55 to 60 percent. Those areas provide potential year-round habitat for sage-grouse, though habitat quality varies. Sagebrush stands range from sparse to moderately dense throughout the areas, with only a marginal grassy understory in many areas.

Despite the prevalence of sagebrush in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts, sage-grouse numbers were never especially high in the area. Five sage-grouse leks are located on and within 2 miles of the North, South, and West Hilight Field tracts' general analysis areas: Stuart I, Stuart II, Black Thunder, Butch, and Hansen Lakes (Figures H-1, H-2 and H-3).

No sage-grouse leks are present on USFS lands in the North Hilight Field tract's general analysis area. Two leks are present on non-federal surface in the tract's general analysis area: Butch and Hansen Lakes. The Hansen Lakes lek is immediately south of USFS surface in that area (Figure H-1). The Hansen Lakes lek is classified as "occupied" by the WGFD (active in at least 1 of the last 10 years). The Butch lek was first recorded in 1990. The peak male count (15) occurred in 1991, after which numbers declined dramatically. No grouse were recorded at the Butch lek during annual checks conducted over the last 14 years (1994 through 2007). The Butch lek is classified as "unoccupied/abandoned" by the WGFD (no activity for 10 consecutive years).

The Butch lek was discovered in 1990, and was active every year through 1993. The Hansen Lakes lek was discovered in 1993, coincidently at the same time peak male counts were dramatically declining at the Butch lek; the leks are approximately 1.5 miles apart. Peak male counts at the Hansen Lakes lek ranged from 14 to 24 birds from 1993 through 2000, but dropped markedly to only 3 birds in 2001. Grouse were present at the lek for the next 2 years, but no birds were observed there after 2003. No other grouse leks are present within 3 miles of the North Hilight Field tract's general analysis area. The next nearest lek is the Stuart II lek, approximately 4.1 miles southwest of the North Hilight Field tract's general analysis area (Figure H-1).

No sage-grouse leks are present on USFS lands in the general analysis area for the South Hilight Field LBA Tract or within that tract's 2-mile wildlife survey area (Figure H-2). Likewise, no lek sites have been documented on non-federal surface in South Hilight Field tract's general analysis area. The former Black Thunder lek was located on non-federal surface approximately 1 mile east of

the South Hilight Field tract's general analysis area. The Black Thunder lek was first documented in 1984, when a peak male count of 21 was recorded. Grouse numbers gradually declined over the next several years of annual monitoring, with only one bird observed at the lek in 1993. No grouse were recorded at the Black Thunder lek during annual checks conducted over the subsequent 12 years (1994 through 2005), prior to any mine-related disturbance occurring within several miles. Due to the consistently low counts, WGFD authorized the mine to reduce searches for grouse leks in the permit area and 1-mile perimeter to every third year beginning in 2004 (i.e., 2004, 2007, etc.). That lek was classified as "unoccupied/abandoned" after 10 consecutive years of inactivity, and it was then impacted by topsoil stripping in 2007 and is now officially classified as "unoccupied/destroyed" by WGFD. The Stuart II lek is located on USFS lands approximately 3 miles northwest of the tract's general analysis area (Figure H-2).

The Stuart II lek lies within the general analysis area for the West Hilight Field LBA Tract (Figure H-3), and is the only lek on USFS lands in the combined wildlife survey areas for the three Hilight Field LBA Tracts. Two leks are present on non-federal surface in the vicinity of the West Hilight Field area. The Stuart I lek is approximately 1.25 miles west of the tract's general analysis area, and the next nearest lek is the former Black Thunder site, approximately 2.25 miles east of the tract's general analysis area (Figure H-3).

The Stuart I lek was first recorded in 1977. The peak male count (29) occurred in 1979, with reduced numbers in the subsequent 2 years. The lek was monitored by the WGFD at approximately 3-year intervals from 1982 through 2003; annual monitoring was conducted by private consultants for unrelated projects each year from 2004 through 2007. Grouse were observed at the lek during only 1 of the 11 survey years from 1982 through 2007. The last sighting occurred in 1991, when two males were recorded at the Stuart I lek. The Stuart II lek was discovered in 1979. Few grouse were seen at the lek over the next 28 years, with a maximum of seven males observed in any survey year. The Stuart II lek was also surveyed primarily at 3-year intervals since its discovery, with annual checks conducted from 2005 through 2007. Because the two Stuart leks were not monitored annually, their management status is "undetermined", despite consistently low counts when surveys did occur.

Grouse counts at these five leks in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts were consistently low since their respective discoveries, with few birds observed at any location in the last 7 to 20 years, depending on the lek site. Additionally, records from the WGFD (obtained from D. Thiele, Regional Biologist, WGFD, Buffalo, Wyoming), and USFS have not documented any new sage-grouse leks within the approximately 131 square mile area that encompasses the combined wildlife survey areas for the three Hilight Field LBA Tracts. Telemetry data collected on radio-collared grouse at the nearby North Antelope Rochelle Mine throughout the last 7 years (2001-2007) shows no sage-grouse locations within several miles of the three Hilight Field LBA Tracts during that period (Brown and Clayton 2004, North

Antelope Rochelle Mine Annual Wildlife Report 2006, 2007). It is important to note that the reduction in grouse attendance at these five leks, and most others in the PRB, preceded physical mining disturbance and, thus, cannot be directly attributable to mine-related activities (Orpet 2007, McKee 2007). Annual counts for each lek are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Annual surveys for sage-grouse broods were conducted in native and reclaimed stream channels at and around the Black Thunder Mine from 1994 through 1999; such surveys were no longer required by WGFD and WDEQ/LQD after that year due to the consistent lack of grouse broods at coal mines throughout the PRB. No new leks or broods were seen during recent baseline inventories conducted for the three Hilight Field LBA Tracts. All grouse broods that have been recorded over the years occurred as incidental sightings during other wildlife surveys.

Areas of suitable habitat for nesting and strutting grounds are widely known as necessary to sustain sage-grouse populations. One recent study suggests that availability of winter habitat may also affect sage-grouse populations (Naugle et al. 2006). Nesting and winter surveys for sage-grouse are not required as part of the annual wildlife programs for the Black Thunder Mine or other applicant mines discussed in this EIS, though winter surveys have been conducted as part of baseline inventories for previous mine expansions. Additionally, periodic winter surveys for other species (i.e., big game, bald eagle roosts) have occurred at all three applicant mines in recent years. Due to their proximity to existing mine permit areas, most USFS lands in the North and South Hilight Field tracts' general analysis areas, and those in the eastern half of the West Hilight Field tract's general analysis area, have been included in a minimum of seven consecutive years (big game surveys 1993-1999) of some level of winter surveys, with additional surveys conducted in some subsequent years. No sage-grouse were ever documented in or near those LBA tracts during those winter surveys.

Direct and Indirect Effects

Three of the five sage-grouse leks located in the combined wildlife survey areas for the three Hilight Field LBA Tracts occur in an area likely to be disturbed by future mining, if the three proposed leasing actions are approved. One lek (Stuart II in the West Hilight Field tract's general analysis area) is on USFS lands and the other two (Hansen Lakes and Butch) are on non-federal surface in the North Hilight Field tract's general analysis area.

Due to the consistently low number of sage-grouse documented in these LBA tracts' wildlife survey areas over the last 3 decades, despite the presence of apparently suitable habitat, leasing and mining USFS lands and adjacent lands within the general analysis areas for the North, South, and West Hilight Field LBA Tracts would have limited effects on individual birds. Some potential impacts of mineral development (including coal mining and oil and gas

development) on sage-grouse that might inhabit the area, as well as on known and potential sage-grouse habitat include: alteration of plant and animal communities; loss or degradation of important seasonal habitats; increased human activity and noise which could cause animals to avoid the area and/or reduce their breeding efficiency; increased road traffic and related injuries or mortalities; increased risk of predation from raptors perched on existing or future power poles and/or grouse avoidance of areas with overhead power lines; potential illegal harvest; and reduced water tables resulting in the loss of herbaceous vegetation. Following reclamation, there may be a long term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining. Sagebrush is a component of both the Sagebrush/Grassland and Big Sagebrush vegetation communities, which occupy approximately 55 to 60 percent of the combined vegetation analysis areas for the three Hilight Field LBA Tracts. WDEQ/LQD reclamation standards call for restoration of sagebrush on at least 20 percent of the reclaimed area. Estimates for the time it would take to restore shrubs, including sagebrush, to pre-mining density levels range from 20 to 100 years. Until sagebrush returns to its pre-mining density levels, a reduction in potential sage-grouse nesting habitat and winter habitat on the three Hilight Field LBA Tracts would persist.

Due to the documented long-term lack of sage-grouse use on USFS lands and adjacent lands in the North, South, and West Hilight Field tracts' general analysis areas and surrounding wildlife survey areas, USFS Standards and Guidelines (USFS 2002, page 1-18; Appendix D) would have limited applications toward controlling the type, timing, and location of disturbance activities within the three Hilight Field LBA Tract areas. The use of existing roads, when possible, could minimize additional impacts related to traffic hazards and the use of new travel corridors by mammalian predators. Raptor predation does not seem to be a primary source of mortality for the local sage-grouse population (Brown and Clayton 2004). Nevertheless, new overhead power lines could be fitted with perch deterrents to limit opportunities for avian predators to target any grouse that might be in the area. The use of underground power lines to the extent possible would also reduce this risk, and would minimize new vertical structures that could affect grouse use or movements in the area. If precautions are taken to avoid direct mortalities and disturbances to nests and leks during the breeding season, grouse might have the opportunity to disperse away from mine activities.

Mine operations and oil and gas development have requirements for reclamation of disturbed areas as recovery of energy resources is completed. Those reclamation efforts can work in concert with Standards and Guidelines toward mitigating impacts to wildlife species and habitats, though reclamation standards are widely variable among industries. New areas disturbed by mining in the general analysis areas for the three Hilight Field LBA Tracts will be reclaimed incrementally, but they may not be attractive to sage-grouse for many years due to slow establishment and growth rates of important sagebrush species. Information gleaned from the multi-year telemetry study at

a neighboring coal mine could also be helpful in reclamation efforts for the three Hilight Field LBA Tracts. In the meantime, the presence of known and apparently suitable sage-grouse habitat elsewhere within the immediate area could provide alternate areas for dispersing grouse to use until reclaimed sagebrush stands have matured adequately to support a local population.

In keeping with the Direction Objectives for the Hilight Bill Geographic Area (USFS 2002, page 1-25), impacts to sage-grouse habitat in the general analysis areas for the three Hilight Field LBA Tracts could be further mitigated off-site by efforts to preserve and enhance habitat on adjoining and nearby private lands, such as those currently under way through the Thunder Basin Grasslands Prairie Ecosystem Association. Management planning and processes that are developed through this combined effort among landowners and federal representatives will presumably provide suitable habitat for sage-grouse that disperse from the three Hilight Field LBA Tracts general analysis areas during the interim between habitat disturbance and completed reclamation.

Should sage-grouse move onto USFS lands analyzed in this EIS in the future, agency Standards and Guidelines would offer appropriate protections for the species and its important habitats. However, under the current conditions, and the documented absence or consistently low presence of this species in the area, mining USFS lands within the North, South, and West Hilight Field LBA Tracts would not adversely impact sage-grouse populations in the region, nor would it conflict with the current TBNG Plan or any future objectives to manage the area for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. The sage-grouse is a common year-round resident throughout much of the PRB and TBNG, but has declined on and within 2 miles of the general analysis areas for the North, South, and West Hilight Field LBA Tracts over the last 30 years. Three decades of regular monitoring have documented that sage-grouse have not consistently inhabited the USFS lands analyzed for the North or South Hilight Field LBA Tracts, nor have they been confirmed as occupying USFS lands analyzed for the West Hilight Field LBA Tract since 1991. Currently, the nearest lek (Payne lek) with regular activity is more than 5.0 miles to the southeast of the USFS lands in the South and West Hilight Field LBA Tracts. Consequently, if the North, South and West Hilight Field LBA Tracts are leased, anticipated mining-related disturbances would not affect any identified and actively used seasonal sage-grouse habitats on or near USFS lands in the combined general analysis areas for these three tracts. Annual monitoring will continue for the life of the Black Thunder Mine, and would include new permit expansions and a one-mile perimeter. Should sage-grouse be observed on USFS lands in any of the three Hilight Field LBA Tracts' wildlife survey areas, appropriate monitoring and mitigation measures would be implemented to minimize impacts to birds, habitats, and populations.

H-3.4.27 Bald eagle (Haliaeetus leucocephalus) Bald eagles occur throughout North America, from Alaska and Canada south to Florida, the Gulf Coast, and northern Mexico. The northwest coast of North America serves as the stronghold for this species, with approximately one-half of the population inhabiting Alaska.

The USFWS officially listed the bald eagle as an endangered species in 43 of the lower 48 states on July 4, 1976. The listing was due to a combination of several factors, including widespread habitat loss, negative effects of pesticide use on reproductive success, indiscriminant shooting, and others. The status of the bald eagle was downgraded to threatened throughout the lower 48 states in 1995. Bald eagle population trends began increasing throughout most of the species' range in the early 1990's, and it was proposed for de-listing in 1999.

On July 9, 2007, USFWS published a Federal Register notice (72 FR 37346) announcing that the bald eagle would be removed from the list of threatened and endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C 1531 *et* seq.) on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, will remain in place. The bald eagle is now recognized as a BLM and USFS Sensitive Species.

Bald eagles typically nest in large trees within a stand of mature, similarly sized trees either beside or in proximity (within 0.7 mile) to rivers, lakes, or reservoirs that harbor adequate fish populations. Those areas tend to be remote and experience little disturbance (Johnsgard 1990). Typically, the nest is placed in the crown of a large cottonwood or pine, but if the topography allows, eagles will nest on cliff edges or escarpments. Open-canopied trees and snags provide required perches in nesting and foraging areas.

All verified bald eagle nests in northeastern Wyoming (BLM Buffalo Field Office GIS database) are situated in significant, mature cottonwood stands along larger streams or rivers (i.e., Tongue River, Powder River, Clear Creek, and Little Thunder Creek). Nesting attempts are rare on the TBNG (Beske 1994). Fish and waterfowl are the primary source of food for nesting bald eagles. Where available, large to mid-size carrion and large rodents (e.g., prairie dogs) can also be an important dietary component.

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant in the northeastern portion of the state. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004), and has often been documented during winter and early spring at nearby coal mines (various coal mine annual reports are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne). Most eagles that migrate through or winter in Campbell County roost communally in stands of large ponderosa pine, along wooded cottonwood-riparian corridors, or

in isolated stands of large trees. As water is scarce in that region, especially during winter, those birds likely forage widely for lagomorphs or carrion.

Existing Conditions

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in the PRB, but only rarely nest in that region. Potential bald eagle nesting and winter roosting habitat, being primarily scattered stands of mature cottonwood trees, are present on USFS and adjacent lands along Little Thunder Creek, which flows through the general analysis areas for the South and West Hilight Field LBA Tracts; no streams flow through the North Hilight Field tract's general analysis area.

In general, the combined wildlife survey areas for the three Hilight Field LBA Tracts do not contain unique or sizeable concentrated prey sources (e.g., fisheries, waterfowl wintering areas) that would be expected to attract bald eagles. As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3). Sheep and their lambs are present in this area in the spring, when bald eagles have typically left the region, and flocks are pastured there infrequently in the winter. The area does not support a large big game herd, though some groups do winter in the area.

Ground surveys for bald eagle winter roost sites were most recently conducted within the combined wildlife survey areas for the three Hilight Field tracts during baseline surveys beginning in 2006. Previous winter roost surveys also encompassed all or most potential habitat within that overall survey area. All winter roost surveys were conducted between ½ hour before and 1 hour after sunrise or between 1 hour before and ½ hour after sunset, per current BLM guidelines for survey timing and frequency. Biologists also watched for nesting bald eagles within the survey area while conducting surveys for other nesting raptors.

No bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the North Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began in the late 1970s and early 1980s, respectively. Similarly, no bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the South Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began during those same timeframes.

The BLM and USFS wildlife databases indicate that the nearest potential bald eagle nest was identified in 2003 in T.43N., R.71W., NE¼NW¼ Section 29, which is in the southwestern corner of the West Hilight Field tract's general analysis area (Figure H-3). Although the nest has been labeled as a bald eagle site for that year, the circumstances of the sighting were less than definitive. The lone observation of the nest was made from approximately 1 mile away late in the nesting season, when young golden eagles are fully feathered except for their heads. It is possible that an inexperienced observer could have mistaken a young golden eagle for an adult bald eagle under those circumstances. Additionally, golden eagles were confirmed nesters at the same site location in both 2002 and 2004. Nevertheless, the site could be treated as a potential bald eagle nest for management purposes.

Direct and Indirect Effects

As no winter roost sites or large groups of bald eagles have been documented in the general analysis area for any of the three Hilight Field LBA Tracts, potential impacts would be limited to occasional foraging individuals rather than a large segment of the population. The increased human presence and noise associated with construction activities, if conducted while eagles are wintering within the area, could harass or displace individual eagles during that period. Nesting eagles could also be distressed to the point of abandoning eggs or young, or their hunting efforts and success impacted. If necessary, the majority of direct effects could be mitigated by controlling the timing and location of disturbance activities, and/or through approved nest relocation efforts.

Indirect effects include additional disturbance and fragmentation of already limited foraging habitat within the geographic area. These impacts could result from a variety of large- and small-scale activities described previously for other species, including, but not limited to: topsoil stripping; overburden and coal removal; reclamation activities; and construction of roads, reservoirs, power lines (above ground and buried), fences, and pipelines. The locations of operations would shift throughout the expanded permit area as mining occurred, with habitats disturbed and reclaimed incrementally. Conversely, the addition of fences and raptor-safe power poles could possibly benefit foraging bald eagles by providing additional perch sites. Due to the limited presence of potential nesting or roosting sites, and lack of concentrated sources of prey, the direct and indirect effects of the Proposed Action and Alternative 2 to bald eagles are expected to be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No bald eagle nests have been documented on or within 1 mile of the North or South Hilight Field LBA Tracts' general analysis areas, and only one dubious nesting event was recorded in the West Hilight Field LBA Tract's general analysis area over time. Bald eagle winter roost sites are absent from all three Hilight Field LBA Tracts' wildlife survey areas, and little potential

nesting or roosting habitat is present. Therefore, potential hazards for this species would be limited to foraging individuals during winter. Disturbance, fragmentation, and alteration of potential foraging habitat would occur. However, the Black Thunder Mine has avoided, where possible, and mitigated raptor impacts in the past through intensive raptor monitoring, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests.

H-3.4.28 Mountain plover (*Charadrius montanus*) The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004). Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003d). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined and recent data suggests that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Existing Conditions

Mountain plovers are summer residents within portions of the TBNG. Most observations of mountain plovers in northeast Wyoming have been associated with prairie dog colonies. Approximately 86 percent of recently (since 1993) occupied mountain plover habitat in that region occurred within prairie dog colonies (Byer 2001). As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3).

As previously described for other short-grass species, the dominance of sagebrush in the North, South, and West Hilight Field LBA Tract's general analysis and wildlife survey areas provides only poor to marginal or unsuitable habitat for mountain plovers. The height and composition of vegetation on most USFS lands in the three Hilight Field tracts' general analysis areas is generally too tall and dense to provide suitable habitat for mountain plovers. The lack of occurrence of this species at the Black Thunder Mine and surrounding area, including all USFS lands in the analysis areas, is well documented. The nearest known population of nesting mountain plovers occurs at the Antelope Mine, approximately 9 miles south of the South Hilight Field tract's general analysis area, and even farther from the other two Hilight Field LBA Tracts.

Direct and Indirect Effects

The direct and indirect effects to mountain plovers in all three general analysis areas for the Hilight Field LBA Tracts would be the same as those described above for the McCown's longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the North, South, and West Hilight Field tracts' general analysis areas are dominated by sagebrush communities that are not attractive to short-grass species such as the mountain plover. No individuals of this species have been documented in any of the three Hilight Field tracts' general analysis areas, though limited potential habitat is present there. Documented alternative habitats for mountain plovers are present in portions of the general area that are more appropriate for this species and are not currently scheduled for mining disturbance.

H-3.4.29 Loggerhead shrike (*Lanius ludovicianus*) Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan, and southern Manitoba, south to California and Florida, and east to southwestern Minnesota, southern Wisconsin, southern Michigan, and Maryland. This species is a common summer resident throughout Wyoming (Cerovski et al. 2004). Shrikes prefer relatively open, heterogeneous habitats characterized by grasses and forbs of low stature interspersed with bare ground and shrubs or low trees with perches for hunting. This species will use a wide variety of trees and shrubs, particularly thick or thorny species, as nesting substrates and hunting perches (Prescott and Bjorge 1999).

Although some shrike nests are used in subsequent years, fidelity to a nest site is limited. This species forages over relatively open habitats, feeding primarily upon arthropods, amphibians, small to medium-sized reptiles, small mammals, and birds (Yosef 1996). Shrikes may also feed upon road kill and carrion. This species is generally tolerant of human activity near a nest, although they will abandon if disturbed during egg-laying or early in incubation. The loggerhead shrike is declining in both number and overall range. Declines have been

attributed to habitat loss and conversion, urbanization, pesticide contamination, and loss of insect prey as a result of pesticide use (Yosef 1996).

Existing Conditions

Loggerhead shrikes are common summer residents within the TBNG, though they are not often observed on or adjacent to USFS lands within the South Hilight Field LBA Tract. Shrikes have occasionally been seen in the 1-mile perimeter wildlife survey area for the adjacent Black Thunder Mine, which overlaps significant portions of USFS lands in the South Hilight Field tract's general analysis area. No actual shrike nests or recently fledged young have been documented on or near USFS lands in the general analysis area for the South Hilight Field LBA Tract, but this species could potentially nest in the general vicinity. Over time, most sightings have occurred in cottonwood-riparian corridors along primary streams in the general Wright analysis area, or in taller greasewood stands. Neither habitat type is common in the general analysis area for the South Hilight Field LBA Tract. Shrikes have also been infrequently recorded perched on various fences or on overhead power lines at other nearby mines. Shrike foraging habitat is present throughout the South Hilight Field tract's general analysis area, including USFS lands. As indicated, existing utility and fence lines currently provide good quality hunting perches.

Direct and Indirect Effects

Implementation of the Proposed Action or Alternatives could result in direct and indirect impacts to loggerhead shrikes, though such impacts would likely be uncommon. No known nest sites have been documented on or adjacent to USFS lands in the South Hilight Field tract's general analysis area or elsewhere in the overlapping mine monitoring area for the adjacent Black Thunder Mine. The most probable direct impact would be the mortality of, or injury to, individuals foraging within or passing through the USFS lands due to collisions with future mine-related vehicles, or dispersal of foraging individuals due to active mining.

The relatively slow movement of mining equipment and the noise associated with the activity would decrease direct impacts associated with vehicle collisions. As loggerhead shrikes are not especially common in the South Hilight Field tract's general analysis area, indirect impacts would be limited despite the fragmentation, degradation, or loss of habitat in the short and mid-term. Any birds that would be displaced would be forced to travel to other locations with acceptable habitat. This could result in stress to individual birds, as well as potential decreased nesting effort and success. Prey numbers reduced by mining would be expected to rebound following reclamation due to generally high reproductive potential and prey tendencies to re-establish and adapt to disturbed and reclaimed areas. The locations of mine-related habitat disturbances and reclamation efforts would proceed incrementally throughout the expanded mining area as operations progressed. Additionally, this mining activity would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for this species. USFS Standards and Guidelines would

offer additional protections for any active nest sites that may be present in the area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Such impacts would be minimized by the lack of regular sightings and known nesting attempts, as well as the relative paucity of suitable nesting habitat on or adjacent to the USFS lands analyzed in this EIS and their surrounding region. Degradation, fragmentation, or loss of potential foraging habitat, reduction in prey populations, and potential collisions with vehicles may occur. Given the lack of birds recorded in the area, and the composition of the shrike's prey base (insects, small mammals, etc.), impacts to shrikes would be minimal. USFS Standards and Guidelines would apply for active nests during the breeding season. Additionally, mining the USFS lands would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for loggerhead shrikes.

H-3.4.30 Brewer's sparrow (*Spizella breweri*) The breeding range of the Brewer's sparrow extends from southwestern Yukon, southern Alberta, and southwestern Saskatchewan, south (east of the Cascades and Sierras) to southern California, central Arizona, and northern New Mexico (Rotenberry et al. 1999). The Brewer's sparrow is a common summer resident of the basin-prairie and mountain-foothills throughout Wyoming (Cerovski et al. 2004). Brewer's sparrow is a sagebrush obligate species (Rotenberry et al. 1999).

This species is an uncommon cowbird (*Molothrus ater*) host and typically builds a small cup nest low in sagebrush shrubs. Brewer's sparrows prefer to nest in medium-sized (48-90 centimeters, or 19-35 inches) live sagebrush within relatively dense (26-42 percent canopy cover) stands (Walker 2004). Grass height and density are important factors for nest concealment. Although tolerant of human visitation, this species may abandon a nest if disturbed during the construction process.

Brewer's sparrows feed primarily on small insects and, to a lesser extent, seeds from grasses and forbs. Throughout areas where they have been surveyed, the species appears to have undergone and continues to undergo statistically significant declines (Rotenberry et al. 1999). Major threats to Brewer's sparrow populations are similar to those faced by other declining sagebrush-obligate species and include habitat conversion and fragmentation, invasion by non-native plants, altered fire regimes, livestock overgrazing, conifer encroachment, energy development, and conversion to urban or residential housing (Walker 2004).

Existing Conditions

Brewer's sparrows are common summer residents within the TBNG and southern Campbell County (Cerovski et al. 2004). Breeding bird survey data from annual monitoring and baseline studies conducted for the Black Thunder

Mine, and incidental observations over time, have shown that the Brewer's sparrow is a common but limited breeder in the area. This species has been recorded in sagebrush habitats near the mine during many of the last 14 years (1994-2007). Although no nests have been encountered in the general analysis area for the South Hilight Field LBA Tract, the presence and behavior (singing) of birds throughout spring and summer suggest that Brewer's sparrows nest in the sagebrush stands common to that area.

Direct and Indirect Effects

As described for the ferruginous hawk, above, habitat loss, degradation, and fragmentation of sagebrush communities in the general analysis area for the South Hilight Field LBA Tract would result from a variety of large- and small-scale mining operations such as topsoil stripping, drilling, and reservoir construction, among others. Potential nesting and foraging habitat would also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances and reclamation efforts would shift throughout the expanded permit area as operations progress.

The use of existing roads, when possible, could minimize impacts related to traffic hazards and predator travel corridors. Increased activity and noise, especially during the nest initiation period, could inhibit nesting proximate to mining activities. Foraging could also be hindered within these areas, especially where active mining occurs. Additional infrastructure and activity associated with the expansion of the mine, in combination with other ongoing disturbances (e.g., CBNG operations), could displace Brewer's sparrows from any historical use areas that might occur in the area. Those birds could potentially move into other sagebrush stands in the general vicinity, assuming they are not already occupied.

Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine and will eventually mitigate impacts to sagebrush habitats to some degree, though such efforts could take decades to benefit sagebrush obligates such as the Brewer's sparrow. Impacts to sagebrush habitat on USFS lands could be further mitigated off-site by efforts to preserve and enhance such habitat on adjacent and nearby private lands, as described above. Standards and Guidelines for sagebrush habitats outlined in the TBNG Plan (USFS 2002, pages 1-18; Appendix D) would be implemented as necessary, and could serve to sustain regional populations of this sparrow. Those management guidelines would apply only to activities beyond the South Hilight Field LBA Tract.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Some habitat loss, degradation, and fragmentation would occur on and near USFS lands in the general analysis area for the South Hilight Field LBA Tract, along with potential impacts to individuals. However, the presence of large stands of sagebrush elsewhere in the general vicinity suggests that Brewer's sparrows would remain viable within the TBNG for at least the short-term. Additionally, the Proposed Action or Alternative 2 would not conflict with the current TBNG Plan (USFS 2002) or future objectives to manage the area for this species. Application of appropriate USFS Standards and Guidelines, successful reclamation efforts, and proper land management on adjoining lands could mitigate potential impacts, to some degree.

H-3.5 West Hilight Field LBA Tract

H-3.5.1 Prairie moonwort (*Botrychium campestre*) The prairie moonwort, a sensitive plant species, has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species was only recorded in Wyoming in a semi-shady mixed deciduous and ponderosa pine forest on sandy soils in the Black Hills. Prairie moonworts are known to exist in a variety of other habitats such as those underlain by Pierre shale, the Laramie Formation, calcareous sedimentary rocks, calcareous soils underlain by limestone, sandy soils and loess prairie. These habitats are generally limited on the West Hilight Field general analysis area, with only some areas dominated by sandy soils present.

Existing Conditions

Prime habitats for the prairie moonwort are not present on the USFS lands within the general analysis area for the West Hilight Field tract. Sites with sandy soils are present on USFS lands and other portions of the general Wright analysis area, but these areas are rather sparsely vegetated and do not provide habitat preferred by this plant species. Prairie moonworts have not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is very low.

H-3.5.2 Narrowleaf moonwort (*Botrychium lineare*) The narrowleaf moonwort, a sensitive plant species, has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species has an affinity for riparian areas and is associated with spruce/fir forests, lodgepole pine forests, and forest meadows.

Existing Conditions

Habitats for the narrowleaf moonwort are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The narrowleaf moonwort has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is very low.

H-3.5.3 Leathery grapefern (*Botrychium multifidum* var. *coulteri*) The leathery grapefern, a plant species of local concern, has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for meadows, wetlands, floodplains and other wet areas in open to forested habitats within forests.

Existing Conditions

Habitats for the leathery grapefern are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The leathery grapefern has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *would have no impact* on the leathery grapefern. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.4 Foxtail sedge (*Carex alopecoidea*) The foxtail sedge, a sensitive plant species, is a perennial plant species and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. The foxtail sedge generally has an affinity for wet meadows and willow-sedge communities along wet, shady creek bottoms and springs.

Existing Conditions
Habitats for the foxtail sedge are not present on the USFS lands within the general Wright analysis area. Suitable wet meadows or willow-sedge communities are not present on these USFS lands. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The foxtail sedge has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *should have no impact* on the foxtail sedge. As indicated, the general analysis area for the West Hilight Field does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is not expected.

H-3.5.5 Elliptic spikerush (*Eleocharis elliptica*) The elliptic spikerush, a sensitive plant species, is a perennial and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for wetland areas created by seeps or springs but may also be found in temporarily flooded areas.

Existing Conditions

Habitats for the elliptic spikerush are not present on the USFS lands within the general Wright analysis area. Suitable wetland habitats are not present on these USFS lands. Few wetland sites associated with various ephemeral drainages and playas are present on portions of the general Wright analysis area, but these sites do not appear to provide optimum habitat for this species. The elliptic spikerush has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to lack of abundant suitable habitat the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field does not provide abundant habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.5.6 Hall's fescue (*Festuca hallii*) The Hall's fescue, a sensitive plant species, is a tufted perennial grass and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for montane meadows, slopes and edges of open coniferous woods and meadows above 6,000 feet in Wyoming.

Existing Conditions

Habitats for the Hall's fescue are not present on the USFS lands within the general Wright analysis area. Suitable montane habitats above 6,000 feet are not present on these USFS lands within the general Wright analysis area, and the Hall's fescue has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the Hall's fescue. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is not expected.

H-3.5.7 Wood lily (*Lilium philadelphicum*) The wood lily, a plant species of local concern, is a perennial herb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for woodland meadows and woodland grasslands.

Existing Conditions

Habitats for the wood lily are not present on the USFS lands within the general Wright analysis area. Suitable woodland meadow or grassland habitats are not present on these USFS lands within the general Wright analysis area, and the wood lily has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the wood lily. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.8 Largeflower triteleia (*Triteleia grandiflora*) The largeflower triteleia, a sensitive plant species, is a perennial herb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and in pinon-juniper woodlands to pine forests and hills.

Existing Conditions

Habitats for the largeflower triteleia are not present on the USFS lands within the general Wright analysis area. Suitable grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and pinon-juniper woodlands or pine forests and hills are not present on these USFS lands within the general Wright analysis area, and the largeflower triteleia has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the largeflower triteleia. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.9 Barr's milkvetch (*Astragalus barrii*) The Barr's milkvetch, a sensitive plant species, is a matt-forming perennial forb that is known from numerous occurrences on the USFS lands within the TBNG. As more surveys are completed, new occurrences are reported. The Barr's milkvetch is found primarily on dry, sparsely-vegetated rocky prairie breaks, knolls, hillsides and ridges. Parent material is calcareous soft shale, siltstone or silty sandstone. Most populations appear to be stable, although populations may decline under drought conditions.

Existing Conditions

Astragalus barrii is a regional endemic plant of the plains in southwestern South Dakota, eastern Wyoming, southeastern Montana, and northwestern Nebraska. According to USFS, this plant species is known to occur in six counties in Wyoming, and there are eleven known occurrences of *A. barrii* in the USFS TBNG.

Suitable habitat for the Barr's milkvetch is present on the USFS lands within the general analysis area for the West Hilight Field LBA Tract as well as other lands within the general Wright analysis area. Populations and individuals have not been documented in the general Wright analysis area, but have been identified in surrounding areas. A pedestrian survey of the tract's general analysis area was conducted in April 2008, when the Barr's milkvetch is in bloom, and no individuals of this species were found. Barr's milkvetch has been collected and positively identified approximately 16 miles south of the general analysis area for the West Hilight Field LBA Tract, in the Section 21 of T.40N., R.71W., based on specimens on file with the Rocky Mountain Herbarium in Laramie, Wyoming.

