CHAPTER 3.0 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The Affected Environment chapter of this FEIS for the proposed Pit 14 Coal LBA project discusses physical, natural, and social resources as they currently exist within the project area. Management issues identified by the BLM-RSFO, public scoping, and interdisciplinary analysis of the area have guided the material presented herein.

The proposed project could potentially affect critical elements of the human environment as listed in the BLM's NEPA Handbook H-1790-1 (USDI-BLM 1988) and subsequent Executive Orders. These critical elements are listed in **Table 3.1**, along with whether or not they would be potentially affected by the project and if they are addressed in the FEIS. The resource elements discussed in this FEIS are summarized in **Table 3.2**.

Table 3.1 Critical Elements of the Human Environment for the Pit 14 Coal LBA Project

Element	Status In The Project Area	Addressed In Text Of FEIS
Air Quality Issues	Potentially affected	Yes
Areas of Critical Environmental Concern	None present	No
Cultural Resources	Potentially affected	Yes
Environmental Justice	Potentially affected	Yes
Farm Lands (prime or unique)	None present	No
Floodplains	None present	No
Invasive/Non-Native Species	Potentially affected	Yes
Native American Religious Concerns	Potentially affected	Yes
Threatened or Endangered Species	Potentially affected	Yes
Wastes, Hazardous or Solid	None present	No
Water Quality Drinking/Ground	Potentially affected	Yes
Wetlands/Riparian Zones	None present	Yes
Wild and Scenic Rivers	None Present	No
Wilderness (study area)	None present	Yes
Source: As listed in BLM National Environmental Policy Act Handbook H-1790-1 (BLM 1988b) and subsequent Executive Orders.		

For each resource element, an assessment area (also referred to as the impact assessment area (IAA) on figures in Chapter 3 and in Chapter 4) has been identified to analyze potential, project-related impacts on the resource. The assessment area, or IAA, is defined as the outermost boundary of an area that encompasses potential direct, indirect, and cumulative impacts that may affect the resources identified for analysis.

Existing disturbances within the assessment areas for each resource elements listed in **Table 3.2** is summarized in **Table 3.3**.

Table 3.2 Other Resource Elements Discussed in the Pit 14 Coal LBA Project

Element	Status In The Project Area	Addressed In Text Of FEIS
Geology and Minerals	Potentially affected	Yes
Soils	Potentially affected	Yes
Surface Water Resources	Potentially affected	Yes
Vegetation	Potentially affected	Yes
Wildlife and Fisheries	Potentially affected	Yes
Wild Horses	Potentially affected	Yes
Land Use	Potentially affected	Yes
Visual Resources	Potentially affected	Yes
Social and Economic Values	Potentially affected	Yes

Table 3.3 Known Disturbance (in Acres) by Resource

Resource	Assessment Area Acres	Total Acres of Known Disturbance on BLM-Administered Land	Assumed Acres of Disturbance on Other Land[1]	Total Disturbed[2]
Solid Leasable Minerals	277,120	12,939	8,992	21,931 (7.91%)
Fluid Leasable Minerals	903,223	11,495	7,988	19,483 (2.16%)
Soils	4,359	2	1	3 (0.07%)
Groundwater	4,359	2	1	3 (0.07%)
Surface Water	271,169	8,620	5,991	14,611 (5.39%)
Vegetation (Including Special Status Plant Species and Invasive Species)	4,359	2	1	3 (0.07%)
Pronghorn	1,603,167	20,699	14,384	35,083 (2.19%)
Mule Deer	1,134,282	8,324	5,784	14,108 (1.24%)
Elk	1,453,728	10,959	7,615	18,574 (1.28%)
Raptor	107,860	5,769	4,023	9,812 (9.10%)
Special Status Animal Species	4,359	2	1	3 (0.07%)
Greater Sage-Grouse	711,526	8,160	5,670	13,830 (1.94%)
Fisheries	271,169	8,620	5,991	14,611 (5.39%)
Wild Horses	1,170,717	12,398	8,616	21,014 (1.79%)
Land Status & Prior Rights	4,359	2	1	3 (0.07%)
Livestock and Grazing Management	1,011,718	10,599	7,365	17,964 (1.78%)
Recreation	1,572,997	10,814	7,515	18,329 (1.17%)
Transportation and ROWs	4,359	2	1	3 (0.07%)
Visual Resources	697,910	10,366	7,204	17,570 (2.52%)
Cultural Resources	277,120	12,939	8,992	21,931 (7.91%)

[1] Assumed disturbance is equal to 40 percent of known disturbance acreage on BLM-administered lands
[2] Includes percentage of assessment area disturbed.

3.2 AIR QUALITY

The assessment area for air quality includes Sweetwater County, Wyoming and regional sensitive areas, including the Bridger Wilderness Area. **Figure 3.1** presents the general air quality assessment area.