Indirect and Direct Impacts

If lands within the general analysis area for the West Hilight Field LBA Tract are leased and mined, potential habitat, individuals, and *A. barrii* populations could be lost due to surface disturbances caused by mining activities. These losses would most likely be permanent unless disturbed lands are reclaimed to habitats that would support this plant species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing* because there are *Astragalus barrii* occurrences outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.5.10 Smooth goosefoot (*Chenopodium subglabrum*) The smooth goosefoot, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for sand bars and sandy blowouts in riparian areas.

Existing Conditions

Habitats for the smooth goosefoot are not present on the USFS lands within the general Wright analysis area. Suitable riparian areas are not present on the USFS lands within the general Wright analysis area. A few riparian areas associated with various ephemeral drainages are present on portions of the general Wright analysis area, but these areas do not contain the required sand bar or sandy blowout habitats required for this plant species. The smooth goosefoot has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the smooth goosefoot. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.11 Flat-top goldentop (*Euthamia graminifolia*) The flat-top goldentop, a plant species of local concern, is a rhizomatous perennial forb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for stony sandbars and streambanks but may also be found on moist or drying sites along open streambanks or roadside ditches.

Existing Conditions

Habitats for the flat-top goldentop are not present on the USFS lands within the general Wright analysis area. Suitable wetland or streambank areas are not present on the USFS lands within the general Wright analysis area. Streambanks and a few wetland areas in association with various ephemeral drainages are present within portions of the general Wright analysis area, but these areas generally do not contain the typical habitats required for this plant species, but marginal habitats are present. The flat-top goldentop has not been recorded on the general Wright analysis areas or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would

be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.5.12 Rosy palafox (*Palafoxia rosea* var. *macrolepis*) The rosy palafox, a plant species of local concern, is an annual forb that has not been documented on USFS lands within the West Hilight Field general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for sagebrush and mixed-grass prairie habitats on sandy soils.

Existing Conditions

Habitats utilized by the rosy palafox are present on the USFS lands within the general Wright analysis area and on other surrounding lands. Sagebrush and mixed-grass prairie plant communities are present on sandy soils in the general Wright analysis area. However, rosy palafox has not been recorded on these lands but is potentially present. This plant species has been documented southeast of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the West Hilight Field tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does contain some suitable habitat for this plant species but the rosy palafox has not been documented. This species has been documented southeast of the general Wright analysis area and abundant habitat is present on other sites that would not be affected

H-3.5.13 Lemonscent (*Pectis angustifolia*) The lemonscent, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the West Hilight Field general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming,

this species generally has an affinity for gravel hills and scoria slopes. Lemonscent is also known to occur in low areas in sandy ravines and on sandbars.

Existing Conditions

Habitats utilized by lemonscent are present on the USFS lands within the general Wright analysis area and on other surrounding lands. However, lemonscent has not been recorded in the general Wright analysis area but could potentially be present. This plant species has been documented south of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the West Hilight Field tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does contain some suitable habitat for this plant species but the lemonscent has not been documented. This species has been documented south of the general Wright analysis area and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.5.14 Larchleaf beardtongue (*Penstemon laricifolius* spp. *exifolius*)

The larchleaf beardtongue (penstemon), a plant species of local concern, is a perennial forb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry, rocky, gravelly or sandy slopes, ridgetops and upland flats with shallow soils. Most populations in Wyoming are found at elevations above 6,000 feet, but this species has been documented at lower elevations in the state.

Existing Conditions

Habitats utilized by larchleaf beardtongue are marginally present on the USFS lands within the general Wright analysis area. A few rocky, gravelly hill slopes and rough breaks provide potential habitat, but the larchleaf beardtongue has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does contain marginal habitat for this plant species but the larchleaf beardtongue has not been documented. This species has been documented and is common in southern Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.5.15 Wooly twinpod (*Physaria didymocarpa* var. *lanata*) The wooly twinpod, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry redbed clay-shale slopes, limey-sandstone outcrops, roadcuts and other exposed rock-cliff substrates. Most populations in Wyoming have been documented in the foothills of the Big Horn Mountains.

Existing Conditions

Habitats utilized by the wooly twinpod are marginally present on the USFS lands within the general Wright analysis area. A few sandstone outcrops and exposed rock-cliff substrates provide potential habitat, but the wooly twinpod has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the West Hilight Field tract does contain marginal habitat for this plant species but the wooly twinpod has not been documented. This species has been documented and is common in north-central Wyoming and abundant habitat is present on other

sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.5.16 Visher's buckwheat (*Eriogonum visheri*) The Visher's buckwheat, a sensitive plant species, has not been documented on USFS lands within the West Hilight Field general analysis area but has been tentatively identified elsewhere within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for gullied ridges and eroded badland hills. These sites generally consist of barren shale and clay outcrops with at least 50 percent bare soil, high salt content and shrink/swell clay soils. Typical habitat includes badland islands in grasslands.

Existing Conditions

Habitats for the Visher's buckwheat are not present on the USFS lands within the general Wright analysis area. A few areas of highly eroded gullies consisting of barren shale or clay outcrops may be found in portions of the general Wright analysis area, but these sites do not appear to provide suitable habitat for this species. The Visher's buckwheat has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the Visher's buckwheat. As indicated, the general analysis area for the West Hilight Field tract does not provide optimum suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.17 Highbush-cranberry (*Viburnum opulus* var. *americanum*) The highbush-cranberry, a sensitive plant species, has not been documented on USFS lands within the West Hilight Field general analysis area or within the TBNG. In Wyoming, this plant species is found within Crook County and is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for moist sites including wooded hillsides, thickets or low woodlands. The highbush-cranberry is found all across northern North America.

Existing Conditions

Habitats for the highbush-cranberry are not present on the USFS lands within the general Wright analysis area. Suitable moist, wooded habitats are not present on these USFS lands within the general Wright analysis area. The highbush-cranberry has not been recorded within the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the highbush-cranberry. As indicated, this species has not been documented in the general Wright analysis area and the general analysis area for the West Hilight Field tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.5.18 Northern leopard frog (*Rana pipiens*) Northern leopard frogs range from the Great Slave Lake and Hudson Bay, south to Kentucky and New Mexico (NatureServe 2007). This species is considered relatively common within Wyoming (Baxter and Stone 1980, Cerovski et al. 2004). Northern leopard frogs require shallow, permanent, or semi-permanent standing water with at least some emergent vegetation for breeding (Wagner 1997). Conversely, they use deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom as overwintering habitat (Wagner 1997). Leopard frogs must have good quality water to successfully reproduce, as degraded or turbid water has the potential to negatively affect development of eggs and tadpoles. Overcrowding and changes in water temperature and pH (5.5 or lower) can increase the incidence of disease and mortality (NatureServe 2007) in this species. Adult frogs feed upon a variety of insects and other invertebrates, tadpoles, snakes, and fish (Cerovski et al. 2004), while tadpoles feed primarily upon small invertebrates, plant tissue, and organic debris. Adults also forage within aquatic and upland habitats, whereas tadpoles are restricted to aquatic habitats. Although their overall range remains essentially undiminished in size, many populations are declining. Major factors affecting leopard frog populations are habitat loss in some portions of their range, habitat degradation, overexploitation, interactions with non-native species, climate change, disease, and other unknown causes (Wagner 1997).

Existing Conditions

The northern leopard frog has been observed in southern Campbell County, but has not officially been recognized as breeding there (Cerovski et al. 2004). Although formal anuran surveys were not required or conducted at the adjacent Black Thunder, Jacobs Ranch, or North Antelope Rochelle mines, annual monitoring efforts for other species conducted in overlapping survey areas from 1983 through 2007 have not revealed the presence of northern leopard frogs or anuran egg masses on USFS lands or elsewhere within the general analysis area for the West Hilight Field LBA Tract. Those surveys occurred during all seasons, with biologists watching and listening for northern leopard frogs and other herptiles while conducting all other surveys throughout the area. It is unlikely that northern leopard frogs would have remained undetected during multiple surveys conducted during that long-term period if they were present in the area. Results from annual wildlife monitoring and

baseline studies for the three mines are on file with, and available from, the WDEQ/LQD in Sheridan or Cheyenne, Wyoming and USFS Douglas Ranger District; those reports also include detailed descriptions of survey areas (including maps), methods, and dates for each year.

Habitat conditions on USFS and non-USFS lands within the tract's general analysis area are classified as poor potential to unsuitable, as there are only limited seasonal water sources available. No permanent or semi-permanent waters are present anywhere on those USFS lands. Little Thunder Creek passes through USFS lands within the West Hilight Field tract. In its natural state, this ephemeral stream is typically dry by mid to late summer, and without flow to maintain open water, any pools persisting until winter freeze solid, thus limiting overwintering habitat for this species. Like Little Thunder Creek, all other drainages throughout the tract's general analysis area are ephemeral in nature and only carry water during or immediately following high intensity precipitation events, resulting in low quality or unsuitable habitat conditions for this frog species. Water discharged from CBNG wells has enhanced the water supply within some portions of Little Thunder Creek and its tributaries, which has increased potential habitat for some aquatic and semi-aquatic species. However, those enhanced areas are still relatively limited and/or isolated in nature. A portion of Little Thunder Creek on USFS lands in the W½ Section 22, T.43N., R.71W. (Little Thunder Reservoir) has been dammed to retain water for at least part of each year. Despite that occasional increased water supply, the reservoir often lacks the emergent vegetation that is important for breeding and foraging leopard frogs. Water levels in drainages are typically too temporary and/or shallow to support tadpoles until metamorphosis, or allow frogs to successfully overwinter, respectively. The general lack of emergent vegetation near temporary water bodies limits their value to northern leopard frogs.

Direct and Indirect Effects

Wetland and aquatic habitats for northern leopard frogs are considered very poor to unsuitable on USFS lands and elsewhere in the general analysis area for the West Hilight Field LBA Tract, as described above. Furthermore, no frog sightings have been recorded on USFS lands during baseline surveys or annual monitoring completed between 1983 and 2007. Consequently, northern leopard frogs and their aquatic and terrestrial habitats are not expected to be impacted if the USFS lands in this LBA tract were leased. In the unlikely event that this species is present in the future, direct loss of, or injury to, foraging and dispersing frogs could result from encounters with mine vehicles or heavy equipment during topsoil stripping or other surface disturbance near Little Thunder Creek, although such risks are minimal due to the lack of frog sightings to date.

It is possible that existing reservoirs and ponds (natural and those enhanced by CBNG discharge water), and those created for flood control, sedimentation, water storage purposes, or wetland mitigation measures could provide suitable foraging or breeding habitat for northern leopard frogs in the future. However,

most artificial water structures would still be limited to relatively shallow, seasonal waters with little emergent vegetation that would not provide for the year-round habitat needs of this frog species. Should those efforts result in improved aquatic habitats, adult frogs, tadpoles, and/or egg masses present in the area could be injured or killed during activities associated with additional construction of diversion dikes or associated channels, or the dewatering of potential habitats downstream of a dike. Under those limited circumstances, potential impacts could include loss of individuals and foraging habitat, increased predation, and changes in stream morphology and hydrology. Standard mining procedures such as the use of silt barriers across affected stream channels and other similar efforts would minimize any negative impacts that might result from mine-related operations. Likewise, adherence to the Thunder Basin National Grassland Plan Standards and Guidelines (USFS 2002) pertaining to water and wetlands would ensure that leopard frogs and other aquatic organisms present on USFS lands would not be negatively affected by increased sedimentation, degraded water chemistry, or otherwise damaged aquatic habitats.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, USFS lands and adjacent non-federal lands within the West Hilight Field general analysis area do not contain suitable habitat for northern leopard frogs. Water sources in the drainages in that area are too temporary and shallow to support tadpoles until metamorphosis, or to allow frogs to successfully overwinter. If present, individual adult leopard frogs may be incidentally killed by vehicles or equipment. Habitat may be enhanced or created during certain mine operations, but water flow and depth associated with existing structures at the adjacent Black Thunder Mine have not resulted in adequate conditions to support the life cycle needs of this species, and they are not expected to create those conditions anywhere in this LBA tract. As no northern leopard frogs have ever been documented on USFS lands within the overall general analysis area for the West Hilight Field LBA Tract, potential effects are expected to be negligible, if they occur at all. Furthermore, northern leopard frogs have been documented at other sites outside of the tract's general analysis area that will not be affected by coal leasing actions.

H-3.5.19 Black-tailed prairie dog (*Cynomys ludovicianus*) The black-tailed prairie dog was removed from the USFWS federal listing process in 2004. The agency ruled that listing this species may be warranted, but was precluded by higher priority considerations. Consequently, the black-tailed prairie dog is no longer considered a candidate species under the Endangered Species Act (ESA).

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). The TBNG, which includes USFS lands in the general analysis area for the

West Hilight Field LBA Tract, harbors one of the seven major colony complexes remaining in North America. Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. This species has the ability to rapidly expand its distribution and population if not limited by pest control practices or disease, and will readily spread into recently disturbed areas. Many species such as the black-footed ferret, mountain plover, burrowing owl, and swift fox are dependent on prairie dogs during a portion of their life cycle. Black-tailed prairie dog occupied range and abundance has declined dramatically, and continues to exhibit a slow decline (NatureServe 2007). Major factors contributing to the decline include disease (sylvatic plague), urbanization, habitat conversion, and control efforts.

Existing Conditions

A total of eight prairie dog colonies (approximately 167.5 total acres) were found within the wildlife survey area for the West Hilight Field LBA Tract in 2007, three of which were present on USFS lands. The West Hilight Field wildlife survey area for this tract includes lands added by the BLM under Alternative 3 and the surrounding 2-mile perimeter. One colony (approximately 89.1 acres in size) on USFS lands was in the general analysis area itself, while the other two colonies on USFS lands were in the surrounding 2-mile perimeter, and ranged from less than 1 acre to about 7 acres in size, for a total of approximately 96 acres. Five additional prairie dog colonies were recorded on non-federal surface within or overlapping the 2-mile wildlife survey area (Figure H-3) in 2007, all five of which were outside of the tract's general analysis area. No colonies were present on adjacent lands within Alternative 3. The total area for those five colonies was approximately 63 non-contiguous acres, and the sizes range from about 2.6 to 27.2 acres.

Only the 89.1-acre colony meets the 80-acre minimum for black-footed ferret habitat (USFWS 1989). As noted above, that colony is on USFS lands and is also within the general analysis area for the West Hilight Field LBA Tract. However, the focus area for ferret reintroduction efforts is outside the coal mine region of the PRB of northeast Wyoming (refer to Management Area 3.63) (USFS 2002, Grenier 2003). That coal region includes all USFS and surrounding lands within the general analysis area for the West Hilight Field LBA Tract. Additionally, some prairie dog colonies in that coal region were recently infested with the plague, while others are currently exposed to year-round disturbance associated with conventional oil and gas, CBNG, and coal (including open pits) resources, as well as seasonal recreational shooting and vehicular travel.

Direct and Indirect Effects

The current mining plans for the Black Thunder Mine does not project any new surface disturbance in the one prairie dog colony that is located within the general analysis area for the West Hilight Field LBA Tract. Nevertheless, that colony would be affected by the proposed leasing action at some point in time. As stated above, that colony (89.1 acres in size) is located on USFS lands.

Such impacts could have immediate results on prairie dogs if an occupied colony is suddenly subjected to the effects of a soil salvage operation, or is otherwise impacted in a short timeframe that precludes the dispersal of individuals prior to surface disturbance. However, as those activities typically occur incrementally across various portions of future mining areas, some individuals could disperse to undisturbed portions of the affected colony, or create one or more new colonies within the area.

Smaller-scale disturbances associated with both the mining and CBNG industries can also impact prairie dog colonies and surrounding vegetation through fragmentation or loss of foraging and burrowing habitat. Linear disturbances associated with mining infrastructure, such as roads, power lines, fences, and pipelines will occur within narrow corridors over relatively short distances, and would be completed within shorter timeframes than the advancement of a surface mine pit. However, such disturbances would still pose some level of risks due to vehicular collisions or by enhancing habitat for mammalian and avian species that prey on prairie dogs.

Some linear impacts could be minimized or mitigated through the consolidation of roads and electric utilities within common corridors, applying perch deterrents on overhead power poles, and reseeding pipeline disturbances quickly with appropriate seed mixes for the region. Minor surface disturbance near existing colonies would provide recently upturned soils that could facilitate the expansion of the existing colonies or the establishment of new ones, as prairie dogs will readily move into recently disturbed areas. Post-mining reclamation could have similar potential benefits; prairie dogs have already demonstrated their ability to inhabit reclaimed lands at the nearby Antelope Mine (BLM 2008).

All USFS Standards and Guidelines applicable to black-tailed prairie dogs outlined in the TBNG Plan (USFS 2002, page 1-20) would be implemented. To reduce risks and habitat loss for prairie dogs and other wildlife species closely associated with prairie dog colonies, new roads will be aligned outside colony boundaries where possible. If it is necessary to place a new road within a prairie dog colony, the amount of road in the colony will be minimized to the extent that soil, drainage, topographical and other physical factors will allow.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Only one of the eight black-tailed prairie dog colonies within the wildlife survey area for the West Hilight Field LBA Tract would be physically disturbed by mining activities within the tract's general analysis area, if the lease is issued. That colony encompassed 89.1 acres in 2007, and it was on USFS lands. Given the fact that seven of the eight colonies within the wildlife survey area for the West Hilight Field LBA Tract were outside of the general analysis area (area of potential surface disturbance) associated with this proposed lease, the tendency of prairie dogs to disperse and expand their

boundaries, and the incremental nature of surface coal mining relative to some other disturbance activities, the potential impacts to prairie dog colonies on and near USFS lands in the West Hilight Field LBA Tract would not have adverse consequences for the viability of the local or regional population. Disturbance and reclamation efforts will occur incrementally in varying locations throughout the permit area as mining progresses through the approved lease.

H-3.5.20 Swift Fox (*Vulpes velox*) The swift fox was removed from the USFWS federal listing process in 1995, after extensive field surveys demonstrated that the population was greater than expected. This species is considered to be common within the eastern Great Plains grasslands of Wyoming (Cerovski et al. 2004), though it typically occurs at very low densities. The exact status of the population is unknown but believed to be increasing, especially in the Northern Plains. Swift foxes are largely nocturnal and typically prefer flat to gently rolling, short- or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). This species uses multiple den sites year-round for shelter, protection from predators, and rearing young. Burrows of other mammals such as badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), and prairie dogs are often used or modified for those purposes. Small to mid-sized mammals constitute the bulk of their diet. Swift foxes have little fear of humans and may den in proximity to human disturbances (residences and busy roadways). This tolerance also makes them susceptible to trapping, vehicle collisions, and attacks by dogs. Major threats faced by the swift fox include habitat loss and degradation, interspecific competition with red fox and coyote (*Canis latrans*), and vehicle collisions.

Existing Conditions

Swift fox have been observed in large grassland blocks in southern Campbell County with more frequency in recent years, and are presumed to breed there. This species has also been documented within the overall TBNG. However, sagebrush communities dominate the general analysis area for the West Hilight Field LBA Tract, as well as USFS lands in that area. The prevalence of sagebrush throughout the tract's wildlife survey area largely explains the extremely limited sightings of this grassland fox over the last 25 years, as described below. Burrows within the existing black-tailed prairie dog colonies and scattered badger or red fox burrows could be used by swift foxes as den or shelter sites, and swift fox could forage in the area.

No specific surveys for swift fox were conducted for this analysis. However, such efforts were completed in 2002 using USFS survey protocols for other unrelated projects. Those surveys were within 6 miles of USFS lands in the West Hilight Field tract's general analysis area. Nocturnal spotlight surveys for rabbits and hares were conducted as part of annual wildlife monitoring at adjacent existing mines every year since at least 1994, with diurnal surveys for a variety of vertebrate species occurring across all seasons annually since the early 1980s. All of those survey efforts overlapped significant portions of the West Hilight Field tract's wildlife survey area.

Despite those combined efforts, no swift foxes have ever been recorded on USFS or other lands within the general analysis area for the West Hilight Field LBA Tract. One sighting was made on adjacent lands east of this LBA tract along Little Thunder Creek between 1995 and 1997 in T.43N., R.71W., SE¼ Section 23 (USFS 2003). A lone fox was also observed on adjacent lands east of this LBA tract in T.43N., R.71W., SW¼ Section 14 during that same period. No swift foxes have been recorded elsewhere in the overall Black Thunder Mine annual monitoring area since surveys began in 1983.

Few other swift fox sightings have been recorded elsewhere within the surrounding region during specific surveys or incidental to other searches at local mines over the last 25 years. Those efforts were conducted as part of annual wildlife monitoring by contract and USFS biologists on private and federal lands in the area. One swift fox was documented approximately 6 to 7 miles southeast of USFS lands within the general analysis areas for the West Hilight Field LBA Tract in March 2002. The fox was observed in T.42N., R.70.W., SE¼ Section 15 during spotlight trapping efforts for sage-grouse at the nearby North Antelope Rochelle Mine. The nearest other sighting occurred in T.43N., R.72W., SE¼ Section 20 between 1995 and 1997, approximately 6 miles west of USFS lands in the West Hilight Field tract's general analysis area. Reports from all annual monitoring and special studies are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

H-3.5.21 Long-billed curlew (*Numenius americanus*) Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California, and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003a). The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Cerovski et al. 2004). Curlews are ground nesters, and require large open expanses of grassland, with relatively low vegetation and few shrubs in which to nest (Hill 1998). The nest is typically a shallow scrape or depression, thinly lined with grass, weeds or cow dung, typically near water or moist areas.

Curlews use historically occupied sites each year, and some individual birds may reuse the same territories from year to year (Dechant et al. 2003a). Curlews primarily feed upon insects but also eat other invertebrates, small crustaceans, toads, and eggs and nestlings of other birds. This species forages in grasslands, wet meadows, prairie dog colonies, and occasionally along the margins of wetlands. Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998). Although some populations may be declining, overall population trends suggest long-billed curlew numbers are stable or increasing slightly. The major factor affecting curlew populations is habitat destruction and fragmentation.

Existing Conditions

Long-billed curlews are uncommon summer residents within the TBNG. The areas evaluated for this analysis include USFS and adjacent lands within the general analysis area for the West Hilight Field LBA Tract. As described for the northern leopard frog and swift fox, above, those areas are dominated by sagebrush habitats with scattered stands of upland grasslands and little water. Consequently, habitat conditions in the tract's general analysis area and surrounding lands would be suitable for foraging migrants, but they do not provide large expanses of grassland areas for nesting activities. No long-billed curlews have ever been documented on USFS lands or adjacent lands in the general analysis area or larger wildlife survey area for the West Hilight Field LBA Tract. Likewise, few curlews have been observed in the surrounding region during annual wildlife monitoring in the area over the last 24 or more years. Most of those sightings occurred during spring months and beyond USFS lands, and were likely individual migrants or non-breeding adults. No significant wetlands (i.e., large lakes) or other persistent conditions that might attract large numbers of curlews during migration exist within the West Hilight Field wildlife survey area.

No nesting occurrences have been documented for long-billed curlews in southern Campbell County (Cerovski et al. 2004), including USFS lands in the West Hilight Field tract's general analysis area and adjacent lands. Potential foraging habitat is present on USFS and adjacent lands in those areas, and elsewhere within the 2-mile wildlife survey perimeter, but nesting habitat conditions are poor to unsuitable. CBNG development activities are increasing throughout the region, with active mining (including open pits) also occurring in the near vicinity. Therefore, potential foraging habitats would be disturbed by the Proposed Action and Alternatives for this LBA tract.

Direct and Indirect Effects

Given the lack of sightings of long-billed curlews in the West Hilight Field LBA Tract general analysis area and surrounding area since 1983, and the fact that habitat conditions in those areas are only suitable for foraging migrants or non-breeding adults, the Proposed Action and Alternatives for this LBA tract are unlikely to cause any direct injury or mortality to this species. However, if present, future mining activities could result in injuries or mortalities to foraging individuals. Foraging individuals may also be displaced by human activities and noise associated with mining. Potential foraging habitats may be disturbed, removed, or fragmented by mining activities. The type, timing, location, and extent of habitat disturbance will vary throughout the tract's general analysis area as operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine, and will eventually mitigate impacts to some degree. The Black Thunder Mine's reclamation plan would incorporate the replacement of jurisdictional wetland acreages existing prior to mining with at least equal types and numbers of wetland acreages. The creation of wetland habitats, especially where adjacent to native or reclaimed grassland habitats, could provide additional (although limited) foraging areas for curlews.

As no long-billed curlews have been documented within USFS lands or other lands in or near the West Hilight Field LBA Tract general analysis area, and habitat conditions do not provide quality nesting areas, species-specific Standards and Guidelines outlined in the Grassland Plan (USFS 2002) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As this species appears to be an infrequent visitor to the tract's general analysis area, and good quality foraging and nesting habitat is not present within the area, impacts to this species are likely to be minimal. Loss, degradation, or fragmentation of potential foraging habitat and potential collisions with vehicles may occur. Reclamation of wetlands and grasslands may create limited foraging or nesting habitat.

H-3.5.22 Ferruginous hawk (*Buteo regalis*) Ferruginous hawks breed throughout much of the western United States and portions of three Canadian provinces (Johnsgard 1990). This species nests throughout Wyoming (Cerovski et al. 2004) and occupies portions of the state during winter. Large expanses of grassland and shrubland, where livestock grazing (vs. cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Most ferruginous hawks in the PRB nest on the ground (usually elevated sites, though some pairs nest in small trees). Typical nest sites include hilltops, rock outcrops, eroded creek banks, small trees, and even relatively level ground. The ferruginous hawk relies primarily on two mammalian families for the majority of its prey: *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs). Numerous nests can occur within the territory of a single pair, and ferruginous hawks often reuse nests for many years.

This species may be sensitive to human disturbance, especially during the nesting period (White and Thurow 1985). This sensitivity can be heightened in years of low prey abundance. Accurate information regarding the trend for the ferruginous hawk is limited and mixed. Some populations may be declining (Bechard and Schmutz 1995); however, overall population trends suggest numbers are stable or increasing (NatureServe 2007). Major factors affecting ferruginous hawk populations include habitat destruction and fragmentation, and human disturbance.

Existing Conditions

Annual monitoring has documented that ferruginous hawks nested in the vicinity of the Black Thunder Mine during each of the last 25 years, and fledged young in all but one of those years. Similar long-term nesting has occurred at the neighboring Jacobs Ranch and North Antelope Rochelle mines. Many of those nests were located on USFS lands. Details describing the number of intact and active nests within the mine monitoring survey areas in a given year are available in annual monitoring and baseline wildlife reports on file at the

USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

The presence or absence of nest material does not determine whether the USFS considers a site as "active" (occupied during at least 1 of the last 7 years). Three ferruginous hawk nest sites in two territories have been documented on USFS lands within the West Hilight Field tract's general analysis area during annual wildlife monitoring surveys conducted through 2007. Two sites still had nest material present that year (Figure H-3).

Only one additional nest site has been recorded on USFS surface within the 2-mile wildlife survey area through 2007. No material was present at the nest site in 2007. Nine additional nest sites in three territories were present on non-federal lands within the tract's general analysis area during the 2007 survey. Nest material was present at four of the nine sites that year.

An additional 40 nest sites (24 individual nests plus 6 multi-species sites) were located on non-federal lands within the tract's 2-mile wildlife survey area through 2007. The 40 nests were in at least 16 different territories. Only 23 of the 40 sites still had nest material present in 2007.

Direct and Indirect Effects

Over time, the Black Thunder Mine has avoided, where possible, or mitigated mining impacts on raptor nests through a variety of means. The mine has voluntarily monitored nesting raptor populations in a perimeter larger than required annually since 1983, maintained and implemented current USFWS approved Raptor Mitigation Plans, adjusted operations to provide temporal and spatial buffers around raptor nests, and ensured that new power lines at the mine conform to current Avian Power Line Interaction Commission (APLIC) guidelines. Provided those practices are continued, direct impacts on ferruginous hawks and their active nest sites will be minimized, both on and near USFS lands. Due to restrictions on disturbance near active nest sites, the most probable source of potential impact to ferruginous hawks themselves would be an increase in injuries and fatalities of individuals foraging within the general analysis area due to vehicle collisions associated with ongoing or future mining and other activities. The use of existing roads in the area, when possible, would help to minimize this risk.

Habitat loss, degradation, and fragmentation would result from a variety of large- and small-scale mining operations such as soil salvaging and reservoir/flood control construction, among others. Potential nesting and foraging habitat might also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features

elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances would shift throughout the expanded permit area as operations progress. Reclamation of disturbed areas would occur incrementally as resource recovery is completed in a given portion of the mine, and would mitigate impacts to some degree. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (lagomorphs and rodents) for ferruginous hawks. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

USFS Standards and Guidelines would be implemented and offer additional protections for active nests; they would apply only to activities outside of the lease area. These protocols should help ensure that the Proposed Action and Alternatives do not significantly degrade the quality of existing ferruginous hawk territories and nest sites. Standards and Guidelines specific to ferruginous hawks outlined in the TBNG Plan (USFS 2002, page 1-20-21) are as follows:

73. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within 0.25 mile (or line of sight) of active ferruginous hawk nests. For the ferruginous hawk, a nest is no longer considered active if it is known to have been unoccupied for the last seven years. This does not apply to pipelines, fences and underground utilities.

74. To help reduce disturbances to nesting ferruginous hawks, prohibit the following activities within 0.5 mile (or line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.

75. To help reduce disturbances to nesting ferruginous hawks, do not authorize the following activities within 0.5 mile (line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., pipelines, utilities, fencing), seismic exploration, and workover operations for maintenance of oil and gas wells.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Most ferruginous hawk nests located within the West Hilight Field tract's general analysis area are located on non-federal surface. Many nests on USFS lands have alternate sites within the same territories that are beyond the general analysis area, and thus are less likely to be impacted by future mining disturbance associated with the proposed leasing action. Some individuals or pairs may experience disturbance, destruction, or fragmentation

of nesting and foraging habitat. Increased disturbance to individuals due to human activity may also occur. However, several factors should minimize the potential mining-related impacts on this species, including the availability of alternate nest sites located further away from pending disturbance in each affected territory, implementation of USFWS and USFS approved mitigation measures, reclaiming habitats as soon as feasible, encouraging nesting within mine reclamation lands through artificial nest structures and habitat features such as rock piles and tree plantings that attract prey species, and continued monitoring of this species to ensure that mitigation methods are applied when necessary.

H-3.5.23 Burrowing owl (*Athene cunicularia*) Burrowing owls breed from southern Alberta to southwestern Saskatchewan, south through east-central Washington, central Oregon, and southern California, and east to eastern North Dakota, west-central Kansas, and Texas (Klute et al. 2003, pg 7). The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Cerovski et al. 2004). This species requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Klute et al. 2003, pg 12).

Most burrowing owl nests within the TBNG are located within prairie dog colonies (USFS 2003). Burrowing owls typically reuse traditional nesting areas. Burrow mounds, shrubs, fence posts or boulders may be used as observation perches. This species is usually tolerant of human activity but is vulnerable to predation by pets (cats, dogs). Burrowing owls forage within a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. This species is often active during daylight hours. Insects and small mammals (mice and voles) are the owls' primary prey items. Burrowing owl populations have been declining throughout its range, primarily due to habitat loss.

Existing Conditions

Burrowing owls are common summer residents within the TBNG (Cerovski et al. 2004). This species was first recorded nesting in the Black Thunder Mine annual monitoring 2-mile perimeter in 1988. Despite the presence of potential nesting habitat (prairie dog and badger burrows) in the monitoring area, this species nested in only 5 of the subsequent 19 years. All known burrowing owl nest sites in the mine monitoring area have been in prairie dog burrows. Four artificial nest boxes have been constructed in the mine's 2-mile perimeter wildlife survey area for mitigation purposes over the years, but no owls have ever been observed at or near them.

No burrowing owl nest sites had been documented within the general analysis area for the West Hilight Field LBA Tract through 2007, including USFS lands within that area. One burrowing owl nest site has been recorded on non-federal lands in the northwestern corner of the general analysis area and approximately 0.25 mile from the nearest USFS lands (Figure H-3). The disturbance-free buffer for active nests of this species is 0.25 mile. This nest

site was active in 2007, but no young fledged. Two additional burrowing owl nest sites (one territory) have been documented in the northeastern portion of the two-mile wildlife survey area. Those nests are located within the North Hilight Field LBA Tract as applied for (refer to Section H-3.3.23). Potential nesting habitat for burrowing owls is present in a prairie dog colony (approximately 89 acres in size) within the West Hilight Field tract's general analysis area, which is located on USFS lands. Another prairie dog colony (about 7 acres in size) is located about 0.25 mile east of the West Hilight Field tract's general analysis area (Figure H-3), and in any badger burrows that might be present in the area would also provide potential nesting habitat for burrowing owls.

Direct and Indirect Effects

No known burrowing owl nest sites are present on USFS lands in the general analysis area for the West Hilight Field LBA Tract. One existing nest site is approximately 0.25 mile of those lands (the USFS buffer for that species is 0.25 mile). Potential nesting habitat in the vicinity of this LBA tract is largely limited to the large prairie dog colony located along Little Thunder Creek within the tract's general analysis area. Therefore, leasing the West Hilight Field LBA Tract would not result in any direct or indirect effects to nesting burrowing owls. Both USFS Standards and Guidelines (USFS 2002) and the Black Thunder Mine's mine permit (TBCC 2005) stipulate that clearance surveys will be conducted and approved by the appropriate agencies before any colony is disturbed during the breeding season. That process will preclude most direct impacts to new nesting burrowing owls in that area.

Because burrowing owls are active during daylight hours, the most probable source of direct impacts would be the death of, or injury to, individuals fleeing heavy equipment, or being killed or injured by equipment while feeding or moving through the mine area. Burrowing owls are generally tolerant of human activities, but increased presence and noise, especially during the nest initiation period, may displace individuals or inhibit nesting proximate to mine operations. Foraging could also be hindered within these areas, especially where mining activities occur near prairie dog colonies.

As described previously, mining could eventually disturb or eliminate prairie dog colonies (potential nesting habitat) on USFS lands in the West Hilight Field tract's general analysis area (approximately 89 acres). However, the limited presence or long-term absence of nesting burrowing owls in that colony, in combination with the presence of other non-disturbed colonies in the area and the ability for prairie dogs to recolonize reclamation, would mitigate those losses to a large extent. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (rodents, non-flying insects) for burrowing owls. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

Additionally, the tendency of prairie dogs to quickly colonize nearby areas when their colonies are disturbed would create new nesting habitat for burrowing owls. Overall, nesting and foraging habitats will be incrementally affected by a variety of large-and small-scale operations. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress, thus providing opportunities for burrowing owls to relocate to other suitable habitat within the immediate area.

Reclamation will proceed incrementally as areas are mined and activities move to new locations within the mine area. Both activities will create loose soil that should be attractive to dispersing prairie dogs (potential habitat source), at least in the short term. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine, and will eventually mitigate habitat impacts to some degree. However, to date, burrowing owls have rarely been documented nesting within reclaimed habitats at surface mines in the PRB of northeast Wyoming.

If nesting burrowing owls are documented on or near USFS lands in the West Hilight Field LBA Tract, USFS Standards and Guidelines applicable to this species would be implemented on applicable lands to offer additional protections beyond those outlined in the USFWS approved Raptor Mitigation Plan for the Black Thunder Mine. Annual monitoring of known burrowing owl nest sites within the 2-mile wildlife survey area for the mine, including USFS and adjacent lands, and other nearby colonies will continue through the life of the mine to document their histories of occupancy and production.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No burrowing owl nests have been documented on USFS lands in the West Hilight Field tract's general analysis area during many years of annual monitoring, and only a single nest site is located approximately 0.25 mile from the nearest USFS lands in the tract's general analysis area. Disturbance, fragmentation, and alteration of foraging and nesting habitats would occur if this tract is leased and mined. However, excluding the single large colony that is located in the tract's general analysis area, few prairie dog colonies occur in the general vicinity of this LBA tract, and most are located outside of the tract's general analysis area.

The Black Thunder Mine has avoided, where possible, and mitigated such impacts in the past through intensive monitoring of both populations and specific nest sites, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests (including burrowing owl nests). Mining activities and noise may disturb individuals inhabiting the lease area, thus inhibiting potential nesting or foraging in proximity to lands with ongoing development. Potential collisions with vehicles might also occur, though none have been recorded in the area to date.

H-3.5.24 Chestnut-collared longspur (*Calcarius ornatus*) The breeding range of the chestnut-collared longspur extends from southern Alberta to southern Manitoba, south to west-central Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et al. 2003b). The chestnut-collared longspur is a common summer resident of the eastern plains of Wyoming (Cerovski et al. 2004). This species prefers native grasslands as breeding sites, inhabiting open prairie and avoiding excessively shrubby areas. Grasslands with dense litter accumulations are also avoided (Dechant et al. 2003b). Scattered shrubs are often used as singing perches. Nests are typically placed in areas of sparse vegetation (less than 20-30 centimeters), but usually with a taller grass component than sites preferred by McCown's longspurs. Nests are on the ground in depressions and often placed beside cattle dung, small shrubs, or under a clump of grass (Hill and Gould 1997). Male fidelity to breeding areas has been observed. Chestnut-collared longspurs feed primarily on seeds (especially grasses), insects, and spiders. This species is generally tolerant of short-term intrusion at the nest site but may desert if disturbed during nest building or egg-laying (Hill and Gould 1997). High rates of predation on eggs and nestlings have been reported and pesticides have been shown to reduce hatching success. The chestnut-collared longspur breeding range has contracted and long-term data suggests population declines (Hill and Gould 1997). These declines have been attributed to loss of native prairie habitat, and conversion to cropland and urban development.

Existing Conditions

Chestnut-collared longspurs are common summer residents within the TBNG. Individuals of this were recorded infrequently on non-federal lands in the West Hilight Field tract's general analysis area during annual monitoring in recent years. As described previously, sagebrush habitats dominate USFS and adjacent lands in the general analysis areas for the West Hilight Field LBA Tract. Grassland areas are present in the form of prairie dog colonies, upland grasslands, and agricultural pasture grasslands, but they occur in isolated parcels scattered throughout the areas rather than in contiguous and/or sizeable blocks that would be attractive to nesting chestnut-collared longspurs. Consequently, only limited suitable habitat conditions exist for this species on USFS lands in the West Hilight Field LBA Tract general analysis area and adjacent lands.

Direct and Indirect Effects

Due to the similarity of potential impacts from future mining on chestnut-collared longspurs and other grassland species previously discussed (e.g., prairie dog and swift fox), detailed descriptions of those impacts are not repeated here. Chestnut-collared longspurs have not been documented as nesting in the West Hilight Field tract's general analysis area. Equipment operations associated with future mining operations could result in fatalities or injury to individuals, nests and eggs, and/or young. Increased human activity and noise could inhibit foraging or nesting within suitable habitats on USFS lands or displace individuals during periods of intense activities. Over the life of the mine, potential nesting and foraging habitats in the general analysis area

could be disturbed, destroyed, altered, or fragmented, though the type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine. Within 1 to 2 years, newly reclaimed areas may create good quality, short-duration nesting habitat for chestnut-collared longspurs. However, as these sites mature, they would become less suitable as nesting habitat for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the West Hilight Field tract's general analysis area are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. Only limited observations of individuals have occurred in the West Hilight Field tract's general analysis area. Potential and documented alternative habitats for chestnut-collared longspurs are present elsewhere in the vicinity in areas not currently scheduled for mining disturbance.

H-3.5.25 McCown's Longspur (*Calcarius mccownii*) McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north-central Colorado, and east to western Nebraska, north-central South Dakota, and southwestern North Dakota (Dechant et al. 2003c). This species is a common summer resident of the eastern plains and great basin-foothills grasslands, basin-prairie shrublands, and agricultural areas throughout most of Wyoming (Cerovski et al. 2004). Specifically, this species requires open habitats such as sparsely vegetated, low structured grasslands, and heavily grazed pastures containing a moderate bare ground component for nesting and foraging. Nest sites are typically a natural or shallow scraped depression on the ground placed in the open or beside vegetation such as bunch grasses, cacti, or shrubs. McCown's longspurs feed on seeds of grasses and forbs, insects, and other arthropods. No strong data suggests breeding site fidelity although some individuals may return to the general nesting area in subsequent years.

Individuals vary in response to human intrusion at nest sites, but appear to be relatively more tolerant than most grassland songbird species. High rates of predation on eggs and nestlings occur especially where nests are associated with vegetative structure. Nestlings may also be directly poisoned where insecticides are sprayed in nest areas (With 1994). Populations are declining, especially within the northern portion of the range. Factors directly affecting the McCown's longspur include the reduction of breeding habitat due to overgrazing, control of prairie fires, plowing, development, and excessive use of pesticides. Conversion of short-grass prairie to agriculture and urban development is the most important factor (With 1994).

Existing Conditions

McCown's longspurs are also common summer residents within the TBNG. Observations of the McCown's longspur mirror those of the chestnut-collared longspur. Limited sightings of individual birds have been recorded in the West Hilight Field tract's general analysis area in recent years, although no confirmed observations of this species were made on USFS lands in that area. The nearest observation to the tract's general analysis area occurred on non-federal lands in NE¼SW¼ Section 13, T.43N., R.71W. in May 2000. The height and composition of vegetation (i.e., sagebrush) on most USFS lands in the West Hilight Field tract's general analysis area is generally too tall and dense, respectively, to provide suitable habitat for McCown's longspurs.

Direct and Indirect Effects

The direct and indirect effects to McCown's longspurs would be the same as those described above for the chestnut-collared longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the West Hilight Field tract's general analysis area are dominated by sagebrush communities that are not as attractive to grassland species such as the longspur. Only limited observations of individuals have occurred in the West Hilight Field tract's general analysis area. Potential and documented alternative habitats for McCown's longspurs are present nearby in more appropriate habitats not currently scheduled for mining disturbance.

H-3.5.26 Greater sage-grouse (*Centrocercus urophasianus*) The Greater sage-grouse occurs year-round throughout non-forested regions of Wyoming (Cerovski et al. 2004). Sage-grouse rely on a variety of habitats within sagebrush dominated landscapes to reproduce and survive throughout the year. Early in the spring, grouse gather at breeding display sites called leks. Leks are usually in open areas (playas, ridge tops, sparse sagebrush, or burned areas) that are surrounded by dense sagebrush and escape cover. The surrounding area also typically represents nesting, loafing, and foraging habitat.

After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nests in some portions of sage-grouse range are typically placed under sagebrush with average height of 36-79 centimeters (Schroeder et al. 1999). However, research conducted within the Southern PRB (Brown and Clayton 2004) indicated that, although shorter sagebrush was present at nest sites, grouse selected shrubs ranging from 55-61 centimeters in height under which to place nests. Re-nesting may occur if the nest is destroyed early during the laying or incubation period. Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). Sage-grouse exhibit high fidelity

to seasonal ranges, and may return to the same area to nest in subsequent years.

For the first month after hatching, the young depend on relatively open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late-season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse feed upon sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense, exposed sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes or windblown ridges are preferred.

Breeding populations of this species have declined by at least 17 to 47 percent throughout much of its range (Connelly et al. 2004). Within Wyoming, sage-grouse populations have generally declined over the past 4 decades. However, sage-grouse population estimates specifically pertaining to the TBNG suggest an overall increase in individuals since 1995. This same general trend was observed both statewide and within the Northeast Wyoming Sage-Grouse Local Working Group (NWSGWG) area.

The NWSGWG identified habitat fragmentation and degradation, disturbance and direct mortality as major influences affecting sage-grouse (NWSGWG 2006). The group identified oil and gas development, vegetation management, invasive plants, and weather as those factors with the most influence on the northeast Wyoming sage-grouse populations and those that may most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming (NWSGWG 2006).

Existing Conditions

As described above, USFS lands on and adjacent to the general analysis areas for the North, South, and West Hilight Field LBA Tracts are dominated by a sagebrush-grassland community, primarily big sagebrush, with shrub cover ranging from 55 to 60 percent. Those areas provide potential year-round habitat for sage-grouse, though habitat quality varies. Sagebrush stands range from sparse to moderately dense throughout the areas, with only a marginal grassy understory in many areas.

Despite the prevalence of sagebrush in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts, sage-grouse numbers were never especially high in the area. Five sage-grouse leks are located on and within 2 miles of the North, South, and West Hilight Field tracts' general analysis areas: Stuart I, Stuart II, Black Thunder, Butch, and Hansen Lakes (Figures H-1, H-2 and H-3).

No sage-grouse leks are present on USFS lands in the North Hilight Field tract's general analysis area. Two leks are present on non-federal surface in

the tract's general analysis area: Butch and Hansen Lakes. The Hansen Lakes lek is immediately south of USFS surface in that area (Figure H-1). The Hansen Lakes lek is classified as "occupied" by the WGFD (active in at least 1 of the last 10 years). The Butch lek was first recorded in 1990. The peak male count (15) occurred in 1991, after which numbers declined dramatically. No grouse were recorded at the Butch lek during annual checks conducted over the last 14 years (1994 through 2007). The Butch lek is classified as "unoccupied/abandoned" by the WGFD (no activity for 10 consecutive years).

The Butch lek was discovered in 1990, and was active every year through 1993. The Hansen Lakes lek was discovered in 1993, coincidently at the same time peak male counts were dramatically declining at the Butch lek; the leks are approximately 1.5 miles apart. Peak male counts at the Hansen Lakes lek ranged from 14 to 24 birds from 1993 through 2000, but dropped markedly to only 3 birds in 2001. Grouse were present at the lek for the next 2 years, but no birds were observed there after 2003. No other grouse leks are present within 3 miles of the North Hilight Field tract's general analysis area. The next nearest lek is the Stuart II lek, approximately 4.1 miles southwest of the North Hilight Field tract's general analysis area (Figure H-1).

No sage-grouse leks are present on USFS lands in the general analysis area for the South Hilight Field LBA Tract or within that tract's 2-mile wildlife survey area (Figure H-2). Likewise, no lek sites have been documented on non-federal surface in South Hilight Field tract's general analysis area. The former Black Thunder lek was located on non-federal surface approximately 1 mile east of the South Hilight Field tract's general analysis area. The Black Thunder lek was first documented in 1984, when a peak male count of 21 was recorded. Grouse numbers gradually declined over the next several years of annual monitoring, with only one bird observed at the lek in 1993. No grouse were recorded at the Black Thunder lek during annual checks conducted over the subsequent 12 years (1994 through 2005), prior to any mine-related disturbance occurring within several miles. Due to the consistently low counts, WGFD authorized the mine to reduce searches for grouse leks in the permit area and 1-mile perimeter to every third year beginning in 2004 (i.e., 2004, 2007, etc.). That lek was classified as "unoccupied/abandoned" after 10 consecutive years of inactivity, and it was then impacted by topsoil stripping in 2007 and is now officially classified as "unoccupied/destroyed" by WGFD. The Stuart II lek is located on USFS lands approximately 3 miles northwest of the tract's general analysis area (Figure H-2).

The Stuart II lek lies within the general analysis area for the West Hilight Field LBA Tract (Figure H-3), and is the only lek on USFS lands in the combined wildlife survey areas for the three Hilight Field LBA Tracts. Two leks are present on non-federal surface in the vicinity of the West Hilight Field LBA Tract. The Stuart I lek is approximately 1.25 miles west of the tract's general analysis area, and the next nearest lek is the former Black Thunder site, approximately 2.25 miles east of the tract's general analysis area (Figure H-3).

The Stuart I lek was first recorded in 1977. The peak male count (29) occurred in 1979, with reduced numbers in the subsequent 2 years. The lek was monitored by the WGFD at approximately 3-year intervals from 1982 through 2003; annual monitoring was conducted by private consultants for unrelated projects each year from 2004 through 2007. Grouse were observed at the lek during only 1 of the 11 survey years from 1982 through 2007. The last sighting occurred in 1991, when two males were recorded at the Stuart I lek. The Stuart II lek was discovered in 1979. Few grouse were seen at the lek over the next 28 years, with a maximum of seven males observed in any survey year. The Stuart II lek was also surveyed primarily at 3-year intervals since its discovery, with annual checks conducted from 2005 through 2007. No sage-grouse have been recorded at the Stuart I and II leks for over 10 years; however, not enough consistent data have been collected to classify either as abandoned. Both leks are now classified "undetermined" (insufficient information to designate as unoccupied). Because the two Stuart leks were not monitored annually, their management status is "undetermined", despite consistently low counts when surveys did occur.

Grouse counts at these five leks in the combined wildlife survey areas for the North, South and West Hilight Field LBA Tracts were consistently low since their respective discoveries, with few birds observed at any location in the last 7 to 20 years, depending on the lek site. Additionally, records from the WGFD (obtained from D. Thiele, Regional Biologist, WGFD, Buffalo, Wyoming), and USFS have not documented any new sage-grouse leks within the approximately 131 square mile area that encompasses the combined wildlife survey areas for the three Hilight Field LBA Tracts. Telemetry data collected on radio-collared grouse at the nearby North Antelope Rochelle Mine throughout the last 7 years (2001-2007) shows no sage-grouse locations within several miles of the three Hilight Field LBA Tracts during that period (Brown and Clayton 2004, North Antelope Rochelle Mine Annual Wildlife Report 2006, 2007). It is important to note that the reduction in grouse attendance at these five leks, and most others in the PRB, preceded physical mining disturbance and, thus, cannot be directly attributable to mine-related activities (Orpet 2007, McKee 2007). Annual counts for each lek are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Annual surveys for sage-grouse broods were conducted in native and reclaimed stream channels at and around the Black Thunder Mine from 1994 through 1999; such surveys were no longer required by WGFD and WDEQ/LQD after that year due to the consistent lack of grouse broods at coal mines throughout the PRB. No new leks or broods were seen during recent baseline inventories conducted for the three Hilight Field LBA Tracts. All grouse broods that have been recorded over the years occurred as incidental sightings during other wildlife surveys.

Areas of suitable habitat for nesting and strutting grounds are widely known as necessary to sustain sage-grouse populations. One recent study suggests that

availability of winter habitat may also affect sage-grouse populations (Naugle et al. 2006). Nesting and winter surveys for sage-grouse are not required as part of the annual wildlife programs for the Black Thunder Mine or other applicant mines discussed in this EIS, though winter surveys have been conducted as part of baseline inventories for previous mine expansions. Additionally, periodic winter surveys for other species (i.e., big game, bald eagle roosts) have occurred at all three applicant mines in recent years. Due to their proximity to existing mine permit areas, most USFS lands in the North and South Hilight Field tracts' general analysis areas, and those in the eastern half of the West Hilight Field tract's general analysis area, have been included in a minimum of seven consecutive years (big game surveys 1993-1999) of some level of winter surveys, with additional surveys conducted in some subsequent years. No sage-grouse were ever documented in or near those LBA tracts during those winter surveys.

Direct and Indirect Effects

Three of the five sage-grouse leks located in the combined wildlife survey areas for the three Hilight Field LBA Tracts occur in an area likely to be disturbed by future mining, if the three proposed leasing actions are approved. One lek (Stuart II in the West Hilight Field tract's general analysis area) is on USFS lands and the other two (Hansen Lakes and Butch) are on non-federal surface in the North Hilight Field tract's general analysis area.

Due to the consistently low number of sage-grouse documented in these LBA tracts' wildlife survey areas over the last 3 decades, despite the presence of apparently suitable habitat, leasing and mining USFS lands and adjacent lands within the general analysis areas for the North, South, and West Hilight Field LBA Tracts would have limited effects on individual birds. Some potential impacts of mineral development (including coal mining and oil and gas development) on sage-grouse that might inhabit the area, as well as on known and potential sage-grouse habitat include: alteration of plant and animal communities; loss or degradation of important seasonal habitats; increased human activity and noise which could cause animals to avoid the area and/or reduce their breeding efficiency; increased road traffic and related injuries or mortalities; increased risk of predation from raptors perched on existing or future power poles and/or grouse avoidance of areas with overhead power lines; potential illegal harvest; and reduced water tables resulting in the loss of herbaceous vegetation. Following reclamation, there may be a long term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining. Sagebrush is a component of both the Sagebrush/Grassland and Big Sagebrush vegetation communities, which occupy approximately 55 to 60 percent of the combined vegetation analysis areas for the three Hilight Field LBA Tracts. WDEQ/LQD reclamation standards call for restoration of sagebrush on at least 20 percent of the reclaimed area. Estimates for the time it would take to restore shrubs, including sagebrush, to pre-mining density levels range from 20 to 100 years. Until sagebrush returns to its pre-mining

density levels, a reduction in potential sage-grouse nesting habitat and winter habitat on the three Hilight Field LBA Tracts would persist.

Due to the documented long-term lack of sage-grouse use on USFS lands and adjacent lands in the North, South, and West Hilight Field tracts' general analysis areas and surrounding wildlife survey areas, USFS Standards and Guidelines (USFS 2002, page 1-18; Appendix D) would have limited applications toward controlling the type, timing, and location of disturbance activities within the three Hilight Field LBA Tract areas. The use of existing roads, when possible, could minimize additional impacts related to traffic hazards and the use of new travel corridors by mammalian predators. Raptor predation does not seem to be a primary source of mortality for the local sage-grouse population (Brown and Clayton 2004). Nevertheless, new overhead power lines could be fitted with perch deterrents to limit opportunities for avian predators to target any grouse that might be in the area. The use of underground power lines to the extent possible would also reduce this risk, and would minimize new vertical structures that could affect grouse use or movements in the area. If precautions are taken to avoid direct mortalities and disturbances to nests and leks during the breeding season, grouse might have the opportunity to disperse away from mine activities.

Mine operations and oil and gas development have requirements for reclamation of disturbed areas as recovery of energy resources is completed. Those reclamation efforts can work in concert with Standards and Guidelines toward mitigating impacts to wildlife species and habitats, though reclamation standards are widely variable among industries. New areas disturbed by mining in the general analysis areas for the three Hilight Field LBA Tracts will be reclaimed incrementally, but they may not be attractive to sage-grouse for many years due to slow establishment and growth rates of important sagebrush species. Information gleaned from the multi-year telemetry study at a neighboring coal mine could also be helpful in reclamation efforts for the three Hilight Field LBA Tracts. In the meantime, the presence of known and apparently suitable sage-grouse habitat elsewhere within the immediate area could provide alternate areas for dispersing grouse to use until reclaimed sagebrush stands have matured adequately to support a local population.

In keeping with the Direction Objectives for the Hilight Bill Geographic Area (USFS 2002, page 1-25), impacts to sage-grouse habitat in the general analysis areas for the three Hilight Field LBA Tracts could be further mitigated off-site by efforts to preserve and enhance habitat on adjoining and nearby private lands, such as those currently under way through the Thunder Basin Grasslands Prairie Ecosystem Association. Management planning and processes that are developed through this combined effort among landowners and federal representatives will presumably provide suitable habitat for sage-grouse that disperse from the three Hilight Field LBA Tracts general analysis areas during the interim between habitat disturbance and completed reclamation.

Should sage-grouse move onto USFS lands analyzed in this EIS in the future, agency Standards and Guidelines would offer appropriate protections for the species and its important habitats. However, under the current conditions, and the documented absence or consistently low presence of this species in the area, mining USFS lands within the North, South, and West Hilight Field LBA Tracts would not adversely impact sage-grouse populations in the region, nor would it conflict with the current TBNG Plan or any future objectives to manage the area for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. The sage-grouse is a common year-round resident throughout much of the PRB and TBNG, but has declined on and within 2 miles of the general analysis areas for the North, South, and West Hilight Field LBA Tracts over the last 30 years. Three decades of regular monitoring have documented that sage-grouse have not consistently inhabited the USFS lands analyzed for the North or South Hilight Field LBA Tracts, nor have they been confirmed as occupying USFS lands analyzed for the West Hilight Field LBA Tract since 1991. Currently, the nearest lek (Payne lek) with regular activity is more than 5.0 miles to the southeast of the USFS lands in the South and West Hilight Field LBA Tracts. Consequently, if the North, South and West Hilight Field LBA Tracts are leased, anticipated mining-related disturbances would not affect any identified and actively used seasonal sage-grouse habitats on or near USFS lands in the combined general analysis areas for these three tracts. Annual monitoring will continue for the life of the Black Thunder Mine, and would include new permit expansions and a one-mile perimeter. Should sage-grouse be observed on USFS lands in any of the three Hilight Field LBA Tracts' wildlife survey areas, appropriate monitoring and mitigation measures would be implemented to minimize impacts to birds, habitats, and populations.

H-3.5.27 Bald eagle (*Haliaeetus leucocephalus*) Bald eagles occur throughout North America, from Alaska and Canada south to Florida, the Gulf Coast, and northern Mexico. The northwest coast of North America serves as the stronghold for this species, with approximately one-half of the population inhabiting Alaska.

The USFWS officially listed the bald eagle as an endangered species in 43 of the lower 48 states on July 4, 1976. The listing was due to a combination of several factors, including widespread habitat loss, negative effects of pesticide use on reproductive success, indiscriminant shooting, and others. The status of the bald eagle was downgraded to threatened throughout the lower 48 states in 1995. Bald eagle population trends began increasing throughout most of the species' range in the early 1990's, and it was proposed for de-listing in 1999.

On July 9, 2007, USFWS published a Federal Register notice (72 FR 37346) announcing that the bald eagle would be removed from the list of threatened

and endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C 1531 *et* seq.) on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, will remain in place. The bald eagle is now recognized as a BLM and USFS Sensitive Species.

Bald eagles typically nest in large trees within a stand of mature, similarly sized trees either beside or in proximity (within 0.7 mile) to rivers, lakes, or reservoirs that harbor adequate fish populations. Those areas tend to be remote and experience little disturbance (Johnsgard 1990). Typically, the nest is placed in the crown of a large cottonwood or pine, but if the topography allows, eagles will nest on cliff edges or escarpments. Open-canopied trees and snags provide required perches in nesting and foraging areas.

All verified bald eagle nests in northeastern Wyoming (BLM Buffalo Field Office GIS database) are situated in significant, mature cottonwood stands along larger streams or rivers (i.e., Tongue River, Powder River, Clear Creek, and Little Thunder Creek). Nesting attempts are rare on the TBNG (Beske 1994). Fish and waterfowl are the primary source of food for nesting bald eagles. Where available, large to mid-size carrion and large rodents (e.g., prairie dogs) can also be an important dietary component.

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant in the northeastern portion of the state. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004), and has often been documented during winter and early spring at nearby coal mines (various coal mine annual reports are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne). Most eagles that migrate through or winter in Campbell County roost communally in stands of large ponderosa pine, along wooded cottonwood-riparian corridors, or in isolated stands of large trees. As water is scarce in that region, especially during winter, those birds likely forage widely for lagomorphs or carrion.

Existing Conditions

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in the PRB, but only rarely nest in that region. Potential bald eagle nesting and winter roosting habitat, being primarily scattered stands of mature cottonwood trees, are present on USFS and adjacent lands along Little Thunder Creek, which flows through the general analysis areas for the South and West Hilight Field LBA Tracts; no streams flow through the North Hilight Field tract's general analysis area.

In general, the combined wildlife survey areas for the three Hilight Field LBA Tracts do not contain unique or sizeable concentrated prey sources (e.g., fisheries, waterfowl wintering areas) that would be expected to attract bald

eagles. As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3). Sheep and their lambs are present in this area in the spring, when bald eagles have typically left the region, and flocks are pastured there infrequently in the winter. The area does not support a large big game herd, though some groups do winter in the area.

Ground surveys for bald eagle winter roost sites were most recently conducted within the combined wildlife survey areas for the three Hilight Field tracts during baseline surveys beginning in 2006. Previous winter roost surveys also encompassed all or most potential habitat within that overall survey area. All winter roost surveys were conducted between ½ hour before and 1 hour after sunrise or between 1 hour before and ½ hour after sunset, per current BLM guidelines for survey timing and frequency. Biologists also watched for nesting bald eagles within the survey area while conducting surveys for other nesting raptors.

No bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the North Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began in the late 1970s and early 1980s, respectively. Similarly, no bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the South Hilight Field tract's general analysis area during any baseline or annual monitoring studies since they began during those same timeframes.

The BLM and USFS wildlife databases indicate that the nearest potential bald eagle nest was identified in 2003 in T.43N., R.71W., NE¼NW¼ Section 29, which is in the southwestern corner of the West Hilight Field tract's general analysis area (Figure H-3). Although the nest has been labeled as a bald eagle site for that year, the circumstances of the sighting were less than definitive. The lone observation of the nest was made from approximately 1 mile away late in the nesting season, when young golden eagles are fully feathered except for their heads. It is possible that an inexperienced observer could have mistaken a young golden eagle for an adult bald eagle under those circumstances. Additionally, golden eagles were confirmed nesters at the same site location in both 2002 and 2004. Nevertheless, the site could be treated as a potential bald eagle nest for management purposes.

Direct and Indirect Effects

As no winter roost sites or large groups of bald eagles have been documented in the general analysis area for any of the three Hilight Field LBA Tracts, potential impacts would be limited to occasional foraging individuals rather than a large segment of the population. The increased human presence and noise associated with construction activities, if conducted while eagles are wintering within the area, could harass or displace individual eagles during that period. Nesting eagles could also be distressed to the point of abandoning eggs or young, or their hunting efforts and success impacted. If necessary, the majority of direct effects could be mitigated by controlling the timing and location of disturbance activities, and/or through approved nest relocation efforts.

Indirect effects include additional disturbance and fragmentation of already limited foraging habitat within the geographic area. These impacts could result from a variety of large- and small-scale activities described previously for other species, including, but not limited to: topsoil stripping; overburden and coal removal; reclamation activities; and construction of roads, reservoirs, power lines (above ground and buried), fences, and pipelines. The locations of operations would shift throughout the expanded permit area as mining occurred, with habitats disturbed and reclaimed incrementally. Conversely, the addition of fences and raptor-safe power poles could possibly benefit foraging bald eagles by providing additional perch sites. Due to the limited presence of potential nesting or roosting sites, and lack of concentrated sources of prey, the direct and indirect effects of the Proposed Action and Alternative 2 to bald eagles are expected to be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No bald eagle nests have been documented on or within 1 mile of the North or South Hilight Field LBA Tracts' general analysis areas, and only one dubious nesting event was recorded in the West Hilight Field LBA Tract's general analysis area over time. Bald eagle winter roost sites are absent from all three Hilight Field LBA Tracts' wildlife survey areas, and little potential nesting or roosting habitat is present. Therefore, potential hazards for this species would be limited to foraging individuals during winter. Disturbance, fragmentation, and alteration of potential foraging habitat would occur. However, the Black Thunder Mine has avoided, where possible, and mitigated raptor impacts in the past through intensive raptor monitoring, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests.

H-3.5.28 Mountain plover (*Charadrius montanus*) The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004).

Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003d). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined and recent data suggests that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Existing Conditions

Mountain plovers are summer residents within portions of the TBNG. Most observations of mountain plovers in northeast Wyoming have been associated with prairie dog colonies. Approximately 86 percent of recently (since 1993) occupied mountain plover habitat in that region occurred within prairie dog colonies (Byer 2001). As described in the North, South, and West Hilight Field LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, two prairie dog colonies encompassing a total of approximately 89.2 acres were present on USFS lands within the three Hilight Field tracts' general analysis areas in 2007. A total of four prairie dog colonies encompassing approximately 112.1 acres were present in the three combined general analysis areas, and a total of 12 prairie dog colonies encompassing approximately 248.9 acres were present in the combined wildlife study areas for the three Hilight Field LBA Tracts in 2007 (Figures H-1, H-2 and H-3).

As previously described for other short-grass species, the dominance of sagebrush in the North, South, and West Hilight Field LBA Tract's general analysis and wildlife survey areas provides only poor to marginal or unsuitable habitat for mountain plovers. The height and composition of vegetation on most USFS lands in the three Hilight Field tracts' general analysis areas is generally too tall and dense to provide suitable habitat for mountain plovers. The lack of occurrence of this species at the Black Thunder Mine and surrounding area, including all USFS lands in the analysis areas, is well documented. The nearest known population of nesting mountain plovers occurs at the Antelope Mine, approximately 9 miles south of the South Hilight Field tract's general analysis area, and even farther from the other two Hilight Field LBA Tracts.

Direct and Indirect Effects

The direct and indirect effects to mountain plovers in all three general analysis areas for the Hilight Field LBA Tracts would be the same as those described above for the McCown's longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. USFS lands in the North, South, and West Hilight Field tracts' general analysis areas are dominated by sagebrush communities that are not attractive to short-grass species such as the mountain plover. No individuals of this species have been documented in any of the three Hilight Field tracts' general analysis areas, though limited potential habitat is present there. Documented alternative habitats for mountain plovers are present in portions of the general area that are more appropriate for this species and are not currently scheduled for mining disturbance.

H-3.5.29 Loggerhead shrike (*Lanius ludovicianus*) Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan, and southern Manitoba, south to California and Florida, and east to southwestern Minnesota, southern Wisconsin, southern Michigan, and Maryland. This species is a common summer resident throughout Wyoming (Cerovski et al. 2004). Shrikes prefer relatively open, heterogeneous habitats characterized by grasses and forbs of low stature interspersed with bare ground and shrubs or low trees with perches for hunting. This species will use a wide variety of trees and shrubs, particularly thick or thorny species, as nesting substrates and hunting perches (Prescott and Bjorge 1999).

Although some shrike nests are used in subsequent years, fidelity to a nest site is limited. This species forages over relatively open habitats, feeding primarily upon arthropods, amphibians, small to medium-sized reptiles, small mammals, and birds (Yosef 1996). Shrikes may also feed upon road kill and carrion. This species is generally tolerant of human activity near a nest, although they will abandon if disturbed during egg-laying or early in incubation. The loggerhead shrike is declining in both number and overall range. Declines have been attributed to habitat loss and conversion, urbanization, pesticide contamination, and loss of insect prey as a result of pesticide use (Yosef 1996).

Existing Conditions

Loggerhead shrikes are common summer residents within the TBNG, though they are not often observed on or adjacent to USFS lands within the West Hilight Field LBA Tract. Shrikes have occasionally been seen in the 1-mile perimeter wildlife survey area for the adjacent Black Thunder Mine. No actual shrike nests or recently fledged young have been documented on or near USFS lands in the general analysis area for the West Hilight Field LBA Tract, but this species could potentially nest in the general vicinity. Over time, most sightings have occurred in cottonwood-riparian corridors along primary streams in the general Wright analysis area, or in taller greasewood stands. Neither habitat

type is common in the general analysis area for the West Hilight Field LBA Tract. Shrikes have also been infrequently recorded perched on various fences or on overhead power lines at other nearby mines. Shrike foraging habitat is present throughout the West Hilight Field tract's general analysis area, including USFS lands. As indicated, existing utility and fence lines currently provide good quality hunting perches.

Direct and Indirect Effects

Implementation of the Proposed Action or Alternatives could result in direct and indirect impacts to loggerhead shrikes, though such impacts would likely be uncommon. No known nest sites have been documented on or adjacent to USFS lands in the West Hilight Field tract's general analysis area or elsewhere in the wildlife monitoring area for the adjacent Black Thunder Mine. The most probable direct impact would be the mortality of, or injury to, individuals foraging within or passing through the USFS lands due to collisions with future mine-related vehicles, or dispersal of foraging individuals due to active mining.