Regional air quality is influenced by the interaction of several factors including meteorology, climate, the magnitude and spatial distribution of local and regional air pollutant sources, and the chemical properties of emitted air pollutants. The following sections summarize existing air quality monitoring activities as well as reported pollutant concentrations in the project area and region. All federal actions within the RSFO must comply with the Clean Air Act and be in conformance with the air quality management objectives specified in the Green River RMP and ROD (BLM 1997).

3.2.1 Air Quality Monitoring

3.2.1.1 Climate

The project area is located in a semi-arid cold, mid-latitude steppe climate regime typified by dry windy conditions, limited rainfall, and long cold winters (Christopherson 1992). **Table 3.4** summarizes components of climate in the project area between 2000 and 2004 and in the region between 1948 and 2005 (IML 2000-2004, Western Regional Climate Center 2005). A representative wind rose for Rock Springs Airport (AP) near the project area in southwest Wyoming is provided as **Figure 3.2**.

Table 3.4 Summary of Climate

Climate Component	Description
Temperature	Maximum temperature (Rock Springs AP, WY): 98°F (37°C) Minimum temperature (Rock Springs AP, WY): -37°F (-38°C) Mean annual temperature (Rock Springs AP, WY): 43°F (6°C) Maximum temperature (Black Butte Mine): 96°F (36°C) Minimum temperature (Black Butte Mine): -30°F (-35°C) Mean annual temperature (Black Butte Mine): 42°F (6°C)
Wind Speed	Predominant Wind Direction (Black Butte Mine): 18.5 percent from West Average Wind Speed (Black Butte Mine): 8.9 mph Maximum Wind Speed (Black Butte Mine): 39.5 mph Minimum Wind Speed (Black Butte Mine): 0 mph
Precipitation	Mean annual precipitation (Rock Springs AP, WY): 8.8 inches Mean annual snow depth (Rock Springs AP, WY): 1 inch Mean annual snowfall (Rock Springs AP, WY): 43.6 inches

Indicators of air quality addressed in this section include concentrations of air pollutants, visibility, and atmospheric deposition. Air pollutant concentration is an indicator of breathable, healthful air; visibility is an indicator of our ability to see the landscape around us; and atmospheric deposition is an indicator of the health of terrestrial and aquatic ecosystems.

3.2.1.2 Air Pollutant Concentrations

Pollutant concentration refers to the amount of a pollutant present in a given amount of air, and can be reported in units of micrograms per cubic meter ($\mu g/m^3$), parts per million (ppm) or parts per billion

(ppb). In addition to meteorological monitoring conducted by numerous agencies and entities throughout the area, the State of Wyoming utilizes monitoring to determine whether the region is in compliance ("attainment") with Wyoming and federal concentration standards (**Figure 3.1**).

The WDEQ/AQD performs regulatory criteria pollutant monitoring throughout the State of Wyoming for nitrogen dioxide (NO_2), ozone (O_3), and two categories of particulate matter: fine particulates with an aerodynamic diameter of 10 micrometers or less (PM_{10}), and fine particulates with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$).

Monitoring system and network locations for various components of air quality presented in **Figure 3.1** include:

- State and Local Air Monitoring System (SLAMS) network measures concentrations of PM_{10} and $PM_{2.5}$ throughout Wyoming. There are 14 SLAMS locations in Wyoming. Data collected in 2003 from the Rock Springs SLAMS site are the most representative of the area potentially affected by the Proposed Action (WDEQ 2004a). Where fine particulate matter ($PM_{2.5}$) data are not collected, ambient $PM_{2.5}$ concentrations may be estimated as up to one half of the reported PM_{10} concentrations (Pace 2005). The $PM_{2.5}/PM_{10}$ ratio in an area varies depending upon the sources contributing to the concentrations, and may require additional data collection for accurate estimation.
- Clean Air Status and Trends Network (CASTNet) system has measured concentrations of sulfur dioxide (SO_2), sulfate (SO_4), O_3, nitrate (NO_3), nitric acid (HNO_3) and ammonium (NH_4) in the United States since the late 1980s. There are three CASTNet stations in Wyoming. Data from the Pinedale CASTNet site (PND165) are the most representative of the assessment area (EPA 2005).
- Wyoming Air Resources Monitoring System (WARMS) has also measured concentrations of SO_2, SO_4, HNO_3, particulate NO_3, total NO_3, and particulate NH_4 in Wyoming since 1999. WARMS data from the network start-up period from 1999 and 2000 may be unreliable. There are four WARMS stations in Wyoming. Data collected from the Pinedale WARMS site are the most representative of the assessment area (Sutton 2005).
- National Atmospheric Deposition Program (NADP) assesses wet deposition by measuring the chemical composition of precipitation (rain and snow). There are eight NADP stations in Wyoming. Data collected from the Pinedale NADP site (WY06) are the most representative of the assessment area (NADP 2005).
- Inter-Agency Monitoring of Protected Visual Environments (IMPROVE) has measured visibility in national parks and wilderness areas in the United States since the 1980s. There are six IMPROVE stations in Wyoming. Data collected from the Bridger Wilderness (BRID1) IMPROVE site are the most representative of the assessment area (Visibility Information Exchange Web System 2005).
- Special Purpose Monitors (SPMs). SPMs have recently been established in the Upper Green River Basin to monitor NO_2, O_3, PM_{10}, and visibility.