The relatively slow movement of mining equipment and the noise associated with the activity would decrease direct impacts associated with vehicle collisions. As loggerhead shrikes are not especially common in the West Hilight Field tract's general analysis area, indirect impacts would be limited despite the fragmentation, degradation, or loss of habitat in the short and mid-term. Any birds that would be displaced would be forced to travel to other locations with acceptable habitat. This could result in stress to individual birds, as well as potential decreased nesting effort and success. Prey numbers reduced by mining would be expected to rebound following reclamation due to generally high reproductive potential and prey tendencies to re-establish and adapt to disturbed and reclaimed areas. The locations of mine-related habitat disturbances and reclamation efforts would proceed incrementally throughout the expanded mining area as operations progressed. Additionally, this mining activity would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for this species. USFS Standards and Guidelines would offer additional protections for any active nest sites that may be present in the area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Such impacts would be minimized by the lack of regular sightings and known nesting attempts, as well as the relative paucity of suitable nesting habitat on or adjacent to the USFS lands analyzed in this EIS and their surrounding region. Degradation, fragmentation, or loss of potential foraging habitat, reduction in prey populations, and potential collisions with vehicles may occur. Given the lack of birds recorded in the area, and the composition of the shrike's prey base (insects, small mammals, etc.), impacts to shrikes would be minimal. USFS Standards and Guidelines would apply for active nests during the breeding season. Additionally, mining the USFS lands

would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for loggerhead shrikes.

H-3.5.30 Brewer's sparrow (*Spizella breweri*) The breeding range of the Brewer's sparrow extends from southwestern Yukon, southern Alberta, and southwestern Saskatchewan, south (east of the Cascades and Sierras) to southern California, central Arizona, and northern New Mexico (Rotenberry et al. 1999). The Brewer's sparrow is a common summer resident of the basin-prairie and mountain-foothills throughout Wyoming (Cerovski et al. 2004). Brewer's sparrow is a sagebrush obligate species (Rotenberry et al. 1999).

This species is an uncommon cowbird (*Molothrus ater*) host and typically builds a small cup nest low in sagebrush shrubs. Brewer's sparrows prefer to nest in medium-sized (48-90 centimeters, or 19-35 inches) live sagebrush within relatively dense (26-42 percent canopy cover) stands (Walker 2004). Grass height and density are important factors for nest concealment. Although tolerant of human visitation, this species may abandon a nest if disturbed during the construction process.

Brewer's sparrows feed primarily on small insects and, to a lesser extent, seeds from grasses and forbs. Throughout areas where they have been surveyed, the species appears to have undergone and continues to undergo statistically significant declines (Rotenberry et al. 1999). Major threats to Brewer's sparrow populations are similar to those faced by other declining sagebrush-obligate species and include habitat conversion and fragmentation, invasion by non-native plants, altered fire regimes, livestock overgrazing, conifer encroachment, energy development, and conversion to urban or residential housing (Walker 2004).

Existing Conditions

Brewer's sparrows are common summer residents within the TBNG and southern Campbell County (Cerovski et al. 2004). Breeding bird survey data from annual monitoring and baseline studies conducted for the Black Thunder Mine, and incidental observations over time, have shown that the Brewer's sparrow is a common but limited breeder in the area. This species has been recorded in sagebrush habitats near the mine during many of the last 14 years (1994-2007). Although no nests have been encountered in the general analysis area for the West Hilight Field LBA Tract, the presence and behavior (singing) of birds throughout spring and summer suggest that Brewer's sparrows nest in the sagebrush stands common to that area.

Direct and Indirect Effects

As described for the ferruginous hawk, above, habitat loss, degradation, and fragmentation of sagebrush communities in the general analysis area for the West Hilight Field LBA Tract would result from a variety of large- and small-scale mining operations such as topsoil stripping, drilling, and reservoir construction, among others. Potential nesting and foraging habitat would also be fragmented by linear disturbances such as the construction, maintenance,

and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances and reclamation efforts would shift throughout the expanded permit area as operations progress.

The use of existing roads, when possible, could minimize impacts related to traffic hazards and predator travel corridors. Increased activity and noise, especially during the nest initiation period, could inhibit nesting proximate to mining activities. Foraging could also be hindered within these areas, especially where active mining occurs. Additional infrastructure and activity associated with the expansion of the mine, in combination with other ongoing disturbances (e.g., CBNG operations), could displace Brewer's sparrows from any historical use areas that might occur in the area. Those birds could potentially move into other sagebrush stands in the general vicinity, assuming they are not already occupied.

Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine and will eventually mitigate impacts to sagebrush habitats to some degree, though such efforts could take decades to benefit sagebrush obligates such as the Brewer's sparrow. Impacts to sagebrush habitat on USFS lands could be further mitigated off-site by efforts to preserve and enhance such habitat on adjacent and nearby private lands, as described above. Standards and Guidelines for sagebrush habitats outlined in the TBNG Plan (USFS 2002, pages 1-18; Appendix D) would be implemented as necessary, and could serve to sustain regional populations of this sparrow. Those management guidelines would apply only to activities beyond the West Hilight Field LBA Tract.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Some habitat loss, degradation, and fragmentation would occur on and near USFS lands in the general analysis area for the West Hilight Field LBA Tract, along with potential impacts to individuals. However, the presence of large stands of sagebrush elsewhere in the general vicinity suggests that Brewer's sparrows would remain viable within the TBNG for at least the short-term. Additionally, the Proposed Action or Alternative 2 would not conflict with the current TBNG Plan (USFS 2002) or future objectives to manage the area for this species. Application of appropriate USFS Standards and Guidelines, successful reclamation efforts, and proper land management on adjoining lands could mitigate potential impacts, to some degree.

H-3.6 North Porcupine LBA Tract

H-3.6.1 Prairie moonwort (*Botrychium campestre*) The prairie moonwort, a sensitive plant species, has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species was only recorded in Wyoming in a semi-shady mixed deciduous and ponderosa pine forest on sandy soils in the Black Hills. Prairie moonworts are known to exist in a variety of other habitats such as those underlain by Pierre shale, the Laramie Formation, calcareous sedimentary rocks, calcareous soils underlain by limestone, sandy soils and loess prairie. These habitats generally do not exist on the North Porcupine general analysis area, as the forest cover and soil substrate are not present.

Existing Conditions

Prime habitats for the prairie moonwort are not present on the USFS lands within the general analysis area for the North Porcupine tract. Sites with sandy soils are present on USFS lands and other portions of the general Wright analysis area, but these areas are rather sparsely vegetated and do not provide habitat preferred by this plant species. Prairie moonworts have not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is very low.

H-3.6.2 Narrowleaf moonwort (*Botrychium lineare*) The narrowleaf moonwort, a sensitive plant species, has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species has an affinity for riparian areas and is associated with spruce/fir forests, lodgepole pine forests, and forest meadows.

Existing Conditions

Habitats for the narrowleaf moonwort are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The narrowleaf

moonwort has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is very low.

H-3.6.3 Leathery grapefern (*Botrychium multifidum* var. *coulteri*) The leathery grapefern, a plant species of local concern, has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for meadows, wetlands, floodplains and other wet areas in open to forested habitats within forests.

Existing Conditions
Habitats for the leathery grapefern are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The leathery grapefern has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *would have no impact* on the leathery grapefern. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.4 Foxtail sedge (*Carex alopecoidea*) The foxtail sedge, a sensitive plant species, is a perennial and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat

is present. The foxtail sedge generally has an affinity for wet meadows and willow-sedge communities along wet, shady creek bottoms and springs.

Existing Conditions

Habitats for the foxtail sedge are not present on the USFS lands within the general Wright analysis area. Suitable wet meadows or willow-sedge communities are not present on these USFS lands. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The foxtail sedge has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the foxtail sedge. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is not expected.

H-3.6.5 Elliptic spikerush (*Eleocharis elliptica*) The elliptic spikerush, a sensitive plant species, is a perennial and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for wetland areas created by seeps or springs but may also be found in temporarily flooded areas.

Existing Conditions

Habitats for the elliptic spikerush are not present on the USFS lands within the general Wright analysis area. Suitable wetland habitats are not present on these USFS lands. Few wetland sites associated with various ephemeral drainages and playas are present on portions of the general Wright analysis area, but these sites do not appear to provide optimum habitat for this species. No seeps or springs are present. The elliptic spikerush has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to lack of abundant suitable habitat the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the

planning area. As indicated, the general analysis area for the North Porcupine LBA Tract does not provide abundant habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.6.6 Hall's fescue (*Festuca hallii*) The Hall's fescue, a sensitive plant species, is a tufted perennial grass and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for montane meadows, slopes and edges of open coniferous woods and meadows above 6,000 feet in Wyoming.

Existing Conditions

Habitats for the Hall's fescue are not present on the USFS lands within the general Wright analysis area. Suitable montane habitats above 6,000 feet are not present on these USFS lands within the general Wright analysis area, and the Hall's fescue has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the Hall's fescue. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is not expected.

H-3.6.7 Wood lily (*Lilium philadelphicum*) The wood lily, a plant species of local concern, is a perennial herb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for woodland meadows and woodland grasslands.

Existing Conditions

Habitats for the wood lily are not present on the USFS lands within the general Wright analysis area. Suitable woodland meadow or grassland habitats are not present on these USFS lands within the general Wright analysis area, and the wood lily has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the wood lily. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.8 Largeflower triteleia (*Triteleia grandiflora*) The largeflower triteleia, a sensitive plant species, is a perennial herb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and in pinon-juniper woodlands to pine forests and hills.

Existing Conditions

Habitats for the largeflower triteleia are not present on the USFS lands within the general Wright analysis area. Suitable grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and pinon-juniper woodlands or pine forests and hills are not present on these USFS lands within the general Wright analysis area, and the largeflower triteleia has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the largeflower triteleia. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.9 Barr's milkvetch (*Astragalus barrii*) The Barr's milkvetch, a sensitive plant species, is a matt-forming perennial forb that is known from numerous occurrences on the USFS lands within the TBNG. As more surveys are completed, new occurrences are reported. The Barr's milkvetch is found primarily on dry, sparsely-vegetated rocky prairie breaks, knolls, hillsides and ridges. Parent material is calcareous soft shale, siltstone or silty sandstone. Most populations appear to be stable, although populations may decline under drought conditions.

Existing Conditions

Astragalus barrii is a regional endemic plant of the plains in southwestern South Dakota, eastern Wyoming, southeastern Montana, and northwestern Nebraska. According to USFS, this plant species is known to occur in six counties in Wyoming, and there are eleven known occurrences of *A. barrii* in the USFS TBNG.

Suitable habitat for the Barr's milkvetch is present on the USFS lands within the general analysis area for the North Porcupine LBA Tract as well as other lands within the general Wright analysis area. Surveys in 2005 identified Barr's milkvetch populations within the general analysis area for the North Porcupine tract, but no individuals were found on USFS lands. Barr's milkvetch populations and individuals have been identified in surrounding areas. Barr's milkvetch has been collected and positively identified approximately 11 miles south of the general analysis area for the North Porcupine LBA Tract, in the Section 21 of T.40N., R.71W., based on specimens on file with the Rocky Mountain Herbarium in Laramie, Wyoming.

Indirect and Direct Impacts

If lands within the general analysis area for the North Porcupine LBA Tract are leased and mined, potential habitat, individuals, and *A. barrii* populations would be lost due to surface disturbances caused by mining activities. These losses would most likely be permanent unless disturbed lands are reclaimed to habitats that would support this plant species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing* because there are *Astragalus barrii* occurrences outside of the areas that would be affected by the Proposed Action or Alternative 2. The Rocky Mountain Herbarium records reveal this plant species is widespread in northeastern Wyoming, so the loss of individuals or populations from mining activities related to the Proposed Action or Alternative 2 would not result in the extirpation of this species.

H-3.6.10 Smooth goosefoot (*Chenopodium subglabrum*) The smooth goosefoot, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for sand bars and sandy blowouts in riparian areas.

Existing Conditions

Habitats for the smooth goosefoot are not present on the USFS lands within the general Wright analysis area. Suitable riparian areas are not present on the USFS lands within the general Wright analysis area. A few riparian areas associated with various ephemeral drainages are present on portions of the general Wright analysis area, but these areas do not contain the required sand bar or sandy blowout habitats required for this plant species. The smooth goosefoot has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the smooth goosefoot. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.11 Flat-top goldentop (*Euthamia graminifolia*) The flat-top goldentop, a plant species of local concern, is a rhizomatous perennial forb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for stony sandbars and streambanks but may also be found on moist or drying sites along open streambanks or roadside ditches.

Existing Conditions

Habitats for the flat-top goldentop are not present on the USFS lands within the general Wright analysis area. Suitable wetland or streambank areas are not present on the USFS lands within the general Wright analysis area. Streambanks and a few wetland areas in association with various ephemeral drainages are present within portions of the general Wright analysis area, but these areas generally do not contain the typical habitats required for this plant species, but marginal habitats are present. The flat-top goldentop has not been recorded on the general Wright analysis areas or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.6.12 Rosy palafox (*Palafoxia rosea* var. *macrolepis*) The rosy palafox, a plant species of local concern, is an annual forb that has not been documented on USFS lands within the North Porcupine general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for sagebrush and mixed-grass prairie habitats on sandy soils.

Existing Conditions

Habitats utilized by the rosy palafox are present on the USFS lands within the general Wright analysis area and on other surrounding lands. Sagebrush and mixed-grass prairie plant communities are present on sandy soils in the

general Wright analysis area. However, rosy palafox has not been recorded on these lands but is potentially present. This plant species has been documented southeast of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the North Porcupine tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does contain some suitable habitat for this plant species but the rosy palafox has not been documented on the site. This species has been documented southeast of the general Wright analysis area and abundant habitat is present on other sites that would not be affected.

H-3.6.13 Lemonscent (*Pectis angustifolia*) The lemonscent, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the North Porcupine general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for gravel hills and scoria slopes. Lemonscent is also known to occur in low areas in sandy ravines and on sandbars.

Existing Conditions

Habitats utilized by lemonscent are present on the USFS lands within the general Wright analysis area and on other surrounding lands. However, lemonscent has not been recorded in the general Wright analysis area but could potentially be present. This plant species has been documented south of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the North Porcupine tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the

planning area. As indicated, the general analysis area for the North Porcupine tract does contain some suitable habitat for this plant species but the lemonscent has not been documented. This species has been documented south of the general Wright analysis area and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.6.14 Larchleaf beardtongue (*Penstemon laricifolius* spp. *exifolius*)
The larchleaf beardtongue (penstemon), a plant species of local concern, is a perennial forb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry, rocky, gravelly or sandy slopes, ridgetops and upland flats with shallow soils. Most populations in Wyoming are found at elevations above 6,000 feet, but this species has been documented at lower elevations in the state.

Existing Conditions
Habitats utilized by larchleaf beardtongue are marginally present on the USFS lands within the general Wright analysis area. A few rocky, gravelly hill slopes and rough breaks provide potential habitat, but the larchleaf beardtongue has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does contain marginal habitat for this plant species but the larchleaf beardtongue has not been documented. This species has been documented and is common in southern Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.6.15 Wooly twinpod (*Physaria didymocarpa* var. *lanata*) The wooly twinpod, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry redbed clay-shale slopes, limey-sandstone

outcrops, roadcuts and other exposed rock-cliff substrates. Most populations in Wyoming have been documented in the foothills of the Big Horn Mountains.

Existing Conditions

Habitats utilized by the wooly twinpod are marginally present on the USFS lands within the general Wright analysis area. A few sandstone outcrops and exposed rock-cliff substrates provide potential habitat, but the wooly twinpod has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the North Porcupine tract does contain marginal habitat for this plant species but the wooly twinpod has not been documented. This species has been documented and is common in north-central Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.6.16 Visher's buckwheat (*Eriogonum visheri*) The Visher's buckwheat, a sensitive plant species, is an annual forb and has not been documented on USFS lands within the North Porcupine general analysis area but has been tentatively identified elsewhere within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for gullied ridges and eroded badland hills. These sites generally consist of barren shale and clay outcrops with at least 50 percent bare soil, high salt content and shrink/swell clay soils. Typical habitat includes badland islands in grasslands.

Existing Conditions

Habitats for the Visher's buckwheat are not present on the USFS lands within the general Wright analysis area. A few areas of highly eroded gullies consisting of barren shale or clay outcrops may be found in portions of the general Wright analysis area, but these sites generally provided a greater vegetation cover than is needed to provide optimum habitat for this species. The Visher's buckwheat has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *would have no impact* on the Visher's buckwheat. As indicated, the general analysis area for the North Porcupine tract does not provide optimum suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.17 Highbush-cranberry (*Viburnum opulus* var. *americanum*) The highbush-cranberry, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the North Porcupine general analysis area or within the TBNG. In Wyoming, this plant species is found within Crook County and is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for moist sites including wooded hillsides, thickets or low woodlands. The highbush-cranberry is found all across northern North America.

Existing Conditions
Habitats for the highbush-cranberry are not present on the USFS lands within the general Wright analysis area. Suitable moist, wooded habitats are not present on these USFS lands within the general Wright analysis area. The highbush-cranberry has not been recorded within the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *would have no impact* on the highbush-cranberry. As indicated, this species has not been documented in the general Wright analysis area and the general analysis area for the North Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.18 Northern leopard frog (*Rana pipiens*) Northern leopard frogs range from the Great Slave Lake and Hudson Bay, south to Kentucky and New Mexico (NatureServe 2007). This species is considered relatively common within Wyoming (Baxter and Stone 1980, Cerovski et al. 2004). Northern leopard frogs require shallow, permanent, or semi-permanent standing water with at least some emergent vegetation for breeding (Wagner 1997). Conversely, they use deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom as overwintering habitat (Wagner 1997). Leopard frogs must have good quality water to successfully reproduce, as degraded or

turbid water has the potential to negatively affect development of eggs and tadpoles. Overcrowding and changes in water temperature and pH (5.5 or lower) can increase the incidence of disease and mortality (NatureServe 2007) in this species. Adult frogs feed upon a variety of insects and other invertebrates, tadpoles, snakes, and fish (Cerovski et al. 2004), while tadpoles feed primarily upon small invertebrates, plant tissue, and organic debris. Adults also forage within aquatic and upland habitats, whereas tadpoles are restricted to aquatic habitats. Although their overall range remains essentially undiminished in size, many populations are declining. Major factors affecting leopard frog populations are habitat loss in some portions of their range, habitat degradation, overexploitation, interactions with non-native species, climate change, disease, and other unknown causes (Wagner 1997).

Existing Conditions

The northern leopard frog has been observed in southern Campbell County, but has not officially been recognized as breeding there (Cerovski et al. 2004). No suitable habitat is present on USFS lands within the general analysis area for the North Porcupine LBA Tract. Porcupine Creek crosses a narrow band (approximately 1,500 feet) of USFS lands in the western portion of the tract's general analysis area (Figure H-4), but that small portion of the creek does not provide sufficient, persistent water quantities or quality to support northern leopard frogs; the same is true of the stream channel immediately upstream and downstream of USFS lands in that area. No other persistently flowing streams or persistent reservoirs are present on USFS lands within the North Porcupine tract's general analysis area.

Habitat conditions for northern leopard frogs vary considerably between the overall general analysis area for the North Porcupine LBA Tract and the USFS lands within that larger area. The tract's general analysis area includes portions of Porcupine Creek and some of its ephemeral tributaries that occasionally retain small pools of water during spring and early summer. Within the general analysis area for the North Porcupine LBA Tract there are an estimated 19.7 acres of jurisdictional wetlands and other waters of the U.S. (OWUS). Of those 25.8 acres, there are approximately 9.3 acres of riverine wetlands, approximately 0.9 acres of stockpond wetlands, approximately 0.9 acres of stockpond open water OWUS, and approximately 8.6 acres of ephemeral stream channel OWUS. There are also approximately 4.9 wetland acres and 1.2 open water acres of non-jurisdictional playa/depressional features. The vegetated wetland areas consist primarily of palustrine emergent herbaceous wet meadow or marsh and palustrine aquatic beds located along ephemeral stream channels and around in-channel stock reservoirs. Without surface discharge of groundwater associated with CBNG development in the area, no water would be present in these ephemeral streams except in response to precipitation events and snow melt. Flows to maintain open water are therefore inconsistent and these streams are often dry by mid- to late summer; without flow to maintain open water, any pools persisting until winter freeze solid, which limits overwintering habitat for this species. Therefore, none of the physical characteristics considered as optimum for the various life stages of

this species are present on the USFS lands throughout this tract's general analysis area, and no leopard frogs or anuran egg masses have been documented on those lands during more than 25 years of annual monitoring efforts. No northern leopard frogs were ever recorded in the general analysis area during overlapping annual monitoring efforts for other species conducted from 1984 through 2007. Results from annual wildlife monitoring and baseline studies for all adjacent mines are on file with, and available from, the WDEQ/LQD in Sheridan or Cheyenne, Wyoming and the USFS Douglas Ranger District Office in Douglas, Wyoming. Those reports also include detailed descriptions of survey areas (including maps), methods, and dates for each year.

Direct and Indirect Effects

Wetland and aquatic habitats for northern leopard frogs are considered unsuitable to poor on USFS lands and elsewhere in the North Porcupine tract general analysis area, as described above. Furthermore, no frog sightings have been recorded on USFS lands during baseline surveys or annual monitoring completed between 1984 and 2007. Consequently, northern leopard frogs and their aquatic and terrestrial habitats are not expected to be impacted if the USFS lands in the North Porcupine LBA Tract are leased and mined.

In the unlikely event that this species is present in the North Porcupine tract's general analysis area in the future, direct loss of, or injury to, foraging and dispersing frogs could result from encounters with mine vehicles or heavy equipment near Porcupine Creek during topsoil stripping or other surface disturbance.

It is possible that existing reservoirs and ponds (natural and those enhanced by CBNG discharge waters), and those created for flood control, sedimentation, water storage purposes, or wetland mitigation measures could provide suitable foraging or breeding habitat for northern leopard frogs in the future. However, most artificial water structures would still be limited to relatively shallow, seasonal waters with little emergent vegetation that would not provide for the year-round habitat needs of this frog species. Should those efforts result in improved aquatic habitats, adult frogs, tadpoles, and/or egg masses present in the area could be injured or killed during activities associated with additional construction of diversion dikes or associated channels, or the dewatering of potential habitats downstream of a dike. Under those limited circumstances, potential impacts could include loss of individuals and foraging habitat, increased predation, and changes in stream morphology and hydrology. Standard mining procedures, such as the use of silt barriers across affected stream channels and other similar efforts, would minimize any negative impacts that might result from mine-related operations. Likewise, adherence to the TBNG Plan Standards and Guidelines (USFS 2002) pertaining to water and wetlands would ensure that leopard frogs and other aquatic organisms present on USFS lands would not be negatively affected by increased sedimentation, degraded water chemistry, or otherwise damaged aquatic habitats.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, USFS lands and adjacent non-federal lands within the North Porcupine tract's general analysis area do not currently contain suitable habitat for northern leopard frogs. Water sources in the drainages in that area are too temporary and shallow to support tadpoles until metamorphosis, or to allow frogs to successfully overwinter. If present, individual adult leopard frogs may be incidentally killed by vehicles or equipment. Habitat may be enhanced or created during certain mine operations, but water flow and depth associated with existing structures at the adjacent North Antelope Rochelle Mine has not resulted in adequate conditions to support the life cycle needs of this species, and they are not expected to create those conditions anywhere in this LBA tract. As no northern leopard frogs have ever been documented on USFS lands within the overall general analysis area for the North Porcupine LBA Tract, potential effects are expected to be negligible, if they occur at all. Furthermore, northern leopard frogs have been documented at other sites outside of the tract's general analysis area that will not be affected by coal leasing actions.

H-3.6.19 Black-tailed prairie dog (*Cynomys ludovicianus*) The black-tailed prairie dog was removed from the USFWS federal listing process in 2004. The agency ruled that listing this species may be warranted, but was precluded by higher priority considerations. Consequently, the black-tailed prairie dog is no longer considered a candidate species under the ESA.

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). The TBNG, which includes USFS lands in the general analysis area for the North Porcupine LBA Tract, harbors one of the seven major colony complexes remaining in North America. Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. This species has the ability to rapidly expand its distribution and population if not limited by pest control practices or disease, and will readily spread into recently disturbed areas. Many species such as the black-footed ferret (*Mustela nigripes*), mountain plover, burrowing owl, and swift fox are dependent on prairie dogs during a portion of their life cycle. The black-tailed prairie dog's occupied range and abundance has declined dramatically, and continues to exhibit a slow decline (NatureServe 2007). Major factors contributing to the decline include disease (sylvatic plague), urbanization, habitat conversion, and control efforts.

Existing Conditions

Surveys have been conducted to locate prairie dog colonies within the 2-mile wildlife survey area surrounding the general analysis area for North Porcupine LBA Tract (Figure H-4). No prairie dog colonies were present on USFS lands

within the North Porcupine tract's general analysis area in 2007. Seventeen prairie dog colonies totaling approximately 1,211.4 non-contiguous acres were present within or overlapped the 2-mile wildlife survey area surrounding the North Porcupine tract's general analysis area in 2007 (Figure H-4). Only one colony (approximately 18.6 acres in size) was within the general analysis area itself. The remaining 16 colonies ranged from 1.5 to 345.3 acres in size.

The entire coal mine region of the PRB of northeast Wyoming, including all USFS and surrounding lands within the general analysis area for the South Porcupine LBA Tract, is beyond the focus area for ferret reintroduction efforts on the TBNG and in the general region (refer to Management Area 3.63-USFS 2002, Grenier 2003). Additionally, some prairie dog colonies in that region are currently experiencing development associated with conventional oil and gas, CBNG, and coal (including open pits) resources. Year-round human activity and disturbance are already present in a few locations.

Direct and Indirect Effects

This LBA tract and its general analysis area are almost entirely encompassed by the existing North Antelope Rochelle Mine permit area; therefore, it is possible that surface disturbance associated with coal removal from the mine's current leases could occur on the tract regardless of whether or not additional leasing occurs in that area. As stated above, one colony (approximately 18.6 acres in size) was within the general analysis area for the North Porcupine LBA Tract in 2007; however, that colony is not located on USFS lands. That one colony would be affected by the proposed leasing action at some point in time. Mining disturbance associated with the adjacent North Antelope Rochelle Mine could impact those prairie dog colonies that exist elsewhere within the larger wildlife survey area surrounding this LBA tract (Figure H-4). Such impacts could have immediate results on prairie dogs if an occupied colony is abruptly subjected to a soil salvaging operation, or is otherwise impacted in a short timeframe that precludes dispersal prior to disturbance. However, as those activities typically occur incrementally across various portions of a mine permit area, some individuals could disperse to undisturbed portions of the affected colony, or create one or more new colonies within the general area.

Smaller-scale disturbances associated with both the mining and CBNG industries can also impact prairie dog colonies and surrounding vegetation through fragmentation or loss of foraging and burrowing habitat. Linear disturbances associated with mining infrastructure, such as roads, power lines, fences, and pipelines will occur within narrow corridors over relatively short distances, and would be completed within shorter timeframes than the advancement of a surface mine pit. However, such disturbances would still pose some level of risks due to vehicular collisions or by enhancing habitat for mammalian and avian species that prey on prairie dogs.

Some linear impacts could be minimized or mitigated through the consolidation of roads and electric utilities within common corridors, applying perch deterrents on overhead power poles, and reseeding pipeline disturbances

quickly with appropriate seed mixes for the region. Minor surface disturbance near existing colonies would provide recently upturned soils that could facilitate the expansion of the existing colonies or the establishment of new ones, as prairie dogs will readily move into recently disturbed areas. Post-mining reclamation could have similar potential benefits; prairie dogs have already demonstrated their ability to inhabit reclaimed lands at the nearby Antelope Mine (BLM 2008).

As no prairie dog colonies are present on USFS lands within the North Porcupine tract's general analysis area, no USFS Standards and Guidelines applicable to black-tailed prairie dogs would be implemented.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No black-tailed prairie dog colonies would be physically disturbed by mining activities on USFS lands within the tract's general analysis area, if the lease is issued. Only one colony (approximately 18.6 acres in size) is present on non-federal lands in the North Porcupine tract general analysis area. Prairie dog colonies located within the existing North Antelope Rochelle Mine permit area could be impacted by mining operations regardless of whether the North Porcupine LBA Tract is leased. Given the limited additional impacts to prairie dog colonies within the North Porcupine tract's general analysis area, the tendency of prairie dogs to disperse and expand their boundaries, and the incremental nature of surface coal mining relative to some other disturbance activities, the potential impacts to prairie dog colonies on and near USFS lands in the North Porcupine tract's wildlife survey area would not have adverse consequences for the viability of the local or regional population. Disturbance and reclamation efforts will occur incrementally in varying locations throughout the permit area as mining progresses through the approved lease.

H-3.6.20 Swift Fox (*Vulpes velox*) The swift fox was removed from the USFWS federal listing process in 1995, after extensive field surveys demonstrated that the population was greater than expected. This species is considered to be common within the eastern Great Plains grasslands of Wyoming (Cerovski et al. 2004), though it typically occurs at very low densities. The exact status of the population is unknown but believed to be increasing, especially in the Northern Plains. Swift foxes are largely nocturnal and typically prefer flat to gently rolling, short- or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). This species uses multiple den sites year-round for shelter, protection from predators, and rearing young. Burrows of other mammals such as badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), and prairie dogs are often used or modified for those purposes. Small to mid-sized mammals constitute the bulk of their diet. Swift foxes have little fear of humans and may den in proximity to human disturbances (residences and busy roadways). This tolerance also makes them susceptible to trapping, vehicle collisions, and attacks by dogs. Major threats

faced by the swift fox include habitat loss and degradation, interspecific competition with red fox and coyote (*Canis latrans*), and vehicle collisions.

Existing Conditions

Swift fox have been observed in large grassland blocks in southern Campbell County with more frequency in recent years, and are presumed to breed there. This species has also been documented within the overall TBNG.

Sagebrush communities generally dominate the wildlife survey area for the North Porcupine LBA Tract, though grasslands are more prevalent in the southwestern portion of the tract's general analysis area. Potential swift fox habitat in that area is largely restricted to the western extent, west of the Antelope Road (Figure H-4). The prevalence of sagebrush throughout the tract's wildlife survey area largely explains the extremely limited sightings of this grassland fox over the last 25 years of monitoring efforts. Burrows within the existing black-tailed prairie dog colonies and scattered badger or red fox burrows could be used by swift foxes as den or shelter sites, and swift fox could forage in the area.

No specific surveys for swift fox were conducted for this analysis. However, such efforts were completed in 2002 using USFS survey protocols for other unrelated projects. Those surveys included USFS lands within and immediately adjacent to the North Porcupine tract's general analysis area, as well as additional lands in the surrounding area. Nocturnal spotlight surveys for rabbits and hares were conducted as part of annual wildlife monitoring at adjacent existing mines every year since at least 1994, with diurnal surveys for a variety of vertebrate species occurring across all seasons annually since the early 1980s. All of those survey efforts overlapped all or significant portions of the North Porcupine wildlife survey area.

Despite those combined survey efforts, no swift fox have ever been recorded on USFS or other lands within the North Porcupine tract general analysis area. Few other swift fox sightings have been recorded elsewhere within the tract's wildlife survey area or surrounding region during specific surveys or incidental to other searches at local mines over the last 25 years. Those efforts were conducted as part of annual wildlife monitoring by USFS and contract biologists on private and federal lands in the area. One swift fox was documented on USFS lands approximately 0.5 mile northeast of the North Porcupine tract's general analysis area in March 2002. The fox was observed in T.42N., R.70W., SE¼ Section 15 during spotlight trapping efforts for sage-grouse at the nearby North Antelope Rochelle Mine. Two separate individuals were observed during spotlight lagomorph surveys conducted for the adjacent Antelope Mine on private surface approximately 4 miles south of the North Porcupine tract's general analysis area in October 2005. A pair of swift foxes was observed in the same general area during similar spotlight surveys in both 2006 and 2007.

Direct and Indirect Effects

Due to absence of swift fox observations in the general analysis area for the North Porcupine tract, the limited presence of suitable habitats on USFS and adjacent lands in that area and the surrounding wildlife survey area, and the lone sighting of a single swift fox in that area over the last 25 years of annual monitoring (including spotlight searches for other species), no direct or indirect impacts are anticipated for this species within the North Porcupine tract's general analysis area. Given these circumstances, species-specific Standards and Guidelines outlined in the TBNG Plan (USFS 2002, page 1-20) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Habitat for this species on USFS lands within the western portion of the general analysis area for the North Porcupine LBA Tract is currently considered as suitable but unoccupied. No fox sightings have been documented on those USFS lands during specific and incidental surveys conducted over the last 25 years (1984-2007). Only four sightings have been recorded within or near the tract's two-mile wildlife survey area during that period: one in 2002, and three since 2005. The three most recent sightings were at least 3 miles to the south, and on the far side of a railroad and county road between the sightings and the nearest USFS lands.

H-3.6.21 Long-billed curlew (*Numenius americanus*) Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003a). The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Cerovski et al. 2004). Curlews are ground nesters, and require large open expanses of grassland, with relatively low vegetation and few shrubs in which to nest (Hill 1998). The nest is typically a shallow scrape or depression, thinly lined with grass, weeds or cow dung, typically near water or moist areas.

Curlews use historically occupied sites each year, and some individual birds may reuse the same territories from year to year (Dechant et al. 2003a). Curlews primarily feed upon insects but also eat other invertebrates, small crustaceans, toads, and eggs and nestlings of other birds. This species forages in grasslands, wet meadows, prairie dog colonies, and occasionally along the margins of wetlands. Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998). Although some populations may be declining, overall population trends suggest long-billed curlew numbers are stable or increasing slightly. The major factor affecting curlew populations is habitat destruction and fragmentation.

Existing Conditions

Long-billed curlews are uncommon summer residents within the TBNG. However, no nesting occurrences have been documented for long-billed curlews in southern Campbell County (Cerovski et al. 2004), including USFS lands in the North Porcupine tract general analysis area and adjacent lands. As described above for the previous species, that area is dominated by sagebrush habitats, and no significant wetlands (i.e., large lakes) or other persistent water conditions that might attract large numbers of curlews during migration exist within the North Porcupine tract's wildlife survey area. Consequently, habitat conditions in the North Porcupine tract's general analysis area and surrounding lands would be suitable for foraging migrants, but they do not provide large expanses of grassland areas for nesting activities.

No long-billed curlews have ever been documented on USFS lands or adjacent lands in the general analysis area or larger wildlife survey area for the North Porcupine LBA Tract. Likewise, few curlews have been observed in the surrounding region during annual wildlife monitoring conducted in the area over the last 25 years. Those general surveys occurred repeatedly throughout the breeding season each year. All curlew sightings that have occurred in the general region over time were recorded during spring months and were beyond USFS lands; those individuals were likely migrants or non-breeding adults.

Direct and Indirect Effects

Given the lack of sightings of long-billed curlews in the North Porcupine LBA Tract general analysis area and surrounding wildlife survey area since 1984, and the fact that habitat conditions in those areas are only suitable for foraging migrants or non-breeding adults, the Proposed Action and Alternatives for this LBA tract are unlikely to cause any direct injury or mortality to this species. However, if present, future mining activities could result in injuries or mortalities to foraging individuals. Foraging individuals may also be displaced by human activities and noise associated with mining. Potential foraging habitats may be disturbed, removed, or fragmented by mining activities. The type, timing, location, and extent of habitat disturbance will vary throughout the tract's general analysis area as operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine, and will eventually mitigate impacts to some degree. The reclamation plan for the North Antelope Rochelle Mine would incorporate the replacement of jurisdictional wetland acreages existing prior to mining with at least equal types and numbers of wetland acreages. The creation of wetland habitats, especially where adjacent to native or reclaimed grassland habitats, could provide additional (although limited) foraging areas for curlews.

As no long-billed curlews have been documented within USFS lands or other lands in or near the North Porcupine tract's general analysis area, and habitat conditions do not provide quality nesting areas, species-specific Standards and Guidelines outlined in the Grassland Plan (USFS 2002) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As this species appears to be an infrequent visitor to the general analysis area, and high quality foraging and nesting habitat is not present within the area, impacts to this species are likely to be minimal. Loss, degradation, or fragmentation of potential foraging habitat and potential collisions with vehicles may occur. Enhanced water features and grasslands associated with reclamation may create new foraging or nesting habitat in the area.

H-3.6.22 Ferruginous hawk (*Buteo regalis*) Ferruginous hawks breed throughout much of the western United States and portions of three Canadian provinces (Johnsgard 1990). This species nests throughout Wyoming (Cerovski et al. 2004) and occupies portions of the state during winter. Large expanses of grassland and shrubland, where livestock grazing (vs. cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Most ferruginous hawks in the PRB nest on the ground (usually elevated sites, though some pairs nest in small trees). Typical nest sites include hilltops, rock outcrops, eroded creek banks, small trees, and even relatively level ground. The ferruginous hawk relies primarily on two mammalian families for the majority of its prey: *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs). Numerous nests can occur within the territory of a single pair, and ferruginous hawks often reuse nests for many years.

This species may be sensitive to human disturbance, especially during the nesting period (White and Thurow 1985). This sensitivity can be heightened in years of low prey abundance. Accurate information regarding the trend for the ferruginous hawk is limited and mixed. Some populations may be declining (Bechard and Schmutz 1995); however, overall population trends suggest numbers are stable or increasing (NatureServe 2007). Major factors affecting ferruginous hawk populations include habitat destruction and fragmentation, and human disturbance.

Existing Conditions

Annual monitoring has documented that ferruginous hawks nested in the vicinity of the North Antelope Rochelle Mine every year since at least 1990, and fledged young in 17 of those 19 years. Similar long-term nesting has occurred at the neighboring Black Thunder and Antelope mines. Ferruginous hawks have nested on USFS lands in the North Porcupine tract's general analysis area. Details describing the number of intact and active nests within the mine monitoring survey areas in a given year are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

The presence or absence of nest material does not determine whether the USFS considers a site as "active" (occupied during at least 1 of the last 7 years). In

2007, 73 individual ferruginous hawk nests (21 territories) were present within the North Porcupine tract wildlife survey area, plus 14 other nest sites that have been used by ferruginous hawks and at least one other raptor species over the years (Figure H-4).

Four nest sites were on USFS surface within the general analysis area itself in 2007, three of which still had nest material present. Three additional individual ferruginous hawk nest sites and two multi-species nests were on non-federal lands within the general analysis area in 2007.

Direct and Indirect Effects

As indicated previously, only a few acres in the North Porcupine tract's general analysis area are not already encompassed by the existing North Antelope Rochelle Mine's existing permit area. Surface disturbance is therefore likely to occur in those areas, regardless of the proposed leasing decision. However, the North Antelope Rochelle Mine has avoided, where possible, or mitigated mining impacts on raptor nests through a variety of means. The mine has also maintained and implemented current USFWS approved Raptor Mitigation Plans, adjusted operations to provide temporal and spatial buffers around raptor nests, and ensured that new power lines at the mine conform to current Avian Power Line Interaction Commission (APLIC) guidelines. Provided those practices are continued, direct impacts on ferruginous hawks and their active nest sites will be minimized, both on and near USFS lands. Due to restrictions on disturbance near active nest sites, the most probable source of potential impact to ferruginous hawks themselves would be an increase in injuries and fatalities of individuals foraging within the general analysis area due to vehicle collisions associated with ongoing or future mining and other activities. The use of existing roads in the area, when possible, would help to minimize this risk.

Habitat loss, degradation, and fragmentation would result from a variety of large- and small-scale mining operations such as soil salvaging and reservoir/flood control construction, among others. Potential nesting and foraging habitat might also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances would shift throughout the expanded permit area as operations progress. Reclamation of disturbed areas would occur incrementally as resource recovery is completed in a given portion of the mine, and would mitigate impacts to some degree. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (lagomorphs and rodents) for ferruginous hawks. However, due to their high reproductive potential and tendencies to re-populate and adapt to

disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

USFS Standards and Guidelines would be implemented and offer additional protections for active nests; they would apply only to activities outside of the current or future lease areas. These protocols should help ensure that the Proposed Action and Alternatives do not significantly degrade the quality of existing ferruginous hawk territories and nest sites. Standards and Guidelines specific to ferruginous hawks outlined in the TBNG Plan (USFS 2002, page 1-20-21) are as follows:

73. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within 0.25 mile (or line of sight) of active ferruginous hawk nests. For the ferruginous hawk, a nest is no longer considered active if it is known to have been unoccupied for the last seven years. This does not apply to pipelines, fences and underground utilities.

74. To help reduce disturbances to nesting ferruginous hawks, prohibit the following activities within 0.5 mile (or line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.

75. To help reduce disturbances to nesting ferruginous hawks, do not authorize the following activities within 0.5 mile (line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., pipelines, utilities, fencing), seismic exploration, and workover operations for maintenance of oil and gas wells.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Mine-related activities will likely disturb ferruginous hawk nest sites on USFS lands in the North Porcupine tract's wildlife survey area. Many ferruginous hawk nests associated with that area are located on non-federal surface, including alternate sites within the same territories that are beyond the area likely to be impacted by future mining disturbance associated with previous or proposed leasing actions. Some individuals or pairs may experience disturbance, destruction, or fragmentation of nesting and foraging habitat. Increased disturbance to individuals due to human activity may also occur. However, several factors should minimize the potential mining-related impacts on this species, including the availability of alternate nest sites located further away from pending disturbance in each affected territory, implementation of USFWS and USFS approved mitigation measures, reclaiming habitats as soon as feasible, encouraging nesting within mine reclamation lands through artificial nest structures and habitat features such as rock piles

and tree plantings that attract prey species, and continued monitoring of this species to ensure that mitigation methods are applied when necessary.

H-3.6.23 Burrowing owl (*Athene cunicularia*) Burrowing owls breed from southern Alberta to southwestern Saskatchewan, south through east-central Washington, central Oregon, and southern California, and east to eastern North Dakota, west-central Kansas, and Texas (Klute et al. 2003, pg 7). The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Cerovski et al. 2004). This species requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Klute et al. 2003, pg 12).

Most burrowing owl nests within the TBNG are located within prairie dog colonies (USFS 2003). Burrowing owls typically reuse traditional nesting areas. Burrow mounds, shrubs, fence posts or boulders may be used as observation perches. This species is usually tolerant of human activity but is vulnerable to predation by pets (cats, dogs). Burrowing owls forage within a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. This species is often active during daylight hours. Insects and small mammals (mice and voles) are the owls' primary prey items. Burrowing owl populations have been declining throughout its range, primarily due to habitat loss.

Existing Conditions

Burrowing owls are common summer residents within the TBNG (Cerovski et al. 2004). This species was observed nested in the North Antelope Rochelle Mine's monitoring area in 1985 and 1989. Despite the presence of potential nesting habitat (prairie dog and badger burrows) in the monitoring area, nesting owls were not found again until 1997. Burrowing owls have nested in the mine's monitoring area in most years since then, especially within a prairie dog colony located in T.41N., R.70W., Section 17, just east of the southeastern corner of the South Porcupine LBA Tract (Figure H-5).

One burrowing owl nest site has been identified in a small (19 acres in size) prairie dog colony within the North Porcupine tract's general analysis area. This colony and nest site are located immediately adjacent to USFS lands (Figure H-4). The USFS buffer for this species is 0.25 mile. No burrowing owl nest sites have been documented on USFS lands within the North Porcupine tract's general analysis area. A total of seven nest sites have been recorded on USFS lands in the surrounding wildlife survey area through 2007; one of which is in a prairie dog colony located approximately 0.25 mile east of the general analysis area, in T.42N., R.70W., Section 25.

Direct and Indirect Effects

No known burrowing owl nest sites are present on USFS lands in the general analysis area for the North Porcupine LBA Tract. However, leasing the North Porcupine LBA Tract could result in direct or indirect effects on two nest sites located within 0.25 mile of USFS lands in that tract; one of which is within the

tract's general analysis area itself, while the other is located immediately east of the tract's general analysis area (Figure H-4). That distance represents the USFS buffer for this species. Most nesting has occurred in prairie dog colonies in or near the tract's general analysis area, though badger burrows have also been used. Both USFS Standards and Guidelines (USFS 2002) and the North Antelope Rochelle Mine's mine permit (PRC 2004) stipulate that clearance surveys will be conducted and approved by the appropriate agencies before any colony is disturbed during the breeding season. That process will preclude most direct impacts to new nesting burrowing owls in that area.

Due to the strong (but not exclusive) relationship between burrowing owls and prairie dog colonies, many of the indirect effects described above for the black-tailed prairie dog would also apply to burrowing owls and, thus, will not be repeated in full detail here. Because burrowing owls are active during daylight hours, the most probable source of direct impacts would be the death of, or injury to, individuals fleeing heavy equipment, or being killed or injured by equipment while feeding or moving through the mine area. Burrowing owls are generally tolerant of human activities, but increased presence and noise, especially during the nest initiation period, may displace individuals or inhibit nesting proximate to mine operations. Foraging could also be hindered within these areas, especially where mining activities occur near prairie dog colonies.

As described previously, only one prairie dog colony (approximately 18.6 acres in size) is present on non-federal lands in the North Porcupine tract general analysis area. Prairie dog colonies located within the existing North Antelope Rochelle Mine permit area could be impacted by mining operations regardless of whether the North Porcupine LBA Tract is leased. If the North Porcupine tract is leased, mining could eventually disturb or eliminate the prairie dog colony (potential nesting habitat) in the tract's general analysis area. Mining could eventually disturb or eliminate prairie dog colonies on adjacent lands in or within 0.25 mile of the North Porcupine tract's general analysis area. However, the generally limited presence of active burrowing owl nests, in combination with the presence of other non-disturbed colonies in the general vicinity and the ability for prairie dogs to recolonize reclamation, would mitigate those losses to a large extent. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (rodents, non-flying insects) for burrowing owls. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

Additionally, the tendency of prairie dogs to quickly colonize nearby areas when their colonies are disturbed would create new nesting habitat for burrowing owls. Overall, nesting and foraging habitats will be incrementally affected by a variety of large-and small-scale operations. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress, thus providing opportunities for burrowing owls to relocate to other suitable habitat within the immediate area.

Reclamation will proceed incrementally as areas are mined and activities move to new locations within the mine area. Both activities will create loose soil that should be attractive to dispersing prairie dogs (potential habitat source), at least in the short term. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine, and will eventually mitigate habitat impacts to some degree. However, to date, burrowing owls have rarely been documented nesting within reclaimed habitats at surface mines in the PRB of northeast Wyoming.

If nesting burrowing owls are documented on or near USFS lands in the North Porcupine LBA Tract, USFS Standards and Guidelines applicable to this species would be implemented on applicable lands to offer additional protections beyond those outlined in the USFWS approved Raptor Mitigation Plan for the North Antelope Rochelle Mine. Annual monitoring of known burrowing owl nest sites within the 2-mile wildlife survey area for the mine, including USFS and adjacent lands, and other nearby colonies will continue through the life of the mine to document their histories of occupancy and production.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No burrowing owl nests have been documented on USFS lands in the North Porcupine tract's general analysis area during many years of annual monitoring. A single nest site is located in the only prairie dog colony that is within the tract's general analysis area, and that nest site is immediately adjacent to USFS lands. Disturbance, fragmentation, and alteration of foraging and nesting habitats would occur if this tract is leased and mined. However, most of the prairie dog colonies in the general vicinity are located outside of the tract's general analysis area where future surface disturbance associated with this leasing action would occur.

The North Antelope Rochelle Mine has avoided, where possible, and mitigated such impacts in the past through intensive monitoring of both populations and specific nest sites, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests (including burrowing owl nests). Mining activities and noise may disturb individuals inhabiting the lease area, thus inhibiting potential nesting or foraging in proximity to lands with ongoing development. Potential collisions with vehicles might also occur, though none have been recorded in the area to date.

H-3.6.24 Chestnut-collared longspur (*Calcarius ornatus*) The breeding range of the chestnut-collared longspur extends from southern Alberta to southern Manitoba, south to west-central Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et al. 2003b). The chestnut-collared longspur is a common summer resident of the eastern plains of Wyoming (Cerovski et al. 2004). This species prefers native grasslands as

breeding sites, inhabiting open prairie and avoiding excessively shrubby areas. Grasslands with dense litter accumulations are also avoided (Dechant et al. 2003b). Scattered shrubs are often used as singing perches. Nests are typically placed in areas of sparse vegetation (less than 20-30 centimeters), but usually with a taller grass component than sites preferred by McCown's longspurs. Nests are on the ground in depressions and often placed beside cattle dung, small shrubs, or under a clump of grass (Hill and Gould 1997). Male fidelity to breeding areas has been observed. Chestnut-collared longspurs feed primarily on seeds (especially grasses), insects, and spiders. This species is generally tolerant of short-term intrusion at the nest site but may desert if disturbed during nest building or egg-laying (Hill and Gould 1997). High rates of predation on eggs and nestlings have been reported and pesticides have been shown to reduce hatching success. The chestnut-collared longspur breeding range has contracted and long-term data suggests population declines (Hill and Gould 1997). These declines have been attributed to loss of native prairie habitat, and conversion to cropland and urban development.

Existing Conditions

Chestnut-collared longspurs are common summer residents within the TBNG. This species has not been recorded on USFS or adjacent lands in the North Porcupine tract's general analysis area during annual monitoring conducted in recent years.

The North Porcupine tract's general analysis area is dominated by sagebrush communities. Potential habitat in that area is largely restricted to the western extent, west of the Antelope Road (Figure H-4).

Direct and Indirect Effects

Due to the similarity of potential impacts from future mining on chestnut-collared longspurs and other grassland species previously discussed (e.g., prairie dog and swift fox), detailed descriptions of those impacts are not repeated here. Chestnut-collared longspurs have not been documented as nesting on USFS or adjacent lands in the North Porcupine tract's general analysis area. Equipment operations associated with future mining operations could result in fatalities or injury to individuals, nests and eggs, and/or young that are present in the area. Increased human activity and noise could inhibit foraging or nesting within suitable habitats on USFS lands or displace individuals during periods of intense activities. Over the life of the mine, potential nesting and foraging habitats in the general analysis area could be disturbed, destroyed, altered, or fragmented, though the type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine. Within 1 to 2 years, newly reclaimed areas may create good quality nesting habitat for chestnut-collared longspurs.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Sagebrush dominated areas such as those on USFS and adjacent lands within the North Porcupine tract's general analysis area are not as attractive to grassland species such as longspurs. No individuals have been documented in the North Porcupine tract's general analysis area or surrounding wildlife survey area. Potential and documented alternative habitats for chestnut-collared longspurs are present elsewhere in the vicinity in areas not currently scheduled for mining disturbance.

H-3.6.25 McCown's Longspur (*Calcarius mccownii*) McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north-central Colorado, and east to western Nebraska, north-central South Dakota, and southwestern North Dakota (Dechant et al. 2003c). This species is a common summer resident of the eastern plains and great basin-foothills grasslands, basin-prairie shrublands, and agricultural areas throughout most of Wyoming (Cerovski et al. 2004). Specifically, this species requires open habitats such as sparsely vegetated, low structured grasslands, and heavily grazed pastures containing a moderate bare ground component for nesting and foraging. Nest sites are typically a natural or shallow scraped depression on the ground placed in the open or beside vegetation such as bunch grasses, cacti, or shrubs. McCown's longspurs feed on seeds of grasses and forbs, insects, and other arthropods. No strong data suggests breeding site fidelity although some individuals may return to the general nesting area in subsequent years.

Individuals vary in response to human intrusion at nest sites, but appear to be relatively more tolerant than most grassland songbird species. High rates of predation on eggs and nestlings occur especially where nests are associated with vegetative structure. Nestlings may also be directly poisoned where insecticides are sprayed in nest areas (With 1994). Populations are declining, especially within the northern portion of the range. Factors directly affecting the McCown's longspur include the reduction of breeding habitat due to overgrazing, control of prairie fires, plowing, development, and excessive use of pesticides. Conversion of short-grass prairie to agriculture and urban development is the most important factor (With 1994).

Existing Conditions

McCown's longspurs are also common summer residents within the TBNG. Observations of the McCown's longspur were similar to those of the chestnut-collared longspur. This species has not been observed on USFS or adjacent lands in the sagebrush dominated North Porcupine tract's general analysis area or its wildlife survey area. This species is regularly observed in prairie dog colonies at the neighboring Antelope Mine.

Direct and Indirect Effects

The direct and indirect effects to McCown's longspurs would be the same as those described above for the chestnut-collared longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Potential impacts to McCown's longspurs would be the same as those described above for the chestnut-collared longspur in the North Porcupine tract's general analysis area. However, as reclaimed grasslands mature, they would become less suitable as nesting habitat for this short-grass species.

H-3.6.26 Greater sage-grouse (*Centrocercus urophasianus*) The Greater sage-grouse occurs year-round throughout non-forested regions of Wyoming (Cerovski et al. 2004). Sage-grouse rely on a variety of habitats within sagebrush dominated landscapes to reproduce and survive throughout the year. Early in the spring, grouse gather at breeding display sites called leks. Leks are usually in open areas (playas, ridge tops, sparse sagebrush, or burned areas) that are surrounded by dense sagebrush and escape cover. The surrounding area also typically represents nesting, loafing, and foraging habitat.

After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nests in some portions of sage-grouse range are typically placed under sagebrush with average height of 36-79 centimeters (Schroeder et al. 1999). However, research conducted within the Southern PRB (Brown and Clayton 2004) indicated that, although shorter sagebrush was present at nest sites, grouse selected shrubs ranging from 55-61 centimeters in height under which to place nests. Re-nesting may occur if the nest is destroyed early during the laying or incubation period. Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). Sage-grouse exhibit high fidelity to seasonal ranges, and may return to the same area to nest in subsequent years.

For the first month after hatching, the young depend on relatively open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late-season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse feed upon sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense, exposed sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes or windblown ridges are preferred.

Breeding populations of this species have declined by at least 17 to 47 percent throughout much of its range (Connelly et al. 2004). Within Wyoming, sage-grouse populations have generally declined over the past 4 decades. However, sage-grouse population estimates specifically pertaining to the TBNG suggest an overall increase in individuals since 1995. This same general trend was observed both statewide and within the Northeast Wyoming Sage-Grouse Local Working Group (NWSGWG) area.

The NWSGWG identified habitat fragmentation and degradation, disturbance and direct mortality as major influences affecting sage-grouse (NWSGWG 2006). The group identified oil and gas development, vegetation management, invasive plants, and weather as those factors with the most influence on the northeast Wyoming sage-grouse populations and those that may most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming (NWSGWG 2006).

Existing Conditions

As described above, USFS lands on and adjacent to the general analysis area for the North Porcupine LBA Tract are dominated by a sagebrush-grassland community, primarily big sagebrush, with shrub cover averaging 54 percent in that area. The North Antelope Rochelle Mine, as part of its wildlife monitoring program from 1984 through 1992, conducted voluntary searches for and annual monitoring of sage-grouse leks throughout the mine's original permit area and a 1-mile perimeter. Those surveys became mandatory with the implementation of Appendix B of the WDEQ/LQD Coal Rules and Regulations in 1993, and continued each year through 2007. Radio-telemetry data gathered from grouse collared at the North Antelope Rochelle Mine during a voluntary, multi-year (2001 through 2007) study have demonstrated that most birds in the North and South Porcupine LBA Tracts' 2-mile wildlife survey areas (Figures H-4 and H-5) reside near the mine year-round. Additional details describing the survey and monitoring efforts for sage-grouse at the North Antelope Rochelle Mine are available in annual wildlife monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

Five sage-grouse leks are located within 2 miles of the North Porcupine tract's general analysis area: Payne, Wilson, Rochelle, Kort I, and Kort II (Figure H-4). The Payne and Kort 1 leks are on USFS lands, but only the Payne lek is actually within the LBA tract's general analysis area itself. These five leks are collectively referred to as the Rochelle Complex. The birds in that complex comprise approximately 4 percent of the grouse population in the entire TBNG, and approximately 17 percent of the population in the Hilight Bill Geographic Area.

The Payne lek was first discovered in spring 2001. The peak male count (21) recorded that year was higher than that of any subsequent year. Grouse counts at the Payne lek have fluctuated over the last 7 years, with numbers increasing each year from 2005 through 2007. The average annual peak count

for males at the Payne lek since its discovery was 10.5. The Payne lek is currently classified as "occupied."

The Wilson lek has been unoccupied for the last 10 consecutive years, and is therefore considered "unoccupied/abandoned."

The Rochelle lek was discovered in 1990 but experienced reduced attendance after 1992, with birds present in only 3 of the subsequent 11 years. The site may have been a satellite to the Wilson lek, used only when the local grouse population was relatively high or increasing. The Rochelle lek was mined through in 2004, and is now classified as "unoccupied/destroyed."

The Kort I lek was first identified in spring 1998 when, for unknown reasons, grouse apparently shifted their breeding activities from the Wilson lek. Male attendance at the Kort I lek gradually declined through 2004 (low of three males), and the birds shifted their display location to the Kort II lek site in 2005. The average peak male count for the Kort leks since their discovery was 5.2 males per year. The Kort I and Kort II leks are currently classified as "occupied."

Although sage-grouse numbers have generally been low in the combined North and South Porcupine tracts' wildlife survey areas over the years, known or potential grouse habitat is present in both areas. However, the most suitable sage-grouse habitat exists in the North Porcupine area, as suggested by the distribution of grouse leks between the two areas and confirmed through the information gleaned from the last 7 years of radio-telemetry data collected in the general vicinity. Results from that project have demonstrated that grouse are most commonly recorded in the eastern quarter of the 2-mile wildlife survey area for the North Porcupine LBA Tract, east of the Payne County Road. Detailed reports and long-term maps documenting grouse locations in the area have been submitted to WDEQ/LQD and other agencies in each study year.

Annual surveys for sage-grouse broods were conducted in native and reclaimed stream channels at the North Antelope Rochelle Mine and adjacent mines from 1994 through 1999; such surveys were no longer required by WGFD and WDEQ/LQD after that year due to the consistent lack of grouse broods observed at coal mines throughout the PRB. Likewise, no sage-grouse broods were seen during recent baseline inventories conducted for the North and South Porcupine LBA Tracts. All grouse broods that have been recorded over the years occurred as incidental sightings during other wildlife surveys.

Nesting and winter surveys for sage-grouse are not required as part of the annual wildlife programs for the North Antelope Rochelle or the other applicant mines included in this EIS (Black Thunder and Jacobs Ranch), though winter surveys have been conducted as part of baseline inventories for previous mine expansions. Additionally, winter surveys for other species (big game and bald eagle roosts) have occurred at all three of these mines in recent years. Due to their proximity to existing mine permit areas, nearly all of the combined North

and South Porcupine tracts' general analysis areas have been included in some level of regular (but not always annual) winter surveys since 1987. No sage-grouse were ever documented in or near these two LBA tracts during those surveys. However, grouse have been confirmed as year-round residents in the vicinity of the North Porcupine tract general analysis area during year-round telemetry studies conducted from 2001 through 2005, with less frequent monitoring during the subsequent two winters. Only isolated grouse sightings occurred within 3 miles of the South Porcupine tract general analysis area during that telemetry monitoring period, with each sighting limited to a single observation per bird.

Direct and Indirect Effects

Because of their location within the existing permit area for the North Antelope Rochelle Mine, all five sage-grouse leks in the North Porcupine tract's wildlife survey area occur in an area likely to be disturbed by future mining, regardless of whether the proposed leasing action is approved.

Some potential impacts of mineral development (including coal mining and oil and gas development) on sage-grouse that might inhabit the general analysis area for the North Porcupine tract, as well as on known and potential sage-grouse habitat include: alteration of plant and animal communities; loss or degradation of important seasonal habitats; increased human activity and noise, which could cause animals to avoid the area and/or reduce their breeding efficiency; increased road traffic and related injuries or mortalities; increased risk of predation from raptors perched on existing or future power poles and/or grouse avoidance of areas with overhead power lines; potential illegal harvest; and reduced water tables resulting in the loss of herbaceous vegetation. Following reclamation, there may be a long-term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining.

Sagebrush communities occupy approximately 54 percent of the vegetation analysis areas in the North Porcupine LBA Tract. Mine operations and oil and gas development have requirements for reclamation of disturbed areas as recovery of energy resources is completed. WDEQ/LQD reclamation standards for surface coal mines call for restoration of sagebrush on at least 20 percent of the reclaimed area. Those reclamation efforts can work in concert with USFS Standards and Guidelines toward mitigating impacts to wildlife species and habitats. New areas disturbed by mining in the general analysis area for the North Porcupine LBA Tract would be reclaimed incrementally, but they may not be attractive to sage-grouse for many years due to slow establishment and growth rates of important sagebrush species. Information gleaned from the multi-year telemetry study at the North Antelope Rochelle Mine would be incorporated into reclamation efforts for the LBA tract to maximize successful reclamation of sage-grouse habitat. Estimates for the time it would take to restore shrubs, including sagebrush, to pre-mining density levels range from 20 to 100 years. Until sagebrush returns to its pre-mining density levels, a reduction in potential year-round sage-grouse habitat within the North

Porcupine tract's general analysis area would persist. In the meantime, the presence of known and apparently suitable sage-grouse habitat elsewhere within the immediate area could provide alternate areas for dispersing grouse to use until reclaimed sagebrush stands have matured adequately to support a local population.

In keeping with the Direction Objectives for the Hilight Bill Geographic Area (USFS 2002, page 1-25), impacts to sage-grouse habitat in the general analysis area for the North Porcupine LBA Tract could be further mitigated off-site by efforts to preserve and enhance habitat on adjoining and nearby private lands, such as those currently under way through the Thunder Basin Grasslands Prairie Ecosystem Association. Management planning and processes that are developed through this combined effort among landowners and federal representatives will presumably provide suitable habitat for sage-grouse that disperse from the North Porcupine tract and adjacent North Antelope Rochelle Mine areas during the interim between habitat disturbance and completed reclamation. Should sage-grouse move onto new USFS lands proposed for mining in the future, agency Standards and Guidelines would offer appropriate protections for the species and its important habitats.

Despite the impacts to the Rochelle lek complex, the proposed leasing action would not contribute to significant reductions in the regional sage-grouse population overall, nor would it conflict with the current TBNG Plan or any future objectives to manage the area for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. More than 20 years of regular monitoring have documented that sage-grouse do inhabit USFS lands analyzed for the North Porcupine LBA Tract general analysis area. Currently, the Payne and Kort leks are the only sites with regular activity in recent years, with most birds seen at the Payne lek. Those leks have been used by an average peak count of 10.5 and 5.2 males per year, respectively, since they were discovered. Although impacts to the leks within the Rochelle complex will be detrimental to individual birds, that group represents only a small (4 to 17 percent) proportion of the sage-grouse population in the TBNG and Hilight Bill Geographic Area, respectively. Annual monitoring will continue for the life of the North Antelope Rochelle Mine, and will include new permit expansions and a 1-mile perimeter. Should additional sage-grouse leks or use areas be observed on USFS lands in the North Porcupine tract's wildlife survey area, appropriate monitoring and mitigation measures will be implemented to minimize impacts to birds, habitats, and populations.

H-3.6.27 Bald eagle (*Haliaeetus leucocephalus*) Bald eagles occur throughout North America, from Alaska and Canada south to Florida, the Gulf Coast, and northern Mexico. The northwest coast of North America serves as

the stronghold for this species, with approximately one-half of the population inhabiting Alaska.

The USFWS officially listed the bald eagle as an endangered species in 43 of the lower 48 states on July 4, 1976. The listing was due to a combination of several factors, including widespread habitat loss, negative effects of pesticide use on reproductive success, indiscriminant shooting, and others. The status of the bald eagle was downgraded to threatened throughout the lower 48 states in 1995. Bald eagle population trends began increasing throughout most of the species' range in the early 1990's, and it was proposed for de-listing in 1999.

On July 9, 2007, USFWS published a Federal Register notice (72 FR 37346) announcing that the bald eagle would be removed from the list of threatened and endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C 1531 *et* seq.) on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, will remain in place. The bald eagle is now recognized as a BLM and USFS Sensitive Species.

Bald eagles typically nest in large trees within a stand of mature, similarly sized trees either beside or in proximity (within 0.7 mile) to rivers, lakes, or reservoirs that harbor adequate fish populations. Those areas tend to be remote and experience little disturbance (Johnsgard 1990). Typically, the nest is placed in the crown of a large cottonwood or pine, but if the topography allows, eagles will nest on cliff edges or escarpments. Open-canopied trees and snags provide required perches in nesting and foraging areas.

All verified bald eagle nests in northeastern Wyoming (BLM Buffalo Field Office GIS database) are situated in significant, mature cottonwood stands along larger streams or rivers (i.e., Tongue River, Powder River, Clear Creek, and Little Thunder Creek). Nesting attempts are rare on the TBNG (Beske 1994). Fish and waterfowl are the primary source of food for nesting bald eagles. Where available, large to mid-size carrion and large rodents (e.g., prairie dogs) can also be an important dietary component.

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant in the northeastern portion of the state. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004), and has often been documented during winter and early spring at nearby coal mines (various coal mine annual reports are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne). Most eagles that migrate through or winter in Campbell County roost communally in stands of large ponderosa pine, along wooded cottonwood-riparian corridors, or in isolated stands of large trees. As water is scarce in that region, especially during winter, those birds likely forage widely for lagomorphs or carrion.

Existing Conditions

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in the PRB, but only rarely nest in that region.

No bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the general analysis areas for the North or South Porcupine LBA Tracts during any baseline or annual monitoring studies since they began in the late 1970s and early 1980s, respectively. Scattered stands of potential bald eagle nesting and winter roosting habitat (mature cottonwood corridors) are present on USFS and adjacent lands along Porcupine Creek as it flows through the general analysis area for the North Porcupine LBA Tract. No streams flow through the South Porcupine tract's general analysis area and few trees are present there.

In general, the combined wildlife survey areas for the two Porcupine LBA Tracts do not contain unique or sizeable, concentrated prey sources (e.g., fisheries, waterfowl wintering areas) that would be expected to attract bald eagles. As described in the North and South Porcupine LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this EIS, no prairie dog colonies were present on USFS lands within either tract's general analysis area in 2007. Only one colony encompassing approximately 18.6 acres was present within the North Porcupine tract's general analysis area, and no colonies were present within the South Porcupine tract's general analysis area, in 2007. A total of 23 prairie dog colonies encompassing approximately 1,317 acres were present in the combined wildlife study areas for the two Porcupine LBA Tracts in 2007 (Figures H-4 and H-5). Sheep and their lambs are present in this area in the spring, when bald eagles have typically left the region, and flocks are pastured there infrequently in the winter. The area does not support a large big game herd, though some groups do winter in the area.

Ground surveys for bald eagle winter roost sites were most recently conducted within the combined wildlife survey areas for the two Porcupine tracts during baseline surveys beginning in 2006. Previous winter roost surveys also encompassed all or most potential habitat within that overall survey area. All winter roost surveys were conducted between ½ hour before and 1 hour after sunrise or between 1 hour before and ½ hour after sunset, per current BLM guidelines for survey timing and frequency. Biologists also watched for nesting bald eagles within the survey area while conducting surveys for other nesting raptors.

Direct and Indirect Effects

As no winter roost sites or large groups of bald eagles have been documented in the general analysis area for either of the two Porcupine LBA Tracts, potential impacts would be limited to occasional foraging individuals rather than a large segment of the population. The increased human presence and noise

associated with construction activities, if conducted while eagles are wintering within the area, could harass or displace individual eagles during that period. Nesting eagles could also be distressed to the point of abandoning eggs or young, or their hunting efforts and success impacted. If necessary, the majority of direct effects could be mitigated by controlling the timing and location of disturbance activities, and/or through approved nest relocation efforts.

Indirect effects include additional disturbance and fragmentation of already limited foraging habitat within the geographic area. These impacts could result from a variety of large- and small-scale activities described previously for other species, including, but not limited to: topsoil stripping; overburden and coal removal; reclamation activities; and construction of roads, reservoirs, power lines (above ground and buried), fences, and pipelines. The locations of operations would shift throughout the expanded permit area as mining occurred, with habitats disturbed and reclaimed incrementally. Conversely, the addition of fences and raptor-safe power poles could possibly benefit foraging bald eagles by providing additional perch sites. Due to the limited presence of potential nesting or roosting sites, and lack of concentrated sources of prey, the direct and indirect effects of the Proposed Action and Alternative 2 to bald eagles are expected to be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No bald eagle nests have been documented on or within 1 mile of the North or South Porcupine LBA Tract's general analysis area since annual monitoring began in the early 1980s. Potential bald eagle winter roost and nesting sites are limited in both LBA tract's wildlife survey area, and no reliable prey sources are present to support nesting or roosting bald eagles. Therefore, potential hazards for this species would be limited to foraging individuals during winter. Disturbance, fragmentation, and alteration of potential foraging habitat would occur. However, the North Antelope Rochelle Mine has avoided, where possible, and mitigated raptor impacts in the past through intensive raptor monitoring, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests.

H-3.6.28 Mountain plover (*Charadrius montanus*) The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004). Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003d). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined and recent data suggests that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Existing Conditions

Mountain plovers are summer residents within portions of the TBNG. Most observations of mountain plovers in northeast Wyoming have been associated with prairie dog colonies. Approximately 86 percent of recently (since 1993) occupied mountain plover habitat in that region occurred within prairie dog colonies (Byer 2001). Because of the similarity in habitat requirements between the mountain plover and McCown's longspur, similar existing conditions and impacts would apply for both species. The nearest known breeding population of mountain plovers occurs in a large prairie dog colony located at the Antelope Mine, approximately 4 miles southwest of the South Porcupine LBA Tract's general analysis area, and even farther from the North Porcupine LBA Tract.

As described above, sagebrush communities dominate the North Porcupine tract's general analysis area. Only one small (approximately 18.6 acres) prairie dog colony is present in that area, and it is located on non-federal lands. Generally, the vegetation in the North Porcupine tract's general analysis area and surrounding wildlife survey area is too tall and dense to attract mountain plovers. The best potential habitat for this species occurs in a large (about 345.3 acres) occupied prairie dog colony immediately south of the North Porcupine tract's general analysis area (Figure H-4). Despite the presence of suitable habitat and the occurrence of annual monitoring in that area, mountain plovers have never been documented on USFS or adjacent lands within the North Porcupine tract's general analysis area.

Mountain plovers have been recorded in the combined North and South Porcupine tracts' wildlife survey areas only three times over the last 2 decades of annual monitoring. In mid-June 2004, single individuals were seen in short-grass areas on two separate days. One adult was observed on non-federal surface in the western portion of the South Porcupine tract's general analysis area. The second individual was recorded in the southwestern portion of the South Porcupine tract's wildlife survey area. Neither adult exhibited any defensive behavior, so both were presumed to be non-breeding birds. In early August 2005, a group of 15 to 20 mountain plovers was observed in the large (345.3 acres in size) prairie dog colony that overlaps both the North and South

Porcupine tracts' wildlife survey areas. That group was presumed to be staging briefly during the fall migration. No other plover sightings have ever been recorded in that colony, despite survey efforts targeting that location.

Direct and Indirect Effects

Due to the similarity in their habitat associations, the direct and indirect effects to mountain plovers in both North and South Porcupine LBA Tracts' general analysis areas would be the same as those described above for the McCown's longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Suitable plover habitat on USFS lands is limited primarily to a large prairie dog colony that overlaps the wildlife survey areas for both the North and South Porcupine LBA Tracts; no prairie dog colonies are present on USFS lands in either tract's general analysis area. Only one mountain plover has been documented in the general analysis area for either Porcupine LBA tract in more than 20 years of annual monitoring. Documented alternative habitats for mountain plovers are present elsewhere in the region that is not currently scheduled for mining disturbance.

H-3.6.29 Loggerhead shrike (*Lanius ludovicianus*) Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan, and southern Manitoba, south to California and Florida, and east to southwestern Minnesota, southern Wisconsin, southern Michigan, and Maryland. This species is a common summer resident throughout Wyoming (Cerovski et al. 2004). Shrikes prefer relatively open, heterogeneous habitats characterized by grasses and forbs of low stature interspersed with bare ground and shrubs or low trees with perches for hunting. This species will use a wide variety of trees and shrubs, particularly thick or thorny species, as nesting substrates and hunting perches (Prescott and Bjorge 1999).

Although some shrike nests are used in subsequent years, fidelity to a nest site is limited. This species forages over relatively open habitats, feeding primarily upon arthropods, amphibians, small to medium-sized reptiles, small mammals, and birds (Yosef 1996). Shrikes may also feed upon road kill and carrion. This species is generally tolerant of human activity near a nest, although they will abandon if disturbed during egg-laying or early in incubation. The loggerhead shrike is declining in both number and overall range. Declines have been attributed to habitat loss and conversion, urbanization, pesticide contamination, and loss of insect prey as a result of pesticide use (Yosef 1996).

Existing Conditions

Loggerhead shrikes are common summer residents within the TBNG. This species has occasionally been observed in a small tree windbreak at an old homestead site located adjacent to the general analysis area for the North Porcupine tract on USFS lands in T.42N., R.71W., SW¼SE¼ Section 35 (Figure

H-4). The presence of young indicates that shrikes have nested in that windbreak at least once. Few other trees or other nesting habitats are present elsewhere in the North Porcupine tract's wildlife survey area, as described for the bald eagle, above. Shrikes have also been infrequently recorded perched on various fences or on overhead power lines elsewhere in the tract's wildlife survey area. Shrike foraging habitat is present throughout the North Porcupine LBA Tract's general analysis area, including USFS lands. As indicated, existing utility and fence lines currently provide good quality hunting perches.

Direct and Indirect Effects

Implementation of the Proposed Action or Alternatives could result in direct and indirect impacts to loggerhead shrikes, though such impacts would likely be uncommon. Only one presumed nest site has been documented on or adjacent to USFS lands or elsewhere in the wildlife survey area for the North Porcupine LBA Tract; that site is just outside of the tract's general analysis area, but is within the existing mine permit area for the North Antelope Rochelle Mine. The most probable direct impact would be the mortality of, or injury to, individuals foraging within or passing through the USFS lands due to collisions with future mine-related vehicles, or dispersal of foraging individuals due to active mining.

The relatively slow movement of mining equipment and the noise associated with the activity would decrease direct impacts associated with vehicle collisions. As loggerhead shrikes are not especially common in the North Porcupine tract's general analysis area, indirect impacts would be limited despite the fragmentation, degradation, or loss of habitat in the short and mid-term. Any birds that would be displaced would be forced to travel to other locations with acceptable habitat. This could result in stress to individual birds, as well as potential decreased nesting effort and success. Prey numbers reduced by mining would be expected to rebound following reclamation due to generally high reproductive potential and prey tendencies to re-establish and adapt to disturbed and reclaimed areas. The locations of mine-related habitat disturbances and reclamation efforts would proceed incrementally throughout the expanded mining area as operations progressed. Additionally, this mining activity would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for this species. USFS Standards and Guidelines would offer additional protections for any active nest sites that may be present in the area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Such impacts would be minimized by the limited number of regular sightings and known nesting attempts, as well as the relative paucity of suitable nesting habitat on or adjacent to the USFS lands analyzed in this EIS and their surrounding region. Degradation, fragmentation, or loss of potential foraging habitat, reduction in prey populations, and potential collisions with

vehicles may occur. Given the limited presence of birds in the area, and the composition of the shrike's prey base (insects, small mammals, etc.), impacts to shrikes would be minimal. USFS Standards and Guidelines would apply for active nests during the breeding season. Additionally, mining the USFS lands would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for loggerhead shrikes.

H-3.6.30 Brewer's sparrow (*Spizella breweri*) The breeding range of the Brewer's sparrow extends from southwestern Yukon, southern Alberta, and southwestern Saskatchewan, south (east of the Cascades and Sierras) to southern California, central Arizona, and northern New Mexico (Rotenberry et al. 1999). The Brewer's sparrow is a common summer resident of the basin-prairie and mountain-foothills throughout Wyoming (Cerovski et al. 2004). Brewer's sparrow is a sagebrush obligate species (Rotenberry et al. 1999).

This species is an uncommon cowbird (*Molothrus ater*) host and typically builds a small cup nest low in sagebrush shrubs. Brewer's sparrows prefer to nest in medium-sized (48-90 centimeters, or 19-35 inches) live sagebrush within relatively dense (26-42 percent canopy cover) stands (Walker 2004). Grass height and density are important factors for nest concealment. Although tolerant of human visitation, this species may abandon a nest if disturbed during the construction process.

Brewer's sparrows feed primarily on small insects and, to a lesser extent, seeds from grasses and forbs. Throughout areas where they have been surveyed, the species appears to have undergone and continues to undergo statistically significant declines (Rotenberry et al. 1999). Major threats to Brewer's sparrow populations are similar to those faced by other declining sagebrush-obligate species and include habitat conversion and fragmentation, invasion by non-native plants, altered fire regimes, livestock overgrazing, conifer encroachment, energy development, and conversion to urban or residential housing (Walker 2004).

Existing Conditions

Brewer's sparrows are common summer residents within the TBNG and southern Campbell County (Cerovski et al. 2004). Breeding bird survey data from annual monitoring and baseline studies conducted for the North Antelope Rochelle Mine, and incidental observations over time, have shown that the Brewer's sparrow is a common but limited breeder in the area. This species has been recorded in sagebrush habitats near the North Porcupine LBA Tract during many survey years over time. Although no nests have been encountered in that general analysis area, the presence and behavior (singing) of birds throughout spring and summer suggest that Brewer's sparrows nest in the sagebrush stands common to the North Porcupine tract's general analysis area.

Direct and Indirect Effects

As described for the sage-grouse, above, habitat loss, degradation, and fragmentation of sagebrush communities in the North Porcupine tract's general analysis area would result from a variety of large- and small-scale mining operations such as topsoil stripping, drilling, and reservoir construction, among others. Potential nesting and foraging habitat would also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances and reclamation efforts would shift throughout the expanded permit area as operations progress.

The use of existing roads, when possible, could minimize impacts related to traffic hazards and predator travel corridors. Increased activity and noise, especially during the nest initiation period, could inhibit nesting proximate to mining activities. Foraging could also be hindered within these areas, especially where active mining occurs. Additional infrastructure and activity associated with the expansion of the mine, in combination with other ongoing disturbances (e.g., CBNG operations), could displace Brewer's sparrows from any historical use areas that might occur in the area. Those birds could potentially move into other sagebrush stands in the general vicinity, assuming they are not already occupied.

Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine and will eventually mitigate impacts to sagebrush habitats to some degree, though such efforts could take decades to benefit sagebrush obligates such as the Brewer's sparrow. Impacts to sagebrush habitat on USFS lands could be further mitigated off-site by efforts to preserve and enhance such habitat on adjacent and nearby private lands, as described above. Standards and Guidelines for sagebrush habitats outlined in the TBNG Plan (USFS 2002, pages 1-18; Appendix D) would be implemented as necessary, and could serve to sustain regional populations of this sparrow. Those management guidelines would apply only to activities beyond the North Porcupine LBA Tract.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Some habitat loss, degradation, and fragmentation would occur on and near USFS lands in the general analysis area for the North Porcupine LBA Tract, along with potential impacts to individuals. However, the presence of large stands of sagebrush elsewhere in the general vicinity suggests that Brewer's sparrows would remain viable within the TBNG for at least the short-

term. Additionally, the Proposed Action or Alternative 2 would not conflict with the current TBNG Plan (USFS 2002) or future objectives to manage the area for this species. Application of appropriate USFS Standards and Guidelines, successful reclamation efforts, and proper land management on adjoining lands could mitigate potential impacts, to some degree.

H-3.7 South Porcupine LBA Tract

H-3.7.1 Prairie moonwort (*Botrychium campestre*) The prairie moonwort, a sensitive plant species, has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species was only recorded in Wyoming in a semi-shady mixed deciduous and ponderosa pine forest on sandy soils in the Black Hills. Prairie moonworts are known to exist in a variety of other habitats such as those underlain by Pierre shale, the Laramie Formation, calcareous sedimentary rocks, calcareous soils underlain by limestone, sandy soils and loess prairie. These habitats generally do not exist on the South Porcupine general analysis area, as the forest cover and soil substrate are not present.

Existing Conditions

Prime habitats for the prairie moonwort are not present on the USFS lands within the general analysis area for the South Porcupine tract. Sites with sandy soils are present on USFS lands and other portions of the general Wright analysis area, but these areas are rather sparsely vegetated and do not provide habitat preferred by this plant species. Prairie moonworts have not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is very low.

H-3.7.2 Narrowleaf moonwort (*Botrychium lineare*) The narrowleaf moonwort, a sensitive plant species, has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species has an affinity for riparian areas and is associated with spruce/fir forests, lodgepole pine forests, and forest meadows.

Existing Conditions

Habitats for the narrowleaf moonwort are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The narrowleaf moonwort has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is very low.

H-3.7.3 Leathery grapefern (*Botrychium multifidum* var. *coulteri*) The leathery grapefern, a plant species of local concern, has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for meadows, wetlands, floodplains and other wet areas in open to forested habitats within forests.

Existing Conditions

Habitats for the leathery grapefern are not present on the USFS lands within the general Wright analysis area. Suitable riparian habitats or forest habitats are not present on these USFS lands within the general Wright analysis area. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The leathery grapefern has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the leathery grapefern. As indicated, the general analysis area for the South

Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.7.4 Foxtail sedge (*Carex alopecoidea*) The foxtail sedge, a sensitive plant species, is a perennial and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. The foxtail sedge generally has an affinity for wet meadows and willow-sedge communities along wet, shady creek bottoms and springs.

Existing Conditions

Habitats for the foxtail sedge are not present on the USFS lands within the general Wright analysis area. Suitable wet meadows or willow-sedge communities are not present on these USFS lands. Few riparian sites associated with various ephemeral drainages are present on other portions of the general Wright analysis area, and these sites do not appear to provide optimum habitat for this species. The foxtail sedge has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the foxtail sedge. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species. The potential for loss of individuals or preferred habitats is not expected.

H-3.7.5 Elliptic spikerush (*Eleocharis elliptica*) The elliptic spikerush, a sensitive plant species, is a perennial and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for wetland areas created by seeps or springs but may also be found in temporarily flooded areas.

Existing Conditions

Habitats for the elliptic spikerush are not present on the USFS lands within the general Wright analysis area. Suitable wetland habitats are not present on these USFS lands. Few wetland sites associated with various ephemeral drainages and playas are present on portions of the general Wright analysis area, but these sites do not appear to provide optimum habitat for this species. No seeps or springs are present. The elliptic spikerush has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to lack of abundant suitable habitat the impacts to this species overall would be minimal.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine LBA Tract does not provide abundant habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.7.6 Hall's fescue (*Festuca hallii*) The Hall's fescue, a sensitive plant species, is a tufted perennial grass and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for montane meadows, slopes and edges of open coniferous woods and meadows above 6,000 feet in Wyoming.

Existing Conditions
Habitats for the Hall's fescue are not present on the USFS lands within the general Wright analysis area. Suitable montane habitats above 6,000 feet are not present on these USFS lands within the general Wright analysis area, and the Hall's fescue has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts
If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale
Implementation of the Proposed Action or Alternative 2 *should have no impact* on the Hall's fescue. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species. The potential loss of individuals or preferred habitats is not expected.

H-3.7.7 Wood lily (*Lilium philadelphicum*) The wood lily, a plant species of local concern, is a perennial herb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for woodland meadows and woodland grasslands.

Existing Conditions

Habitats for the wood lily are not present on the USFS lands within the general Wright analysis area. Suitable woodland meadow or grassland habitats are not present on these USFS lands within the general Wright analysis area, and the wood lily has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the wood lily. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.7.8 Largeflower triteleia (*Triteleia grandiflora*) The largeflower triteleia, a sensitive plant species, is a perennial herb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and in pinon-juniper woodlands to pine forests and hills.

Existing Conditions

Habitats for the largeflower triteleia are not present on the USFS lands within the general Wright analysis area. Suitable grassy areas in sagebrush at the edge of aspen and lodgepole pine forests and pinon-juniper woodlands or pine forests and hills are not present on these USFS lands within the general Wright analysis area, and the largeflower triteleia has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the largeflower triteleia. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.7.9 Barr's milkvetch (*Astragalus barrii*) The Barr's milkvetch, a sensitive plant species, is a matt-forming perennial forb that is known from numerous occurrences on the USFS lands within the TBNG. As more surveys

are completed, new occurrences are reported. The Barr's milkvetch is found primarily on dry, sparsely-vegetated rocky prairie breaks, knolls, hillsides and ridges. Parent material is calcareous soft shale, siltstone or silty sandstone. Most populations appear to be stable, although populations may decline under drought conditions.

Existing Conditions

Astragalus barrii is a regional endemic plant of the plains in southwestern South Dakota, eastern Wyoming, southeastern Montana, and northwestern Nebraska. According to USFS, this plant species is known to occur in six counties in Wyoming, and there are eleven known occurrences of *A. barrii* in the USFS TBNG.

Suitable habitat for the Barr's milkvetch is present on the USFS lands within the general analysis area for the South Porcupine LBA Tract as well as other lands within the general Wright analysis area. Surveys in 2005 identified Barr's milkvetch populations within the general analysis area for the South Porcupine tract, but no individuals were found on USFS lands. Barr's milkvetch populations and individuals have been identified in surrounding areas. Barr's milkvetch has been collected and positively identified approximately 7 miles south of the general analysis area for the South Porcupine LBA Tract, in the Section 21 of T.40N., R.71W., based on specimens on file with the Rocky Mountain Herbarium in Laramie, Wyoming.

Indirect and Direct Impacts

If lands within the general analysis area for the South Porcupine LBA Tract are leased and mined, potential habitat, individuals, and *A. barrii* populations would be lost due to surface disturbances caused by mining activities. These losses would most likely be permanent unless disturbed lands are reclaimed to habitats that would support this plant species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing* because there are *Astragalus barrii* occurrences outside of the areas that would be affected by the Proposed Action or Alternative 2. The Rocky Mountain Herbarium records reveal this plant species is widespread in northeastern Wyoming, so the loss of individuals or populations from mining activities related to the Proposed Action or Alternative 2 would not result in the extirpation of this species.

H-3.7.10 Smooth goosefoot (*Chenopodium subglabrum*) The smooth goosefoot, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for sand bars and sandy blowouts in riparian areas.

Existing Conditions

Habitats for the smooth goosefoot are not present on the USFS lands within the general Wright analysis area. Suitable riparian areas are not present on the USFS lands within the general Wright analysis area. A few riparian areas associated with various ephemeral drainages are present on portions of the general Wright analysis area, but these areas do not contain the required sand bar or sandy blowout habitats required for this plant species. The smooth goosefoot has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *should have no impact* on the smooth goosefoot. As indicated, the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.7.11 Flat-top goldentop (*Euthamia graminifolia*) The flat-top goldentop, a plant species of local concern, is a rhizomatous perennial forb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for stony sandbars and streambanks but may also be found on moist or drying sites along open streambanks or roadside ditches.

Existing Conditions

Habitats for the flat-top goldentop are not present on the USFS lands within the general Wright analysis area. Suitable wetland or streambank areas are not present on the USFS lands within the general Wright analysis area. Streambanks and a few wetland areas in association with various ephemeral drainages are present within portions of the general Wright analysis area, but these areas generally do not contain the typical habitats required for this plant species, but marginal habitats are present. The flat-top goldentop has not been recorded on the general Wright analysis areas or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine

tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is low.

H-3.7.12 Rosy palafox (*Palafoxia rosea* var. *macrolepis*) The rosy palafox, a plant species of local concern, is an annual forb that has not been documented on USFS lands within the South Porcupine general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for sagebrush and mixed-grass prairie habitats on sandy soils.

Existing Conditions

Habitats utilized by the rosy palafox are present on the USFS lands within the general Wright analysis area and on other surrounding lands. Sagebrush and mixed-grass prairie plant communities are present on sandy soils in the general Wright analysis area. However, rosy palafox has not been recorded on these lands but is potentially present. This plant species has been documented southeast of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the South Porcupine tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does contain some suitable habitat for this plant species but the rosy palafox has not been documented on the site. This species has been documented southeast of the general Wright analysis area and abundant habitat is present on other sites that would not be affected.

H-3.7.13 Lemonscent (*Pectis angustifolia*) The lemonscent, a plant species of local concern, is an annual forb and has not been documented on USFS lands within the South Porcupine general analysis area but has been recorded on other lands within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for gravel hills and scoria slopes. Lemonscent is also known to occur in low areas in sandy ravines and on sandbars.

Existing Conditions

Habitats utilized by lemonscent are present on the USFS lands within the general Wright analysis area and on other surrounding lands. However,

lemonscent has not been recorded in the general Wright analysis area but could potentially be present. This plant species has been documented south of the general Wright analysis area.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general analysis area for the South Porcupine tract, and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does contain some suitable habitat for this plant species but the lemonscent has not been documented. This species has been documented south of the general Wright analysis area and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.7.14 Larchleaf beardtongue (*Penstemon laricifolius* spp. *exifolius*)

The larchleaf beardtongue (penstemon), a plant species of local concern, is a perennial forb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry, rocky, gravelly or sandy slopes, ridgetops and upland flats with shallow soils. Most populations in Wyoming are found at elevations above 6,000 feet, but this species has been documented at lower elevations in the state.

Existing Conditions

Habitats utilized by larchleaf beardtongue are marginally present on the USFS lands within the general Wright analysis area. A few rocky, gravelly hill slopes and rough breaks provide potential habitat, but the larchleaf beardtongue has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does contain marginal habitat for this plant species but the larchleaf beardtongue has not been documented. This species has been documented and is common in southern Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.7.15 Wooly twinpod (*Physaria didymocarpa* var. *lanata*) The wooly twinpod, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. This plant species is suspected of occurring on other TBNG lands where suitable habitat is present. In Wyoming, this species generally has an affinity for dry redbed clay-shale slopes, limey-sandstone outcrops, roadcuts and other exposed rock-cliff substrates. Most populations in Wyoming have been documented in the foothills of the Big Horn Mountains.

Existing Conditions

Habitats utilized by the wooly twinpod are marginally present on the USFS lands within the general Wright analysis area. A few sandstone outcrops and exposed rock-cliff substrates provide potential habitat, but the wooly twinpod has not been recorded on these lands. This plant species has not been documented near the general Wright analysis area but is potentially present.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities. However, due to the presence of abundant habitat outside of the general Wright analysis area and the fact that this plant is abundant in other areas, the impacts to this species overall would be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, the general analysis area for the South Porcupine tract does contain marginal habitat for this plant species but the wooly twinpod has not been documented. This species has been documented and is common in north-central Wyoming and abundant habitat is present on other sites outside of the areas that would be affected by the Proposed Action or Alternative 2.

H-3.7.16 Visher's buckwheat (*Eriogonum visheri*) The Visher's buckwheat, a sensitive plant species, is an annual forb and has not been documented on USFS lands within the South Porcupine general analysis area but has been tentatively identified elsewhere within the TBNG. This plant species is suspected of occurring on TBNG lands where suitable habitat is

present. This species generally has an affinity for gullied ridges and eroded badland hills. These sites generally consist of barren shale and clay outcrops with at least 50 percent bare soil, high salt content and shrink/swell clay soils. Typical habitat includes badland islands in grasslands.

Existing Conditions

Habitats for the Visher's buckwheat are not present on the USFS lands within the general Wright analysis area. A few areas of highly eroded gullies consisting of barren shale or clay outcrops may be found in portions of the general Wright analysis area, but these sites generally provided a greater vegetation cover than is needed to provide optimum habitat for this species. The Visher's buckwheat has not been recorded on the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the Visher's buckwheat. As indicated, the general analysis area for the South Porcupine tract does not provide optimum suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.6.17 Highbush-cranberry (*Viburnum opulus* var. *americanum*) The highbush-cranberry, a sensitive plant species, is a perennial forb and has not been documented on USFS lands within the South Porcupine general analysis area or within the TBNG. In Wyoming, this plant species is found within Crook County and is suspected of occurring on TBNG lands where suitable habitat is present. This species generally has an affinity for moist sites including wooded hillsides, thickets or low woodlands. The highbush-cranberry is found all across northern North America.

Existing Conditions

Habitats for the highbush-cranberry are not present on the USFS lands within the general Wright analysis area. Suitable moist, wooded habitats are not present on these USFS lands within the general Wright analysis area. The highbush-cranberry has not been recorded within the general Wright analysis area or adjacent areas.

Indirect and Direct Impacts

If present on areas to be disturbed by mining, individuals of this species would be lost when topsoil is removed or during disturbances caused by other mining activities.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *would have no impact* on the highbush-cranberry. As indicated, this species has not been documented in the general Wright analysis area and the general analysis area for the South Porcupine tract does not provide suitable habitat for this plant species so the potential loss of individuals or preferred habitats is not expected.

H-3.7.18 Northern leopard frog (*Rana pipiens*) Northern leopard frogs range from the Great Slave Lake and Hudson Bay, south to Kentucky and New Mexico (NatureServe 2007). This species is considered relatively common within Wyoming (Baxter and Stone 1980, Cerovski et al. 2004). Northern leopard frogs generally require shallow, permanent, or semi-permanent standing water with at least some emergent vegetation for breeding (Wagner 1997, Cerovski et al. 2004). Conversely, they use deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom as overwintering habitat (Wagner 1997). Leopard frogs must have good quality water to successfully reproduce, as degraded or turbid water has the potential to negatively affect development of eggs and tadpoles. Overcrowding and changes in water temperature and pH (5.5 or lower) can increase the incidence of disease and mortality (NatureServe 2007) in this species. Adult frogs feed upon a variety of insects and other invertebrates, tadpoles, snakes, and fish (Cerovski et al. 2004), while tadpoles feed primarily upon small invertebrates, plant tissue, and organic debris. Adults also forage within aquatic and upland habitats, whereas tadpoles are restricted to aquatic habitats. Although their overall range remains essentially undiminished in size, many populations are declining. Major factors affecting leopard frog populations are habitat loss in some portions of their range, habitat degradation, overexploitation, interactions with non-native species, climate change, disease, and other unknown causes (Wagner 1997).

Existing Conditions

The northern leopard frog has been observed in southern Campbell County, but has not officially been recognized as breeding there (Cerovski et al. 2004). No suitable habitat is present on USFS lands within the general analysis area for the South Porcupine LBA Tract. Prior to CBNG development in this area, no persistent standing water was present within the South Porcupine tract's general analysis area, including all USFS surface lands in that area (Figure H-5). Water sources on those lands are limited to an ephemeral tributary of Porcupine Creek (Mike's Draw), which flows in response to precipitation events such as rain storms and excessive snow melt. However, surface discharge of groundwater associated with CBNG development within the tract's general analysis area, which is a relatively recent phenomenon, has resulted in generally wetter conditions within the stream's channel throughout the year. Within the tract's entire general analysis area, there are an estimated 12.3 acres of jurisdictional wetlands and other waters of the U.S. (OWUS). Of those 12.3 acres, there are approximately 6.8 acres of riverine wetlands, approximately 0.4 acres of stockpond wetlands, approximately 0.2 acres of stockpond open water OWUS, and approximately 4.9 acres of ephemeral

stream channel OWUS, all of which are present along Mike's Draw.. The vegetated wetland areas consist primarily of palustrine emergent herbaceous wet meadow or marsh along the ephemeral stream channel. Without surface discharge of groundwater associated with CBNG development in the area, no water would be present in Mike's Draw except in response to precipitation events and snow melt. Flows to maintain open water are therefore considered inconsistent, which limits overwintering habitat for this species. Therefore, none of the physical characteristics considered as optimum for the various life stages of this species are present on the USFS lands throughout this tract's general analysis area, and no leopard frogs or anuran egg masses have been documented on those lands during more than 25 years of annual monitoring efforts. No northern leopard frogs were ever recorded in the general analysis area during overlapping annual monitoring efforts for other species conducted from 1984 through 2007. Results from annual wildlife monitoring and baseline studies for all adjacent mines are on file with, and available from, the WDEQ/LQD in Sheridan or Cheyenne, Wyoming and the USFS Douglas Ranger District Office in Douglas, Wyoming. Those reports also include detailed descriptions of survey areas (including maps), methods, and dates for each year.

Direct and Indirect Effects

Wetland and aquatic habitats for northern leopard frogs are considered unsuitable to poor on USFS lands and elsewhere in the South Porcupine tract's general analysis area, as described above. Furthermore, no frog sightings have been recorded on USFS lands during baseline surveys or annual monitoring completed between 1984 and 2007. Consequently, northern leopard frogs and their aquatic and terrestrial habitats are not expected to be impacted if the USFS lands in the South Porcupine LBA Tract are leased and mined.

In the unlikely event that this species is present in the South Porcupine tract's general analysis area in the future, direct loss of, or injury to, foraging and dispersing frogs could result from encounters with mine vehicles or heavy equipment near Mike's Draw during topsoil stripping or other surface disturbance. If the South Porcupine tract is leased and proposed for mining by PRC, the North Antelope Rochelle Mine does not presently intend to mine through Mike's Draw and the potential habitat for this species would not be disturbed under the Proposed Action or Alternative 2.

It is possible that existing reservoirs and ponds (natural and those enhanced by CBNG discharge waters), and those created for flood control, sedimentation, water storage purposes, or wetland mitigation measures could provide suitable foraging or breeding habitat for northern leopard frogs in the future. However, most artificial water structures would still be limited to relatively shallow, seasonal waters with little emergent vegetation that would not provide for the year-round habitat needs of this frog species. Should those efforts result in improved aquatic habitats, an adult frogs, tadpoles, and/or egg masses present in the area could be injured or killed during activities associated with additional construction of diversion dikes or associated channels, or the

dewatering of potential habitats downstream of a dike. Under those limited circumstances, potential impacts could include loss of individuals and foraging habitat, increased predation, and changes in stream morphology and hydrology. Standard mining procedures such as the use of silt barriers across affected stream channels and other similar efforts would minimize any negative impacts that might result from mine-related operations. Likewise, adherence to the TBNG Plan Standards and Guidelines (USFS 2002) pertaining to water and wetlands would ensure that leopard frogs and other aquatic organisms present on USFS lands would not be negatively affected by increased sedimentation, degraded water chemistry, or otherwise damaged aquatic habitats.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As indicated, USFS lands and adjacent non-federal lands within the South Porcupine tract's general analysis area do not currently contain suitable habitat for northern leopard frogs. Water sources in that area are too temporary and shallow to support tadpoles until metamorphosis, or to allow frogs to successfully overwinter. If present, individual adult leopard frogs may be incidentally killed by vehicles or equipment. Habitat may be enhanced or created during certain mine operations, but water flow and depth associated with existing structures at the adjacent North Antelope Rochelle Mine has not resulted in adequate conditions to support the life cycle needs of this species, and they are not expected to create those conditions anywhere in this LBA tract. As no northern leopard frogs have ever been documented on USFS lands within the overall general analysis area for the South Porcupine LBA Tract, potential effects are expected to be negligible, if they occur at all. Furthermore, northern leopard frogs have been documented at other sites outside of the tract's general analysis area that will not be affected by coal leasing actions.

H-3.7.19 Black-tailed prairie dog (*Cynomys ludovicianus*) The black-tailed prairie dog was removed from the USFWS federal listing process in 2004. The agency ruled that listing this species may be warranted, but was precluded by higher priority considerations. Consequently, the black-tailed prairie dog is no longer considered a candidate species under the ESA.

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). The TBNG, which includes USFS lands in the general analysis area for the South Porcupine LBA Tract, harbors one of the seven major colony complexes remaining in North America. Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. This species has the ability to rapidly expand its distribution and population if not limited by pest control practices or disease, and will readily spread into recently disturbed areas. Many species such as the black-footed ferret

(*Mustela nigripes*), mountain plover, burrowing owl, and swift fox are dependent on prairie dogs during a portion of their life cycle. The black-tailed prairie dog's occupied range and abundance has declined dramatically, and continues to exhibit a slow decline (NatureServe 2007). Major factors contributing to the decline include disease (sylvatic plague), urbanization, habitat conversion, and control efforts.

Existing Conditions

Surveys have been conducted to locate prairie dog colonies within the 2-mile wildlife survey area surrounding the general analysis area for South Porcupine LBA Tract (Figure H-5). No prairie dog colonies were present within the general analysis area for the tract in 2007. Ten prairie dog colonies totaling approximately 476.3 non-contiguous acres were present within or overlapped the 2-mile wildlife survey area surrounding the South Porcupine tract's general analysis area in 2007 (Figure H-5). The largest colony was approximately 345.3 acres in size; this colony is within both North and South Porcupine tracts' wildlife survey areas. The remaining nine colonies were all less than 40 acres in size.

The entire coal mine region of the PRB of northeast Wyoming, including all USFS and surrounding lands within the general analysis area for the South Porcupine LBA Tract, is beyond the focus area for ferret reintroduction efforts on the TBNG and in the general region (refer to Management Area 3.63-USFS 2002, Grenier 2003). Additionally, some prairie dog colonies in that region are currently experiencing development associated with conventional oil and gas, CBNG, and coal (including open pits) resources. Year-round human activity and disturbance are already present in a few locations.

Direct and Indirect Effects

This LBA tract and its general analysis area are almost entirely encompassed by the existing North Antelope Rochelle Mine permit area; therefore, it is possible that surface disturbance associated with coal removal from the mine's current leases could occur on the tract, regardless of whether or not additional leasing occurs in that area. As no colonies are present in the South Porcupine tract's general analysis area, leasing and mining this LBA tract under either the Proposed Action or Alternative 2 would not disturb any existing prairie dog colonies. However, mining disturbance associated with the adjacent North Antelope Rochelle Mine could impact those prairie dog colonies that exist elsewhere within the larger wildlife survey area surrounding the tract (Figure H-5). Such impacts could have immediate results on prairie dogs if an occupied colony is abruptly subjected to a soil salvaging operation, or is otherwise impacted in a short timeframe that precludes dispersal prior to disturbance. However, as those activities typically occur incrementally across various portions of a mine permit area, some individuals could disperse to undisturbed portions of the affected colony, or create one or more new colonies within the general area.

Smaller-scale disturbances associated with both the mining and CBNG industries can also impact prairie dog colonies and surrounding vegetation through fragmentation or loss of foraging and burrowing habitat. Linear disturbances associated with mining infrastructure, such as roads, power lines, fences, and pipelines will occur within narrow corridors over relatively short distances, and would be completed within shorter timeframes than the advancement of a surface mine pit. However, such disturbances would still pose some level of risks due to vehicular collisions or by enhancing habitat for mammalian and avian species that prey on prairie dogs.

Some linear impacts could be minimized or mitigated through the consolidation of roads and electric utilities within common corridors, applying perch deterrents on overhead power poles, and reseeding pipeline disturbances quickly with appropriate seed mixes for the region. Minor surface disturbance near existing colonies would provide recently upturned soils that could facilitate the expansion of the existing colonies or the establishment of new ones, as prairie dogs will readily move into recently disturbed areas. Post-mining reclamation could have similar potential benefits; prairie dogs have already demonstrated their ability to inhabit reclaimed lands at the nearby Antelope Mine (BLM 2008).

As no prairie dog colonies are present on USFS lands within the South Porcupine tract's general analysis area, no USFS Standards and Guidelines applicable to black-tailed prairie dogs would be implemented.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No black-tailed prairie dog colonies would be physically disturbed by mining activities on USFS lands within the tract's general analysis area, if the lease is issued. No colonies are present on either federal or non-federal lands in the South Porcupine tract's general analysis area. Prairie dog colonies located within the existing North Antelope Rochelle Mine permit area could be impacted by mining operations regardless of whether the South Porcupine LBA Tract is leased. Given the tendency of prairie dogs to disperse and expand their boundaries, and the incremental nature of surface coal mining relative to some other disturbance activities, the potential impacts to prairie dog colonies on and near USFS lands in the South Porcupine tract's wildlife survey area would not have adverse consequences for the viability of the local or regional population. Disturbance and reclamation efforts will occur incrementally in varying locations throughout the permit area as mining progresses through the approved lease.

H-3.7.20 Swift Fox (*Vulpes velox*) The swift fox was removed from the USFWS federal listing process in 1995, after extensive field surveys demonstrated that the population was greater than expected. This species is considered to be common within the eastern Great Plains grasslands of Wyoming (Cerovski et al. 2004), though it typically occurs at very low densities.

The exact status of the population is unknown but believed to be increasing, especially in the Northern Plains. Swift foxes are largely nocturnal and typically prefer flat to gently rolling, short- or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). This species uses multiple den sites year-round for shelter, protection from predators, and rearing young. Burrows of other mammals such as badgers (*Taxidea taxus*), red foxes (*Vulpes vulpes*), and prairie dogs are often used or modified for those purposes. Small to mid-sized mammals constitute the bulk of their diet. Swift foxes have little fear of humans and may den in proximity to human disturbances (residences and busy roadways). This tolerance also makes them susceptible to trapping, vehicle collisions, and attacks by dogs. Major threats faced by the swift fox include habitat loss and degradation, interspecific competition with red fox and coyote (*Canis latrans*), and vehicle collisions.

Existing Conditions

Swift fox have been observed in large grassland blocks in southern Campbell County with more frequency in recent years, and are presumed to breed there. This species has also been documented within the overall TBNG.

Sagebrush communities generally dominate the wildlife survey area for the South Porcupine LBA Tract, though the tract's general analysis area is dominated by various native and introduced grassland species. Therefore, the South Porcupine tract's general analysis area is considered suitable habit for this species. The prevalence of sagebrush throughout the wildlife survey area largely explains the extremely limited sightings of this grassland fox over the last 25 years. Burrows within the existing black-tailed prairie dog colonies and scattered badger or red fox burrows could be used by swift foxes as den or shelter sites, and swift fox could forage in the area.

No specific surveys for swift fox were conducted for this analysis. However, such efforts were completed in 2002 using USFS survey protocols for other unrelated projects. Those surveys included USFS lands within and immediately adjacent to the South Porcupine tract's general analysis area, as well as additional lands in the surrounding area. Nocturnal spotlight surveys for rabbits and hares were conducted as part of annual wildlife monitoring at adjacent existing mines every year since at least 1994, with diurnal surveys for a variety of vertebrate species occurring across all seasons annually since the early 1980s. All of those survey efforts overlapped all or significant portions of the South Porcupine wildlife survey area.

Despite those combined survey efforts, no swift fox have ever been recorded on USFS or other lands within the South Porcupine tract general analysis area. However, swift fox have been observed on private surface in the southwestern portion of the two-mile wildlife survey area in recent years. This species was first recorded in October 2005 during spotlight lagomorph surveys conducted for the adjacent Antelope Mine. That year, two separate individuals (an adult and juvenile) walking and hunting on a grassy hill in T.41N., R.71W., NW¼ SW¼ Section 22 and NE¼ SW¼ Section 22, respectively. A pair of swift foxes

was observed in the adjacent sections to the west and south during similar spotlight surveys conducted in both 2006 and 2007.

Direct and Indirect Effects

Suitable but unoccupied swift fox habitat is present on and near USFS lands and adjacent lands within the general analysis area for the South Porcupine LBA Tract, though individuals have been observed in recent years approximately 1.25 miles to the southwest, within the surrounding wildlife survey area for this LBA tract. Should this species be present on those lands in the future, direct loss of or injury to individuals foraging or denning within, or passing through that area could result from vehicle collisions or encounters with equipment associated with mine-related activities. Swift fox are relatively tolerant of human activities, but may avoid areas directly affected by mine operations as human presence and noise escalate with active mining. As the population size and residency status of the individuals in the area are largely unknown, some swift fox may remain within undisturbed habitats in the vicinity of mining encroachment.

The Proposed Action or Alternatives could also disturb potential swift fox foraging, denning, or shelter habitat on USFS and adjacent lands within the South Porcupine tract's general analysis area. Those habitats could be removed, altered, or fragmented to varying degrees by one or more mine- or non-mine-related activities such as topsoil removal and a variety of linear disturbances (e.g., roads, fences, power lines, and pipelines). However, the latter disturbances will occur within narrow corridors over relatively short distances, and will typically be completed within a few days. Linear disturbances and habitat alterations could also provide convenient travel corridors and habitat for larger mammalian predators that could compete with swift foxes for prey species. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area and on USFS lands as mining operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the area, and will eventually provide additional foraging and potential denning habitat for the swift fox. Surface disturbing activities may result in a short-term, localized decrease in prey base (small rodents and voles), but due to their high reproductive potential and tendencies to re-establish and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance. Should swift fox be documented on or adjacent to USFS lands in the tract's general analysis area, that agency would determine whether species-specific Standards and Guidelines outlined in the TBNG Plan (USFS 2002, page 1-20) would apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Habitat for this species on USFS lands within the general analysis area for the South Porcupine LBA Tract is currently considered as suitable but unoccupied. No fox sightings have been documented on those

USFS lands during specific and incidental surveys conducted over the last 25 years (1984-2007). Only four sightings have been recorded within or near the South Porcupine tract's two-mile wildlife survey area during that period: one in 2002, and three since 2005. The three most recent sightings were at least 1.75 miles to the southwest, and on the far side of a railroad and county road between the sightings and the nearest USFS lands.

H-3.7.21 Long-billed curlew (*Numenius americanus*) Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California, and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003a). The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Cerovski et al. 2004). Curlews are ground nesters, and require large open expanses of grassland, with relatively low vegetation and few shrubs in which to nest (Hill 1998). The nest is typically a shallow scrape or depression, thinly lined with grass, weeds or cow dung, typically near water or moist areas.

Curlews use historically occupied sites each year, and some individual birds may reuse the same territories from year to year (Dechant et al. 2003a). Curlews primarily feed upon insects but also eat other invertebrates, small crustaceans, toads, and eggs and nestlings of other birds. This species forages in grasslands, wet meadows, prairie dog colonies, and occasionally along the margins of wetlands. Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998). Although some populations may be declining, overall population trends suggest long-billed curlew numbers are stable or increasing slightly. The major factor affecting curlew populations is habitat destruction and fragmentation.

Existing Conditions

Long-billed curlews are uncommon summer residents within the TBNG. However, no nesting occurrences have been documented for long-billed curlews in southern Campbell County (Cerovski et al. 2004), including USFS lands in the South Porcupine tract general analysis area and adjacent lands. As described above for the previous species, the South Porcupine tract's general analysis area is dominated by upland grassland habitats, although no significant wetlands (i.e., large lakes) or other persistent water conditions that might attract large numbers of curlews during migration exist within the South Porcupine tract's wildlife survey area. Consequently, habitat conditions in the South Porcupine tract's general analysis area and surrounding lands would be suitable for foraging migrants, but the water component typically associated with nesting areas is lacking in this area.

No long-billed curlews have ever been documented on USFS lands or adjacent lands in the general analysis area or larger wildlife survey area for the South Porcupine LBA Tract. Likewise, few curlews have been observed in the surrounding region during annual wildlife monitoring conducted in the area

over the last 25 years. Those general surveys occurred repeatedly throughout the breeding season each year. All curlew sightings that have occurred in the general region over time were recorded during spring months and were beyond USFS lands; those individuals were likely migrants or non-breeding adults.

Direct and Indirect Effects

Given the lack of sightings of long-billed curlews in the South Porcupine LBA Tract general analysis area and surrounding wildlife survey area since 1984, and the fact that habitat conditions in those areas are only suitable for foraging migrants or non-breeding adults, the Proposed Action and Alternatives for this LBA tract are unlikely to cause any direct injury or mortality to this species. However, if present, future mining activities could result in injuries or mortalities to foraging individuals. Foraging individuals may also be displaced by human activities and noise associated with mining. Potential foraging habitats may be disturbed, removed, or fragmented by mining activities. The type, timing, location, and extent of habitat disturbance will vary throughout the tract's general analysis area as operations progress. Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine, and will eventually mitigate impacts to some degree. The reclamation plan for the North Antelope Rochelle Mine would incorporate the replacement of jurisdictional wetland acreages existing prior to mining with at least equal types and numbers of wetland acreages. The creation of wetland habitats, especially where adjacent to native or reclaimed grassland habitats, could provide additional (although limited) foraging areas for curlews.

As no long-billed curlews have been documented within USFS lands or other lands in or near the South Porcupine tract's general analysis area, and habitat conditions do not provide quality nesting areas, species-specific Standards and Guidelines outlined in the Grassland Plan (USFS 2002) would not apply.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. As this species appears to be an infrequent visitor to the general analysis area, and high quality foraging and nesting habitat is not present within the area, impacts to this species are likely to be minimal. Loss, degradation, or fragmentation of potential foraging habitat and potential collisions with vehicles may occur. Enhanced water features and grasslands associated with reclamation may create new foraging or nesting habitat in the area.

H-3.7.22 Ferruginous hawk (*Buteo regalis*) Ferruginous hawks breed throughout much of the western United States and portions of three Canadian provinces (Johnsgard 1990). This species nests throughout Wyoming (Cerovski et al. 2004) and occupies portions of the state during winter. Large expanses of grassland and shrubland, where livestock grazing (vs. cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Most ferruginous hawks in the PRB nest on the ground

(usually elevated sites, though some pairs nest in small trees). Typical nest sites include hilltops, rock outcrops, eroded creek banks, small trees, and even relatively level ground. The ferruginous hawk relies primarily on two mammalian families for the majority of its prey: *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs). Numerous nests can occur within the territory of a single pair, and ferruginous hawks often reuse nests for many years.

This species may be sensitive to human disturbance, especially during the nesting period (White and Thurow 1985). This sensitivity can be heightened in years of low prey abundance. Accurate information regarding the trend for the ferruginous hawk is limited and mixed. Some populations may be declining (Bechard and Schmutz 1995); however, overall population trends suggest numbers are stable or increasing (NatureServe 2007). Major factors affecting ferruginous hawk populations include habitat destruction and fragmentation, and human disturbance.

Existing Conditions

Annual monitoring has documented that ferruginous hawks nested in the vicinity of the North Antelope Rochelle Mine every year since at least 1990, and fledged young in 17 of those 19 years. Similar long-term nesting has occurred at the neighboring Black Thunder and Antelope mines. Ferruginous hawks have nested on USFS lands in the South Porcupine tract's general analysis area. Details describing the number of intact and active nests within the mine monitoring survey areas in a given year are available in annual monitoring and baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

The presence or absence of nest material does not determine whether the USFS considers a site as "active" (occupied during at least 1 of the last 7 years). In 2007, 33 individual ferruginous hawk nests (11 territories) were present within the South Porcupine wildlife survey area, plus 5 other nest sites that have been used by ferruginous hawks and at least one other raptor species over the years (Figure H-5).

Five individual ferruginous hawk nest sites were on USFS lands within the general analysis area itself in 2007, one of which still had nest material present. Five additional individual nest sites were on non-federal lands in that area in 2007.

Direct and Indirect Effects

As indicated previously, only a few acres in the South Porcupine tract's general analysis area are not already encompassed by the existing North Antelope Rochelle Mine's existing permit area. Surface disturbance is therefore likely to occur in those areas, regardless of the proposed leasing decision. However, the North Antelope Rochelle Mine has avoided, where possible, or mitigated mining impacts on raptor nests through a variety of means. The mine has also maintained and implemented current USFWS approved Raptor Mitigation

Plans, adjusted operations to provide temporal and spatial buffers around raptor nests, and ensured that new power lines at the mine conform to current Avian Power Line Interaction Commission (APLIC) guidelines. Provided those practices are continued, direct impacts on ferruginous hawks and their active nest sites will be minimized, both on and near USFS lands. Due to restrictions on disturbance near active nest sites, the most probable source of potential impact to ferruginous hawks themselves would be an increase in injuries and fatalities of individuals foraging within the general analysis area due to vehicle collisions associated with ongoing or future mining and other activities. The use of existing roads in the area, when possible, would help to minimize this risk.

Habitat loss, degradation, and fragmentation would result from a variety of large- and small-scale mining operations such as soil salvaging and reservoir/flood control construction, among others. Potential nesting and foraging habitat might also be fragmented by linear disturbances such as the construction, maintenance, and removal of roads, fences, power lines, and pipelines. Those disturbances could also create new travel corridors for mammalian predators that reside in or pass through the area. However, many such disturbances would occur within narrow corridors over relatively short distances, typically over a period of days. Additionally, those structures are often constructed immediately prior to the removal of similar features elsewhere in the area, often resulting in minimal or no net gain of new linear disturbances. All mine-related habitat disturbances would shift throughout the expanded permit area as operations progress. Reclamation of disturbed areas would occur incrementally as resource recovery is completed in a given portion of the mine, and would mitigate impacts to some degree. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (lagomorphs and rodents) for ferruginous hawks. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

USFS Standards and Guidelines would be implemented and offer additional protections for active nests; they would apply only to activities outside of the current or future lease areas. These protocols should help ensure that the Proposed Action and Alternatives do not significantly degrade the quality of existing ferruginous hawk territories and nest sites. Standards and Guidelines specific to ferruginous hawks outlined in the TBNG Plan (USFS 2002, page 1-20-21) are as follows:

73. To help prevent abandonment, reproductive failure or nest destruction, prohibit development of new facilities within 0.25 mile (or line of sight) of active ferruginous hawk nests. For the ferruginous hawk, a nest is no longer considered active if it is known to have been unoccupied for the last seven years. This does not apply to pipelines, fences and underground utilities.

74. To help reduce disturbances to nesting ferruginous hawks, prohibit the following activities within 0.5 mile (or line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., roads, water impoundments, oil and gas facilities), reclamation, gravel mining operations, drilling of water wells, and oil and gas drilling.

75. To help reduce disturbances to nesting ferruginous hawks, do not authorize the following activities within 0.5 mile (line of sight) of active ferruginous hawk nests from 1 March through 31 July: construction (e.g., pipelines, utilities, fencing), seismic exploration, and workover operations for maintenance of oil and gas wells.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Mine-related activities will likely disturb ferruginous hawk nest sites on USFS lands in the South Porcupine tract's wildlife survey area. Many ferruginous hawk nests associated with that area are located on non-federal surface, including alternate sites within the same territories that are beyond the area likely to be impacted by future mining disturbance associated with previous or proposed leasing actions. Some individuals or pairs may experience disturbance, destruction, or fragmentation of nesting and foraging habitat. Increased disturbance to individuals due to human activity may also occur. However, several factors should minimize the potential mining-related impacts on this species, including the availability of alternate nest sites located further away from pending disturbance in each affected territory, implementation of USFWS and USFS approved mitigation measures, reclaiming habitats as soon as feasible, encouraging nesting within mine reclamation lands through artificial nest structures and habitat features such as rock piles and tree plantings that attract prey species, and continued monitoring of this species to ensure that mitigation methods are applied when necessary.

H-3.7.23 Burrowing owl (*Athene cunicularia*) Burrowing owls breed from southern Alberta to southwestern Saskatchewan, south through east-central Washington, central Oregon, and southern California, and east to eastern North Dakota, west-central Kansas, and Texas (Klute, et al. 2003, pg 7). The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Cerovski et al. 2004). This species requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Klute, et al. 2003, pg 12).

Most burrowing owl nests within the TBNG are located within prairie dog colonies (USFS 2003). Burrowing owls typically reuse traditional nesting areas. Burrow mounds, shrubs, fence posts or boulders may be used as observation perches. This species is usually tolerant of human activity but is vulnerable to predation by pets (cats, dogs). Burrowing owls forage within a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and

sparsely vegetated areas. This species is often active during daylight hours. Insects and small mammals (mice and voles) are the owls' primary prey items. Burrowing owl populations have been declining throughout its range, primarily due to habitat loss.

Existing Conditions

Burrowing owls are common summer residents within the TBNG (Cerovski et al. 2004). This species was observed nested in the North Antelope Rochelle Mine's monitoring area in 1985 and 1989. Despite the presence of potential nesting habitat (prairie dog and badger burrows) in the monitoring area, nesting owls were not found again until 1997. Burrowing owls have nested in the mine's monitoring area in most years since then, especially within a prairie dog colony located in T.41N., R.70W., Section 17, just east of the southeastern corner of the South Porcupine LBA Tract (Figure H-5).

No burrowing owl nest sites had been documented within the South Porcupine tract's general analysis area through 2007, including USFS lands in that area. Eleven nest sites have been recorded in the surrounding 2-mile wildlife survey area: one on USFS lands and 10 on non-federal surface. Seven of those 11 nest sites were in a single prairie dog colony located approximately 0.4 mile east of the southeastern corner of this general analysis area in T.41N., R.70W., Section 17 (Figure H-5).

Direct and Indirect Effects

No known burrowing owl nest sites are present on USFS lands in the general analysis area for the South Porcupine LBA Tract. Most nesting has occurred in prairie dog colonies near each general analysis area, though badger burrows have also been used. Both USFS Standards and Guidelines (USFS 2002) and the North Antelope Rochelle Mine's mine permit (PRC 2004) stipulate that clearance surveys will be conducted and approved by the appropriate agencies before any colony is disturbed during the breeding season. That process will preclude most direct impacts to new nesting burrowing owls in that area.

Due to the strong (but not exclusive) relationship between burrowing owls and prairie dog colonies, many of the indirect effects described above for the black-tailed prairie dog would also apply to burrowing owls and, thus, will not be repeated in full detail here. Because burrowing owls are active during daylight hours, the most probable source of direct impacts would be the death of, or injury to, individuals fleeing heavy equipment, or being killed or injured by equipment while feeding or moving through the mine area. Burrowing owls are generally tolerant of human activities, but increased presence and noise, especially during the nest initiation period, may displace individuals or inhibit nesting proximate to mine operations. Foraging could also be hindered within these areas, especially where mining activities occur near prairie dog colonies.

As described previously, no prairie dog colonies (potential burrowing owl nesting habitat) are present in the general analysis area for the South Porcupine LBA Tract. Two colonies are however located within approximately

0.25 mile of the South Porcupine tract's general analysis area, both of which are within North Antelope Rochelle Mine's existing permit area, and mining could eventually disturb or eliminate those colonies regardless of whether the South Porcupine LBA Tract is leased. However, the generally limited presence of active nests, in combination with the presence of other non-disturbed colonies in the area and the ability for prairie dogs to recolonize reclamation, would mitigate those losses to a large extent. Surface disturbing activities could also result in a short-term, localized decrease in the prey base (rodents, non-flying insects) for burrowing owls. However, due to their high reproductive potential and tendencies to re-populate and adapt to disturbed and reclaimed areas, prey numbers should increase quickly after the disturbance.

Additionally, the tendency of prairie dogs to quickly colonize nearby areas when their colonies are disturbed would create new nesting habitat for burrowing owls. Overall, nesting and foraging habitats will be incrementally affected by a variety of large-and small-scale operations. The type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress, thus providing opportunities for burrowing owls to relocate to other suitable habitat within the immediate area.

Reclamation will proceed incrementally as areas are mined and activities move to new locations within the mine area. Both activities will create loose soil that should be attractive to dispersing prairie dogs (potential habitat source), at least in the short term. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine, and will eventually mitigate habitat impacts to some degree. However, to date, burrowing owls have rarely been documented nesting within reclaimed habitats at surface mines in the PRB of northeast Wyoming.

If nesting burrowing owls are documented on or near USFS lands in the South Porcupine LBA Tract, USFS Standards and Guidelines applicable to this species would be implemented on applicable lands to offer additional protections beyond those outlined in the USFWS approved Raptor Mitigation Plan for the North Antelope Rochelle Mine. Annual monitoring of known burrowing owl nest sites within the 2-mile wildlife survey area for the mine, including USFS and adjacent lands, and other nearby colonies will continue through the life of the mine to document their histories of occupancy and production.

<u>Determination of Effect and Rationale</u>

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No burrowing owl nests have been documented on or within 0.25 mile of USFS lands in the general analysis area for the South Porcupine LBA Tract during many years of annual monitoring. Most prairie dog colonies in the general vicinity are located outside of the tract's general analysis area where future surface disturbance associated with this leasing action would occur.

The North Antelope Rochelle Mine has avoided, where possible, and mitigated impacts in the past through intensive monitoring of both populations and specific nest sites, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests (including burrowing owl nests). Mining activities and noise may disturb individuals inhabiting the lease area, thus inhibiting potential nesting or foraging in proximity to lands with ongoing development. Potential collisions with vehicles might also occur, though none have been recorded in the area to date.

H-3.7.24 Chestnut-collared longspur (*Calcarius ornatus*) The breeding range of the chestnut-collared longspur extends from southern Alberta to southern Manitoba, south to west-central Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et al. 2003b). The chestnut-collared longspur is a common summer resident of the eastern plains of Wyoming (Cerovski et al. 2004). This species prefers native grasslands as breeding sites, inhabiting open prairie and avoiding excessively shrubby areas. Grasslands with dense litter accumulations are also avoided (Dechant et al. 2003b). Scattered shrubs are often used as singing perches. Nests are typically placed in areas of sparse vegetation (less than 20-30 centimeters), but usually with a taller grass component than sites preferred by McCown's longspurs. Nests are on the ground in depressions and often placed beside cattle dung, small shrubs, or under a clump of grass (Hill and Gould 1997). Male fidelity to breeding areas has been observed. Chestnut-collared longspurs feed primarily on seeds (especially grasses), insects, and spiders. This species is generally tolerant of short-term intrusion at the nest site but may desert if disturbed during nest building or egg-laying (Hill and Gould 1997). High rates of predation on eggs and nestlings have been reported and pesticides have been shown to reduce hatching success. The chestnut-collared longspur breeding range has contracted and long-term data suggests population declines (Hill and Gould 1997). These declines have been attributed to loss of native prairie habitat, and conversion to cropland and urban development.

Existing Conditions

Chestnut-collared longspurs are common summer residents within the TBNG. This species has not been recorded on USFS or adjacent lands in the South Porcupine tract's general analysis area during annual monitoring conducted in recent years.

The South Porcupine tract's general analysis area is dominated by various native and introduced grassland species. Therefore, the general analysis area for the South Porcupine LBA Tract is considered suitable habitat for this species.

Direct and Indirect Effects

Due to the similarity of potential impacts from future mining on chestnut-collared longspurs and other grassland species previously discussed (e.g., prairie dog and swift fox), detailed descriptions of those impacts are not

repeated here. Chestnut-collared longspurs have not been documented as nesting on USFS or adjacent lands in the South Porcupine tract's general analysis area. Individuals of this species have been documented on non-federal surface in the larger South Porcupine 2-mile wildlife survey area (Figure H-5); which was presumed due to observations of breeding displays. Equipment operations associated with future mining operations could result in fatalities or injury to individuals, nests and eggs, and/or young that are present in the area. Increased human activity and noise could inhibit foraging or nesting within suitable habitats on USFS lands or displace individuals during periods of intense activities. Over the life of the mine, potential nesting and foraging habitats in the general analysis area could be disturbed, destroyed, altered, or fragmented, though the type, timing, location, and extent of habitat disturbance will vary throughout the general analysis area as mining operations progress. Reclamation of disturbed areas will occur incrementally as resources are extracted in a given portion of the mine. Within 1 to 2 years, newly reclaimed areas may create good quality nesting habitat for chestnut-collared longspurs.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. The grasslands in the South Porcupine tract's general analysis area are more likely to attract these birds than the sagebrush-dominated areas that typically occur in the general Wright analysis area. No individuals have been documented in the South Porcupine tract's general analysis area, although they have been documented on non-federal surface in the larger South Porcupine 2-mile wildlife survey area. Potential and documented alternative habitats for chestnut-collared longspurs are present elsewhere in the vicinity in areas not currently scheduled for mining disturbance.

H-3.7.25 McCown's Longspur (*Calcarius mccownii*) McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north-central Colorado, and east to western Nebraska, north-central South Dakota, and southwestern North Dakota (Dechant et al. 2003c). This species is a common summer resident of the eastern plains and great basin-foothills grasslands, basin-prairie shrublands, and agricultural areas throughout most of Wyoming (Cerovski et al. 2004). Specifically, this species requires open habitats such as sparsely vegetated, low structured grasslands, and heavily grazed pastures containing a moderate bare ground component for nesting and foraging. Nest sites are typically a natural or shallow scraped depression on the ground placed in the open or beside vegetation such as bunch grasses, cacti, or shrubs. McCown's longspurs feed on seeds of grasses and forbs, insects, and other arthropods. No strong data suggests breeding site fidelity although some individuals may return to the general nesting area in subsequent years.

Individuals vary in response to human intrusion at nest sites, but appear to be relatively more tolerant than most grassland songbird species. High rates of

predation on eggs and nestlings occur especially where nests are associated with vegetative structure. Nestlings may also be directly poisoned where insecticides are sprayed in nest areas (With 1994). Populations are declining, especially within the northern portion of the range. Factors directly affecting the McCown's longspur include the reduction of breeding habitat due to overgrazing, control of prairie fires, plowing, development, and excessive use of pesticides. Conversion of short-grass prairie to agriculture and urban development is the most important factor (With 1994).

Existing Conditions

McCown's longspurs are also common summer residents within the TBNG. Observations of the McCown's longspur were similar to those of the chestnut-collared longspur. McCown's longspurs were not recorded on USFS lands in the grassland dominated South Porcupine tract's general analysis area, but individuals have been seen occasionally on non-federal lands in and near that area. This species is regularly observed in prairie dog colonies at the neighboring Antelope Mine.

Direct and Indirect Effects

The direct and indirect effects to McCown's longspurs would be the same as those described above for the chestnut-collared longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Potential impacts to McCown's longspurs would be the same as those described above for the chestnut-collared longspur in the South Porcupine tract's general analysis area. However, as reclaimed grasslands mature, they would become less suitable as nesting habitat for this short-grass species.

H-3.7.26 Greater sage-grouse (*Centrocercus urophasianus*) The Greater sage-grouse occurs year-round throughout non-forested regions of Wyoming (Cerovski et al. 2004). Sage-grouse rely on a variety of habitats within sagebrush dominated landscapes to reproduce and survive throughout the year. Early in the spring, grouse gather at breeding display sites called leks. Leks are usually in open areas (playas, ridge tops, sparse sagebrush, or burned areas) that are surrounded by dense sagebrush and escape cover. The surrounding area also typically represents nesting, loafing, and foraging habitat.

After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nests in some portions of sage-grouse range are typically placed under sagebrush with average height of 36-79 centimeters (Schroeder et al. 1999). However, research conducted within the Southern PRB (Brown and Clayton 2004) indicated that, although shorter sagebrush was present at nest sites, grouse selected shrubs ranging from 55-61 centimeters in height under which to place nests. Re-

nesting may occur if the nest is destroyed early during the laying or incubation period. Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). Sage-grouse exhibit high fidelity to seasonal ranges, and may return to the same area to nest in subsequent years.

For the first month after hatching, the young depend on relatively open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late-season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse feed upon sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense, exposed sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes or windblown ridges are preferred.

Breeding populations of this species have declined by at least 17 to 47 percent throughout much of its range (Connelly et al. 2004). Within Wyoming, sage-grouse populations have generally declined over the past 4 decades. However, sage-grouse population estimates specifically pertaining to the TBNG suggest an overall increase in individuals since 1995. This same general trend was observed both statewide and within the Northeast Wyoming Sage-Grouse Local Working Group (NWSGWG) area.

The NWSGWG identified habitat fragmentation and degradation, disturbance and direct mortality as major influences affecting sage-grouse (NWSGWG 2006). The group identified oil and gas development, vegetation management, invasive plants, and weather as those factors with the most influence on the northeast Wyoming sage-grouse populations and those that may most effectively be addressed to provide the greatest benefit for sage-grouse conservation in northeast Wyoming (NWSGWG 2006).

Existing Conditions

As described above, USFS lands on the general analysis area for the South Porcupine LBA Tract are dominated by various native and introduced grassland species. The North Antelope Rochelle Mine, as part of its wildlife monitoring program from 1984 through 1992, conducted voluntary searches for and annual monitoring of sage-grouse leks throughout the mine's original permit area and a 1-mile perimeter. Those surveys became mandatory with the implementation of Appendix B of the WDEQ/LQD Coal Rules and Regulations in 1993, and continued each year through 2007. Radio-telemetry data gathered from grouse collared at the North Antelope Rochelle Mine during a voluntary, multi-year (2001 through 2007) study have demonstrated that most birds in the North and South Porcupine LBA Tracts' 2-mile wildlife survey areas (Figures H-4 and H-5) reside near the mine year-round. Additional details describing the survey and monitoring efforts for sage-grouse at the North Antelope Rochelle Mine are available in annual wildlife monitoring and

baseline wildlife reports on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne.

No sage-grouse leks have been documented on or within 3 miles of the South Porcupine tract's general analysis area (Figure H-5). The Payne lek, which is nearly 5 miles to the northeast, is the closest sage-grouse lek to the South Porcupine tract's general analysis area.

Although sage-grouse numbers have generally been low in the combined North and South Porcupine tracts' wildlife survey areas over the years, known or potential grouse habitat is present in both areas. However, the most suitable sage-grouse habitat exists in the North Porcupine area, as suggested by the distribution of grouse leks between the two areas and confirmed through the information gleaned from the last 7 years of radio-telemetry data collected in the general vicinity. Results from that project have demonstrated that grouse are most commonly recorded in the eastern quarter of the 2-mile wildlife survey area for the North Porcupine LBA Tract, east of the Payne County Road. Detailed reports and long-term maps documenting grouse locations in the area have been submitted to WDEQ/LQD and other agencies in each study year.

Annual surveys for sage-grouse broods were conducted in native and reclaimed stream channels at the North Antelope Rochelle Mine and adjacent mines from 1994 through 1999; such surveys were no longer required by WGFD and WDEQ/LQD after that year due to the consistent lack of grouse broods observed at coal mines throughout the PRB. Likewise, no sage-grouse broods were seen during recent baseline inventories conducted for the North and South Porcupine LBA Tracts. All grouse broods that have been recorded over the years occurred as incidental sightings during other wildlife surveys.

Nesting and winter surveys for sage-grouse are not required as part of the annual wildlife programs for the North Antelope Rochelle or the other applicant mines included in this EIS (Black Thunder and Jacobs Ranch), though winter surveys have been conducted as part of baseline inventories for previous mine expansions. Additionally, winter surveys for other species (big game and bald eagle roosts) have occurred at all three of these mines in recent years. Due to their proximity to existing mine permit areas, nearly all of the combined North and South Porcupine tracts' general analysis areas have been included in some level of regular (but not always annual) winter surveys since 1987. No sage-grouse were ever documented in or near these two LBA tracts during those surveys. However, grouse have been confirmed as year-round residents in the vicinity of the North Porcupine general analysis area during year-round telemetry studies conducted from 2001 through 2005, with less frequent monitoring during the subsequent two winters. Only isolated grouse sightings occurred within 3 miles of the South Porcupine general analysis area during that telemetry monitoring period, with each sighting limited to a single observation per bird.

Direct and Indirect Effects

No impacts to sage-grouse are expected for the South Porcupine area due to the documented lack of sage-grouse and suitable sage-grouse habitat in that area.

Some potential impacts of mineral development (including coal mining and oil and gas development) on sage-grouse that might inhabit the general analysis area for the South Porcupine tract, as well as on known and potential sage-grouse habitat include: alteration of plant and animal communities; loss or degradation of important seasonal habitats; increased human activity and noise which could cause animals to avoid the area and/or reduce their breeding efficiency; increased road traffic and related injuries or mortalities; increased risk of predation from raptors perched on existing or future power poles and/or grouse avoidance of areas with overhead power lines; potential illegal harvest; and reduced water tables resulting in the loss of herbaceous vegetation. Following reclamation, there may be a long-term loss of nesting and winter habitat, depending on the amount of sagebrush that is restored relative to the amount of sagebrush that is present before mining.

Mine operations and oil and gas development have requirements for reclamation of disturbed areas as recovery of energy resources is completed. WDEQ/LQD reclamation standards for surface coal mines call for restoration of sagebrush on at least 20 percent of the reclaimed area. Those reclamation efforts can work in concert with USFS Standards and Guidelines toward mitigating impacts to wildlife species and habitats. New areas disturbed by mining in the South Porcupine tract's general analysis area would be reclaimed incrementally, but they may not be attractive to sage-grouse for many years due to slow establishment and growth rates of important sagebrush species. Information gleaned from the multi-year telemetry study at the North Antelope Rochelle Mine will be incorporated into reclamation efforts for the LBA tract to maximize successful reclamation of sage-grouse habitat. Estimates for the time it would take to restore shrubs, including sagebrush, to pre-mining density levels range from 20 to 100 years. Until sagebrush returns to its pre-mining density levels, a reduction in potential year-round sage-grouse habitat within the South Porcupine tract's general analysis area would persist. In the meantime, the presence of known and apparently suitable sage-grouse habitat elsewhere within the immediate area could provide alternate areas for dispersing grouse to use until reclaimed sagebrush stands have matured adequately to support a local population.

In keeping with the Direction Objectives for the Hilight Bill Geographic Area (USFS 2002, page 1-25), impacts to sage-grouse habitat in the North Antelope Rochelle Mine's permit area could be further mitigated off-site by efforts to preserve and enhance habitat on adjoining and nearby private lands, such as those currently under way through the Thunder Basin Grasslands Prairie Ecosystem Association. Management planning and processes that are developed through this combined effort among landowners and federal representatives will presumably provide suitable habitat for sage-grouse that

disperse from the North Antelope Rochelle Mine area during the interim between habitat disturbance and completed reclamation. Should sage-grouse move onto new USFS lands proposed for mining in the future, agency Standards and Guidelines would offer appropriate protections for the species and its important habitats.

Despite the impacts to the Rochelle lek complex, the proposed leasing action would not contribute to significant reductions in the regional sage-grouse population overall, nor would it conflict with the current TBNG Plan or any future objectives to manage the area for this species.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. More than 20 years of regular monitoring have documented that sage-grouse do not inhabit the grassland dominated South Porcupine LBA Tract general analysis area. Annual monitoring will continue for the life of the North Antelope Rochelle Mine, and will include new permit expansions and a one-mile perimeter. Should additional sage-grouse leks or use areas be observed on USFS lands in the South Porcupine tract's wildlife survey area, appropriate monitoring and mitigation measures will be implemented to minimize impacts to birds, habitats, and populations.

H-3.7.27 Bald eagle (*Haliaeetus leucocephalus*) Bald eagles occur throughout North America, from Alaska and Canada south to Florida, the Gulf Coast, and northern Mexico. The northwest coast of North America serves as the stronghold for this species, with approximately one-half of the population inhabiting Alaska.

The USFWS officially listed the bald eagle as an endangered species in 43 of the lower 48 states on July 4, 1976. The listing was due to a combination of several factors, including widespread habitat loss, negative effects of pesticide use on reproductive success, indiscriminant shooting, and others. The status of the bald eagle was downgraded to threatened throughout the lower 48 states in 1995. Bald eagle population trends began increasing throughout most of the species' range in the early 1990's, and it was proposed for de-listing in 1999.

On July 9, 2007, USFWS published a Federal Register notice (72 FR 37346) announcing that the bald eagle would be removed from the list of threatened and endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C 1531 *et* seq.) on August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, will remain in place. The bald eagle is now recognized as a BLM and USFS Sensitive Species.

Bald eagles typically nest in large trees within a stand of mature, similarly sized trees either beside or in proximity (within 0.7 mile) to rivers, lakes, or reservoirs that harbor adequate fish populations. Those areas tend to be remote and experience little disturbance (Johnsgard 1990). Typically, the nest is placed in the crown of a large cottonwood or pine, but if the topography allows, eagles will nest on cliff edges or escarpments. Open-canopied trees and snags provide required perches in nesting and foraging areas.

All verified bald eagle nests in northeastern Wyoming (BLM Buffalo Field Office GIS database) are situated in significant, mature cottonwood stands along larger streams or rivers (i.e., Tongue River, Powder River, Clear Creek, and Little Thunder Creek). Nesting attempts are rare on the TBNG (Beske 1994). Fish and waterfowl are the primary source of food for nesting bald eagles. Where available, large to mid-size carrion and large rodents (e.g., prairie dogs) can also be an important dietary component.

Bald eagles nest and winter throughout Wyoming, though typically are not locally abundant in the northeastern portion of the state. The species regularly migrates through and winters in Campbell County (Cerovski et al. 2004), and has often been documented during winter and early spring at nearby coal mines (various coal mine annual reports are on file at the USFS Douglas Ranger District Office in Douglas and/or with WDEQ/LQD in Cheyenne). Most eagles that migrate through or winter in Campbell County roost communally in stands of large ponderosa pine, along wooded cottonwood-riparian corridors, or in isolated stands of large trees. As water is scarce in that region, especially during winter, those birds likely forage widely for lagomorphs or carrion.

Existing Conditions

The bald eagle is seasonally common and most frequently observed during the winter months. Bald eagles are relatively common winter residents and migrants in the PRB, but only rarely nest in that region.

No bald eagle nests or winter roosts have been documented within 1 mile of USFS lands located within the general analysis areas for the North or South Porcupine LBA Tracts during any baseline or annual monitoring studies since they began in the late 1970s and early 1980s, respectively. Scattered stands of potential bald eagle nesting and winter roosting habitat (mature cottonwood corridors) are present on USFS and adjacent lands along Porcupine Creek as it flows through the general analysis area for the North Porcupine LBA Tract. No streams flow through the South Porcupine tract's general analysis area and few trees are present there.

In general, the combined wildlife survey areas for the two Porcupine LBA Tracts do not contain unique or sizeable, concentrated prey sources (e.g., fisheries, waterfowl wintering areas) that would be expected to attract bald eagles. As described in the North and South Porcupine LBA Tracts' black-tailed prairie dog analyses that are included within this appendix and in Section 3.10 of this

EIS, no prairie dog colonies were present on USFS lands within either tract's general analysis area in 2007. Only one colony encompassing approximately 18.6 acres was present within the North Porcupine tract's general analysis area, and no colonies were present within the South Porcupine tract's general analysis area, in 2007. A total of 23 prairie dog colonies encompassing approximately 1,317 acres were present in the combined wildlife study areas for the two Porcupine LBA Tracts in 2007 (Figures H-4 and H-5). Sheep and their lambs are present in this area in the spring, when bald eagles have typically left the region, and flocks are pastured there infrequently in the winter. The area does not support a large big game herd, though some groups do winter in the area.

Ground surveys for bald eagle winter roost sites were most recently conducted within the combined wildlife survey areas for the two Porcupine tracts during baseline surveys beginning in 2006. Previous winter roost surveys also encompassed all or most potential habitat within that overall survey area. All winter roost surveys were conducted between ½ hour before and 1 hour after sunrise or between 1 hour before and ½ hour after sunset, per current BLM guidelines for survey timing and frequency. Biologists also watched for nesting bald eagles within the survey area while conducting surveys for other nesting raptors.

Direct and Indirect Effects

As no winter roost sites or large groups of bald eagles have been documented in the general analysis area for either of the two Porcupine LBA Tracts, potential impacts would be limited to occasional foraging individuals rather than a large segment of the population. The increased human presence and noise associated with construction activities, if conducted while eagles are wintering within the area, could harass or displace individual eagles during that period. Nesting eagles could also be distressed to the point of abandoning eggs or young, or their hunting efforts and success impacted. If necessary, the majority of direct effects could be mitigated by controlling the timing and location of disturbance activities, and/or through approved nest relocation efforts.

Indirect effects include additional disturbance and fragmentation of already limited foraging habitat within the geographic area. These impacts could result from a variety of large- and small-scale activities described previously for other species, including, but not limited to: topsoil stripping; overburden and coal removal; reclamation activities; and construction of roads, reservoirs, power lines (above ground and buried), fences, and pipelines. The locations of operations would shift throughout the expanded permit area as mining occurred, with habitats disturbed and reclaimed incrementally. Conversely, the addition of fences and raptor-safe power poles could possibly benefit foraging bald eagles by providing additional perch sites. Due to the limited presence of potential nesting or roosting sites, and lack of concentrated sources

of prey, the direct and indirect effects of the Proposed Action and Alternative 2 to bald eagles are expected to be minimal.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. No bald eagle nests have been documented on or within 1 mile of the North or South Porcupine LBA Tract's general analysis area since annual monitoring began in the early 1980s. Potential bald eagle winter roost and nesting sites are limited in both LBA tract's wildlife survey area, and no reliable prey sources are present to support nesting or roosting bald eagles. Therefore, potential hazards for this species would be limited to foraging individuals during winter. Disturbance, fragmentation, and alteration of potential foraging habitat would occur. However, the North Antelope Rochelle Mine has avoided, where possible, and mitigated raptor impacts in the past through intensive raptor monitoring, implementation of USFWS approved mitigation measures, and adjusting operations to provide temporal and spatial buffers around raptor nests.

H-3.7.28 Mountain plover (*Charadrius montanus*) The mountain plover breeds from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south-central Wyoming, east-central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas. In Wyoming, this species is a common summer resident (Cerovski et al. 2004). Mountain plovers require flat grasslands with short and sparse vegetation, and a large bare ground component (Knopf 1996) for nesting, foraging, or staging. Within the PRB, heavily grazed prairie dog colonies generally provide the most suitable mountain plover habitat.

Mountain plovers are monogamous and possibly polyandrous ground nesters, and typically produce at least two clutches. The nest is a shallow depression occasionally thinly lined with grass. Plovers may utilize the same nesting area in subsequent years (Dechant et al. 2003d). Adults and fledged chicks leave the breeding grounds by early August, and may stage within appropriate habitats before migrating. Plovers feed primarily upon insects. Beetles, grasshoppers, crickets, and ants are the most important prey items (Knopf 1996). This species is highly approachable and does not flee far. Mountain plover populations have historically declined and recent data suggests that this species is continuing to decline in numbers. Causes of population declines have been primarily attributed to regional changes in agricultural practices (Knopf 1996).

Existing Conditions

Mountain plovers are summer residents within portions of the TBNG. Most observations of mountain plovers in northeast Wyoming have been associated with prairie dog colonies. Approximately 86 percent of recently (since 1993) occupied mountain plover habitat in that region occurred within prairie dog colonies (Byer 2001). Because of the similarity in habitat requirements

between the mountain plover and McCown's longspur, similar existing conditions and impacts would apply for both species. The nearest known breeding population of mountain plovers occurs in a large prairie dog colony located at the Antelope Mine, approximately 4 miles southwest of the South Porcupine LBA Tract's general analysis area, and even farther from the North Porcupine area.

Some portions of the grassland-dominated South Porcupine tract's general analysis area and surrounding area would be considered suitable mountain plover habitat, including both USFS and non-federal surface. The best potential habitat for this species occurs in the large (about 345.3 acres) occupied prairie dog colony that overlaps the wildlife monitoring area for both the North and South Porcupine LBA Tracts (Figures H-4 and H-5). Despite the presence of suitable habitat and the occurrence of annual monitoring in that area, mountain plovers have never been documented on USFS or adjacent lands within the South Porcupine tract's general analysis area.

Mountain plovers have been recorded in the combined North and South Porcupine tract's wildlife survey areas only three times over the last 2 decades of annual monitoring. In mid-June 2004, single individuals were seen in short-grass areas on two separate days. One adult was observed on non-federal surface in the western portion of the South Porcupine tract's general analysis area. The second individual was recorded in the southwestern portion of the South Porcupine tract's wildlife survey area. Neither adult exhibited any defensive behavior, so both were presumed to be non-breeding birds. In early August 2005, a group of 15 to 20 mountain plovers was observed in the large (345.3 acres in size) prairie dog colony that overlaps both the North and South Porcupine tracts' wildlife surveys areas. That group was presumed to be staging briefly during the fall migration. No other plover sightings have ever been recorded in that colony, despite survey efforts targeting that location.

Direct and Indirect Effects

Due to the similarity in their habitat associations, the direct and indirect effects to mountain plovers in both North and South Porcupine LBA Tracts' general analysis areas would be the same as those described above for the McCown's longspur.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Suitable plover habitat on USFS lands is limited primarily to a large prairie dog colony that overlaps the wildlife survey areas for both the North and South Porcupine LBA Tracts; no prairie dog colonies are present on USFS lands in either tract's general analysis area. Only one mountain plover has been documented in the general analysis area for either Porcupine LBA tract in more than 20 years of annual monitoring. Documented alternative habitats for mountain plovers are present elsewhere in the region that is not currently scheduled for mining disturbance.

H-3.7.29 Loggerhead shrike (*Lanius ludovicianus*) Loggerhead shrikes breed from Washington, northern Alberta, central Saskatchewan, and southern Manitoba, south to California and Florida, and east to southwestern Minnesota, southern Wisconsin, southern Michigan, and Maryland. This species is a common summer resident throughout Wyoming (Cerovski et al. 2004). Shrikes prefer relatively open, heterogeneous habitats characterized by grasses and forbs of low stature interspersed with bare ground and shrubs or low trees with perches for hunting. This species will use a wide variety of trees and shrubs, particularly thick or thorny species, as nesting substrates and hunting perches (Prescott and Bjorge 1999).

Although some shrike nests are used in subsequent years, fidelity to a nest site is limited. This species forages over relatively open habitats, feeding primarily upon arthropods, amphibians, small to medium-sized reptiles, small mammals, and birds (Yosef 1996). Shrikes may also feed upon road kill and carrion. This species is generally tolerant of human activity near a nest, although they will abandon if disturbed during egg-laying or early in incubation. The loggerhead shrike is declining in both number and overall range. Declines have been attributed to habitat loss and conversion, urbanization, pesticide contamination, and loss of insect prey as a result of pesticide use (Yosef 1996).

Existing Conditions

Loggerhead shrikes are common summer residents within the TBNG. This species has occasionally been observed in a small tree windbreak at an old homestead site located near the general analysis area for the South Porcupine tract on USFS lands in T.42N., R.71W., SW¼SE¼ Section 35 (Figure H-5). The presence of young indicates that shrikes have nested in that windbreak at least once. Few other trees or other nesting habitats are present elsewhere in the South Porcupine tract's wildlife survey area, as described for the bald eagle, above. Shrikes have also been infrequently recorded perched on various fences or on overhead power lines elsewhere in the tract's wildlife survey area. Shrike foraging habitat is present throughout the South Porcupine LBA Tract's general analysis area, including USFS lands. As indicated, existing utility and fence lines currently provide good quality hunting perches.

Direct and Indirect Effects

Implementation of the Proposed Action or Alternatives could result in direct and indirect impacts to loggerhead shrikes, though such impacts would likely be uncommon. Only one presumed nest site has been documented on or adjacent to USFS lands or elsewhere in the wildlife survey area for the South Porcupine LBA Tract; that site is just outside of the tract's general analysis area, but is within the existing mine permit area for the North Antelope Rochelle Mine. The most probable direct impact would be the mortality of, or injury to, individuals foraging within or passing through the USFS lands due to collisions with future mine-related vehicles, or dispersal of foraging individuals due to active mining.

The relatively slow movement of mining equipment and the noise associated with the activity would decrease direct impacts associated with vehicle collisions. As loggerhead shrikes are not especially common in the South Porcupine tract's general analysis area, indirect impacts would be limited despite the fragmentation, degradation, or loss of habitat in the short and mid-term. Any birds that would be displaced would be forced to travel to other locations with acceptable habitat. This could result in stress to individual birds, as well as potential decreased nesting effort and success. Prey numbers reduced by mining would be expected to rebound following reclamation due to generally high reproductive potential and prey tendencies to re-establish and adapt to disturbed and reclaimed areas. The locations of mine-related habitat disturbances and reclamation efforts would proceed incrementally throughout the expanded mining area as operations progressed. Additionally, this mining activity would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for this species. USFS Standards and Guidelines would offer additional protections for any active nest sites that may be present in the area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. Such impacts would be minimized by the limited number of regular sightings and known nesting attempts, as well as the relative paucity of suitable nesting habitat on or adjacent to the USFS lands analyzed in this EIS and their surrounding region. Degradation, fragmentation, or loss of potential foraging habitat, reduction in prey populations, and potential collisions with vehicles may occur. Given the limited presence of birds in the area, and the composition of the shrike's prey base (insects, small mammals, etc.), impacts to shrikes would be minimal. USFS Standards and Guidelines would apply for active nests during the breeding season. Additionally, mining the USFS lands would not conflict with the current TBNG Plan, or any future objectives to manage the TBNG for loggerhead shrikes.

H-3.7.30 Brewer's sparrow (*Spizella breweri*) The breeding range of the Brewer's sparrow extends from southwestern Yukon, southern Alberta, and southwestern Saskatchewan, south (east of the Cascades and Sierras) to southern California, central Arizona, and northern New Mexico (Rotenberry et al. 1999). The Brewer's sparrow is a common summer resident of the basin-prairie and mountain-foothills throughout Wyoming (Cerovski et al. 2004). Brewer's sparrow is a sagebrush obligate species (Rotenberry et al. 1999).

This species is an uncommon cowbird (*Molothrus ater*) host and typically builds a small cup nest low in sagebrush shrubs. Brewer's sparrows prefer to nest in medium-sized (48-90 centimeters, or 19-35 inches) live sagebrush within relatively dense (26-42 percent canopy cover) stands (Walker 2004). Grass height and density are important factors for nest concealment. Although tolerant of human visitation, this species may abandon a nest if disturbed during the construction process.

Brewer's sparrows feed primarily on small insects and, to a lesser extent, seeds from grasses and forbs. Throughout areas where they have been surveyed, the species appears to have undergone and continues to undergo statistically significant declines (Rotenberry et al. 1999). Major threats to Brewer's sparrow populations are similar to those faced by other declining sagebrush-obligate species and include habitat conversion and fragmentation, invasion by non-native plants, altered fire regimes, livestock overgrazing, conifer encroachment, energy development, and conversion to urban or residential housing (Walker 2004).

Existing Conditions

Brewer's sparrows are common summer residents within the TBNG and southern Campbell County (Cerovski et al. 2004). Breeding bird survey data from annual monitoring and baseline studies conducted for the North Antelope Rochelle Mine, and incidental observations over time, have shown that the Brewer's sparrow is a common but limited breeder in the area. As expected, no Brewer's sparrows have been recorded in the grassland dominated general analysis area for the South Porcupine LBA Tract or surrounding lands.

Direct and Indirect Effects

No impacts Brewer's sparrows are expected for the South Porcupine area due to the documented lack of sparrows and suitable sparrow habitat in that area.

Determination of Effect and Rationale

Implementation of the Proposed Action or Alternative 2 *may impact individuals but is not likely to cause a trend to federal listing or loss of viability* within the planning area. More than 20 years of regular monitoring have documented that sage-grouse do not inhabit the grassland dominated general analysis area for the South Porcupine LBA Tract.

The use of existing roads, when possible, could minimize impacts related to traffic hazards and predator travel corridors. Increased activity and noise, especially during the nest initiation period, could inhibit nesting proximate to mining activities. Foraging could also be hindered within these areas, especially where active mining occurs. Additional infrastructure and activity associated with the expansion of the mine, in combination with other ongoing disturbances (e.g., CBNG operations), could displace Brewer's sparrows from any historical use areas that might occur in nearby sagebrush-dominated areas. Those birds could potentially move into other sagebrush stands in the general vicinity, assuming they are not already occupied.

Reclamation of disturbed areas will occur incrementally as mining is completed in a given portion of the mine and will eventually mitigate impacts to sagebrush habitats to some degree, though such efforts could take decades to benefit sagebrush obligates such as the Brewer's sparrow. Impacts to sagebrush habitat on USFS lands could be further mitigated off-site by efforts to preserve and enhance such habitat on adjacent and nearby private lands, as described above. Standards and Guidelines for sagebrush habitats outlined in the TBNG

Plan (USFS 2002, pages 1-18; Appendix D) would be implemented as necessary, and could serve to sustain regional populations of this sparrow. Those management guidelines would apply only to activities beyond the South Porcupine LBA Tract.

H-4.0 CUMULATIVE EFFECTS REGARDING SENSITIVE SPECIES

Cumulative effects are defined under the National Environmental Policy Act of 1969 (NEPA) process as the incremental impacts of past, present, and reasonably foreseeable future actions conducted by any entity (federal, state, private, and others).

Cumulative short- and long-term disturbances to the species considered in this analysis arise from multiple sources that occur on federal and non-federal lands within the general Wright analysis area, including USFS lands within that area and neighboring lands. Those sources include direct and indirect impacts of mining (with an anticipated life of at least 20 more years), extraction of conventional oil and gas and CBNG reserves, road development and relocation, construction and removal of power lines and pipelines, grazing (livestock and wildlife), drought, occupied residences, and hunting and trapping. Those activities have occurred in the vicinity of the general Wright analysis area in the past and most are expected to continue at similar levels, at least for the near future.

Coal mining and CBNG development are expected to occur at an increased rate in the future. Other reasonable and foreseeable developments within the area could potentially include the construction of a coal-fired power plant and new rail lines for transporting coal. Both mining and oil and gas development activities have requirements for reclamation of disturbed areas as resources are depleted. However, those standards are dramatically different in both implementation and monitoring. As new areas of disturbance related to energy extraction activities are added, areas that have been mined out will be restored and reclaimed. Similarly, oil and gas well sites will be reclaimed once they are depleted and abandoned.

No critical habitat for any USFS Sensitive Species has been delineated in the general Wright analysis area (including the USFS lands). Any habitat losses that do occur will eventually be mitigated for most species by reclamation with native seed mixes, which may improve habitat quality by reducing the presence of non-native plants (e.g., crested wheatgrass) within the area. Leasing lands within the general Wright analysis area will not conflict with the current TBNG Plan, or any future objectives to manage USFS lands and provide habitat for sensitive species. Because effects of disturbance on sensitive species inhabiting the same habitat types would be the same, cumulative impacts are analyzed according to species' main habitat associations.

H-4.1 Species Associated Primarily With Short Grasses or Prairie Dog Colonies

Five evaluated species are strongly associated with prairie dog colonies or other areas with short, sparse vegetation: the black-tailed prairie dog, mountain plover, burrowing owl, chestnut-collared longspur, and McCown's longspur. Cumulative impacts to these habitats and associated species will largely result from activities that would decrease occupied black-tailed prairie dog colonies within the area. As the prairie dog is the most common sensitive species in the area, it has the most potential to be affected by cumulative impacts from the Proposed Actions and Alternatives. Specifically, individuals could be killed or injured by activities in or near prairie dog colonies, and habitat would be lost until reclamation takes place. Incremental habitat disturbance and freshly turned soil in stripped and reclaimed areas would allow escaping or dispersing animals to create new burrows, and thus maintain a presence in the area.

Burrowing owls and mountain plovers rely heavily on prairie dogs to provide and maintain suitable nesting habitat. Longspurs are also often found in prairie dog colonies in the overall general Wright analysis area. Therefore, any activities that jeopardize prairie dogs will also affect those species to some degree. Although impacts would occur on approximately 148.6 acres of prairie dog colonies that are currently located within the combined general analysis areas for the North Hilight Field, South Hilight Field, West Hilight Field, West Jacobs Ranch, North Porcupine, and South Porcupine LBA Tracts (108.1 acres of which occur on or within one-quarter-mile of USFS lands), the presence of approximately 1,490.6 total acres of colonies that currently exist on and within 2 miles of the six combined general analysis areas would minimize negative impacts to those three species. Despite their strong association with prairie dogs, species such as burrowing owls, mountain plovers, and longspurs can all utilize short-grass habitats other than prairie dog colonies. However, all of those avian species would benefit from the presence of undisturbed prairie dog colonies surrounding the six combined general analysis areas, including USFS lands, as well as other short-form vegetative communities.

Despite the presence of additional habitat outside the six combined general analysis areas, cumulative effects expected for these five species would include habitat destruction, alteration, and fragmentation. As indicated, some individuals may be killed or injured by vehicles or equipment, collisions with fences, and poisoning or shooting. Predation rates on some species may increase due to the creation of favorable habitats, perches, or travel corridors for avian or mammalian predators. Nests of avian species will likely be destroyed or compromised by human disturbances or activities, and individuals (especially avian species) will likely be displaced from existing territories. Such occurrences would increase competition for available adjacent territories. If those areas have already reached carrying capacity, the result would be intra-specific competition followed by nutritional stress, decreased fecundity, and/or mortality.

H-4.2 Mixed Sagebrush and/or Mid-grass Species

Mid-grass parcels interspersed with sagebrush commonly occur in the general Wright analysis area, including USFS lands. Mining in the area would impact the sagebrush shrubland/mixed prairie grassland habitats that are present. Evaluated species for mixed grassland habitats included the swift fox, long-billed curlew, and ferruginous hawk. Cumulative impacts to those species would be the similar to those described above. However, as all of these species have the capacity of utilizing a variety of habitats, including prairie dog colonies and short-grass areas, beyond the overall general Wright analysis area, the cumulative effects would be somewhat lessened.

Regarding the swift fox and ferruginous hawk, the fragmentation, alteration, or destruction of suitable habitats would also destroy denning and shelter sites or nest sites, respectively, and would potentially facilitate inter-specific competition for available prey bases. Both the swift fox and hawks using these habitats would also be negatively affected by activities that reduce prey availability. The impacts would be partially mitigated by the existing presence of alternate denning and nesting sites in the area that would not be disturbed by the Proposed Actions or Alternatives. The greatest threat to mixed sagebrush and/or mid-grass species would arise from the creation of habitat patches that are too small to attract individuals or sustain viable breeding pairs or populations.

H-4.3 Sagebrush Obligates

Species associated with sagebrush habitats that could occur in or near the general Wright analysis area and associated USFS lands include the Greater sage-grouse and Brewer's sparrow. However, more than 25 consecutive years of monitoring have demonstrated that the sagebrush stands within most of this area are insufficient in size and structure to provide optimum sage-grouse habitat. However, due to the total combined acreage of big sagebrush shrubland that would be disturbed by mining the six combined general analysis areas (approximately 18,330 total acres), sage-grouse would likely experience cumulative impacts by the Proposed Actions or Alternatives. Similarly, the relatively small and somewhat sparse shrub stands within the general analysis areas for these six LBA tracts provide limited, marginal habitat for Brewer's sparrows, and observations have been sparse in the area over time. No Brewer's sparrows have been recorded on or near the USFS lands during more than two decades of frequent spring and summer surveys.

Given the widespread occurrence of sagebrush habitat within the overall general Wright analysis area (including USFS lands), cumulative impacts to sagebrush habitats and their associated species would occur as a result of leasing and mining these six LBA tracts under the Proposed Actions or Alternatives. Direct impacts would likely be limited to the injury or mortality of individual sage-grouse and Brewer's sparrows, or their nests or young. Indirect impacts to the sagebrush-dependant species could entail changes in

their presence or distribution as the quantity and quality of existing sagebrush stands in the area are diminished due to habitat fragmentation, alteration, degradation, and conversion of shrubland communities during ongoing and new mining operations.

Any displaced individuals would have to compete for the limited availability of adjacent territories, and if those areas have reached carrying capacity, intra-specific competition may result in nutritional stress, decrease in fecundity, or mortality to affected individuals. Sagebrush habitats lost to mining would be mitigated, as required. However, those efforts would not likely be able to keep pace with, or compensate for, the on-going loss or alteration of sagebrush habitat within the area, as sagebrush stands can take two or three decades to re-establish.

H-4.4 Tree or Wetland/Aquatic Species

Within the general Wright analysis area, trees are found primarily in a few shelterbelts/windbreaks planted adjacent to widely scattered ranching facilities. Very few other trees are present due to the lack of water and suitable habitats. Approximately 602 acres of wetlands and other waters of the U.S. have been identified within the combined general analysis areas for these six LBA tracts, which provide wetland/aquatic habitats on and near USFS lands. Species associated with treed or aquatic habitats that could occur in or near those areas include the loggerhead shrike and northern leopard frog, though the latter is less likely to be present. Cumulative effects to shrikes would be similar, but slightly greater than, those for non-raptor avian species within mixed mid-grass and shrub habitats. The increased intensity of effects would be due to the overall lack of trees (potential nest sites), and thus the limited alternate habitats as trees are lost to mining. Mitigating that impact is the fact that detailed tree inventories would be conducted prior to all mining disturbances, as required by state and federal agencies, so that every tree that is lost to mining would be replaced during final reclamation. High intensity activity and noise when mining is most proximate along stream corridors where native trees occur could deter shrikes from nesting in the area, at least until they acclimated to the disturbance. All trees destroyed by mining will be replaced during reclamation, but it will take decades for them to mature to their current stature.

Northern leopard frogs are not prevalent within either the general Wright analysis area or associated USFS lands, and therefore have little potential to be affected by cumulative impacts from the Proposed Actions and Alternatives. Wetland and aquatic habitats for northern leopard frogs are considered very poor to unsuitable on USFS lands within the combined general analysis areas for these six LBA tracts, and no frog sightings have been recorded on USFS lands within these areas. If this species is present in the future, individuals could be killed or injured by activities in proximity to aquatic habitats. Dewatering or degradation of breeding habitats could kill eggs, tadpoles, or over-wintering adults, as well as increase predation rates on adults and eggs.

Conversely, the creation and augmentation of aquatic habitats for sedimentation ponds and other purposes could maintain and possibly increase local northern leopard frog populations. There would be no net loss of jurisdictional wetlands, as they would be restored under the jurisdiction of the U.S. Corps of Engineers (refer to Section 3.7 of this EIS). Non-jurisdictional and functional wetlands would be restored in accordance with the requirements of the surface landowner or as required by WDEQ/LQD.

Overall, despite the death, injury, and displacement of some animals, the cumulative impacts associated with the Proposed Actions or Alternatives are not expected to significantly reduce the size or viability of populations of any of the USFS Region 2 Sensitive Species. Many of these species have not been documented within the general Wright analysis area or associated USFS lands over the last 25 years, have already been displaced from those areas, or have remained present despite the ongoing mine and non-mine activities in and near those areas.

H-5.0 TBNG PLAN COMPLIANCE

The Proposed Actions and Alternatives are considered to be in compliance with Grassland-wide, Geographic Area, and Management Area Standards and Guidelines for wildlife (including regionally sensitive species, and Management Indicator Species) detailed in the Grassland Plan (USFS 2002).

H-6.0 REQUIRED MITIGATION AND RECOMMENDED MONITORING

To help protect USFS Region 2 Sensitive Species, the mine operator will notify the USFS District Ranger, Douglas, Wyoming, if sensitive species nests or dens, in addition to those identified in the Biological Assessment (Appendix G of this EIS), are located during mining. Future surveys for any USFS Region 2 Sensitive Species could be conducted in response to requests from the USFS Douglas District Ranger. This would allow assessments of how, and if, implementation of the TBNG Plan is benefiting these species.

Mitigation measures designed to reduce impacts to wildlife that are required by the Surface Mining Control and Reclamation Act (SMCRA) and state law include:

- Using raptor-safe power lines;
- Designing fences to permit wildlife passage;
- Creating artificial raptor nest sites;
- Relocating raptor nests and taking other action to maintain active nesting pairs;
- Restoring pre-mining topography to the maximum extent possible;
- Planting a diverse mixture of grasses, forbs, and shrubs in configurations beneficial to wildlife; and
- Building and maintaining sediment control ponds or other sediment control devices during mining.

To further minimize negative impacts to faunal species of concern, the U.S. Fish and Wildlife Service (USFWS) requires additional species-specific protective measures, as well as targeted monitoring and mitigation plans for certain Region 2 Sensitive Species.

H-7.0 USFS MANAGEMENT INDICATOR SPECIES EVALUATION

H-7.1 Introduction

Species that have been identified by the Regional Forester as Management Indicator Species (MIS) must be considered for the Wright Area Coal Lease Applications because the general analysis areas for North Hilight Field, South Hilight Field, West Hilight Field, North Porcupine, and South Porcupine LBA Tracts include federal lands administered by the USFS. There is no USFS administered surface within the general analysis area for the West Jacobs Ranch LBA Tract. The purpose of this section of this Appendix is to provide information about the potential environmental effects that leasing the USFS administered lands would have on USFS TBNG Forest Plan MIS.

H-7.2 Species Evaluated and Rationale

A Management Indicator Species is defined as a "plant or animal species or habitat components selected in a planning process used to monitor the effects of planned management activities on populations of wildlife and fish, including those that are socially or economically important" (USFS 2002). MIS are selected to serve as barometers for species diversity and viability. These species are monitored over time to assess the effects of management activities on their populations and habitat, and the populations of other species with similar habitat needs. MIS for the TBNG are identified by Geographic Area. In accordance with the TBNG Plan (USFS 2002), the Greater sage-grouse was selected as the MIS to be evaluated for this project (as defined for the Hilight Bill Geographic area).

For detailed sage-grouse habitat and population information, please see Section 3.10.5 in this EIS. This MIS evaluation and the Biological Assessment (Appendix G) of this EIS analyzes and discloses potential effects to wildlife if lands within the general Wright analysis area are leased and mined. The USFS Douglas Ranger District biologists have reviewed Section 3.10 and the BA in this EIS.

In addition to the information provided in this analysis, a full Biological Assessment and Biological Evaluation (BABE) document is being prepared for review by USFS Douglas Ranger District biologists as part of future permitting actions. Among other things, that document will provide supplemental information regarding local and regional population trends for the MIS (greater sage-grouse). The approved BABE will be available for public view at the Douglas Ranger District office.

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