Specific monitoring protocols, known as reference (or equivalent) methods, must be followed to determine compliance with Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS). Other conditions must also be met for data to be used for regulatory purposes. These include (1) that the air monitoring station meet probe siting criteria, (2) that the station be in the ambient air, and (3) that the data be collected according to a quality assurance project plan approved by the responsible regulatory agency (such as the WDEQ/AQD).

Criteria pollutants identified as potential concerns for the Proposed Action are PM_{10}, NO_2, and SO_2. The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, loading and hauling overburden and coal, and the large areas of disturbed land all produce fugitive dust. Stationary and point

Figure 3.1 Monitoring System and Network Locations

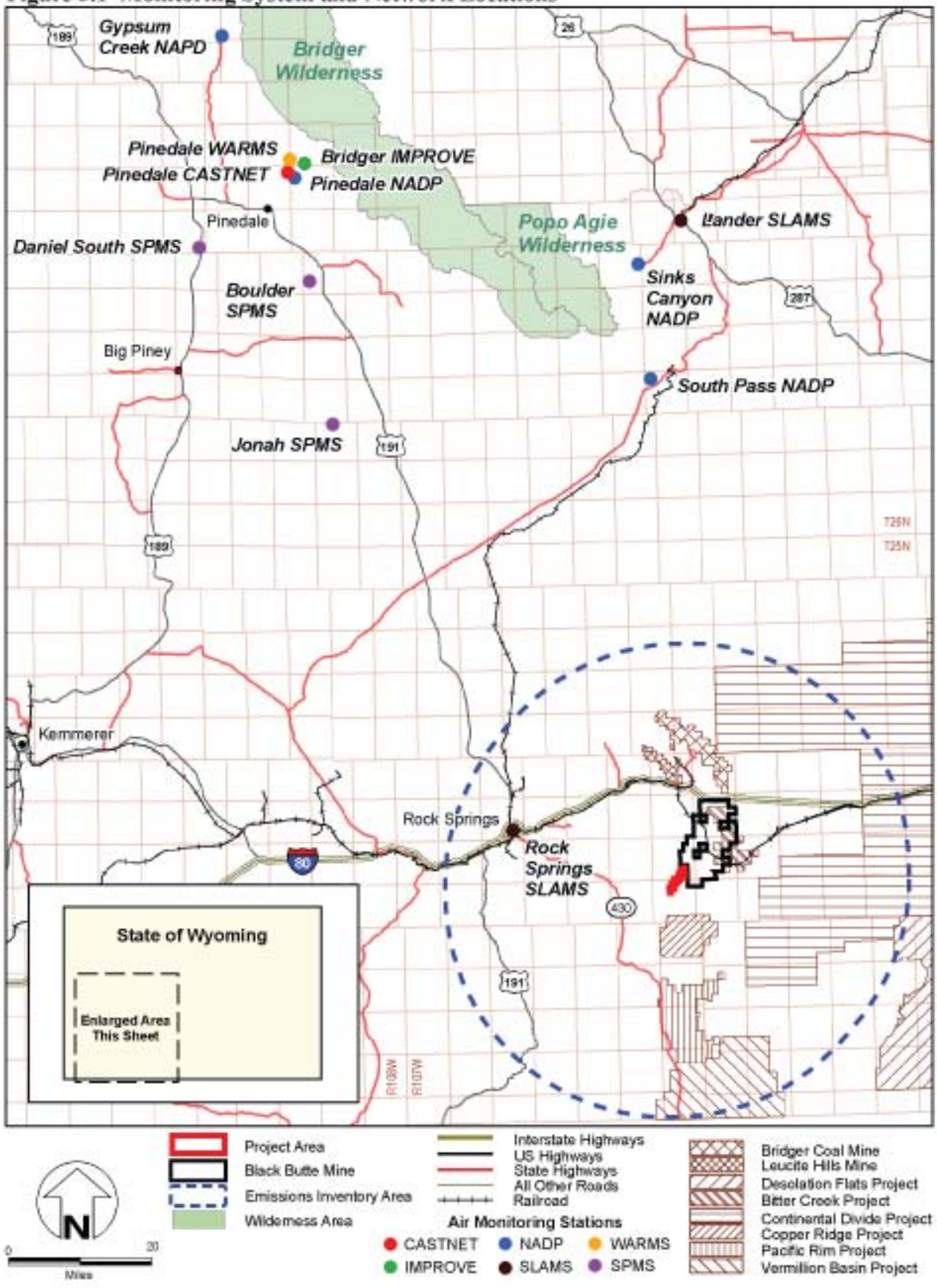
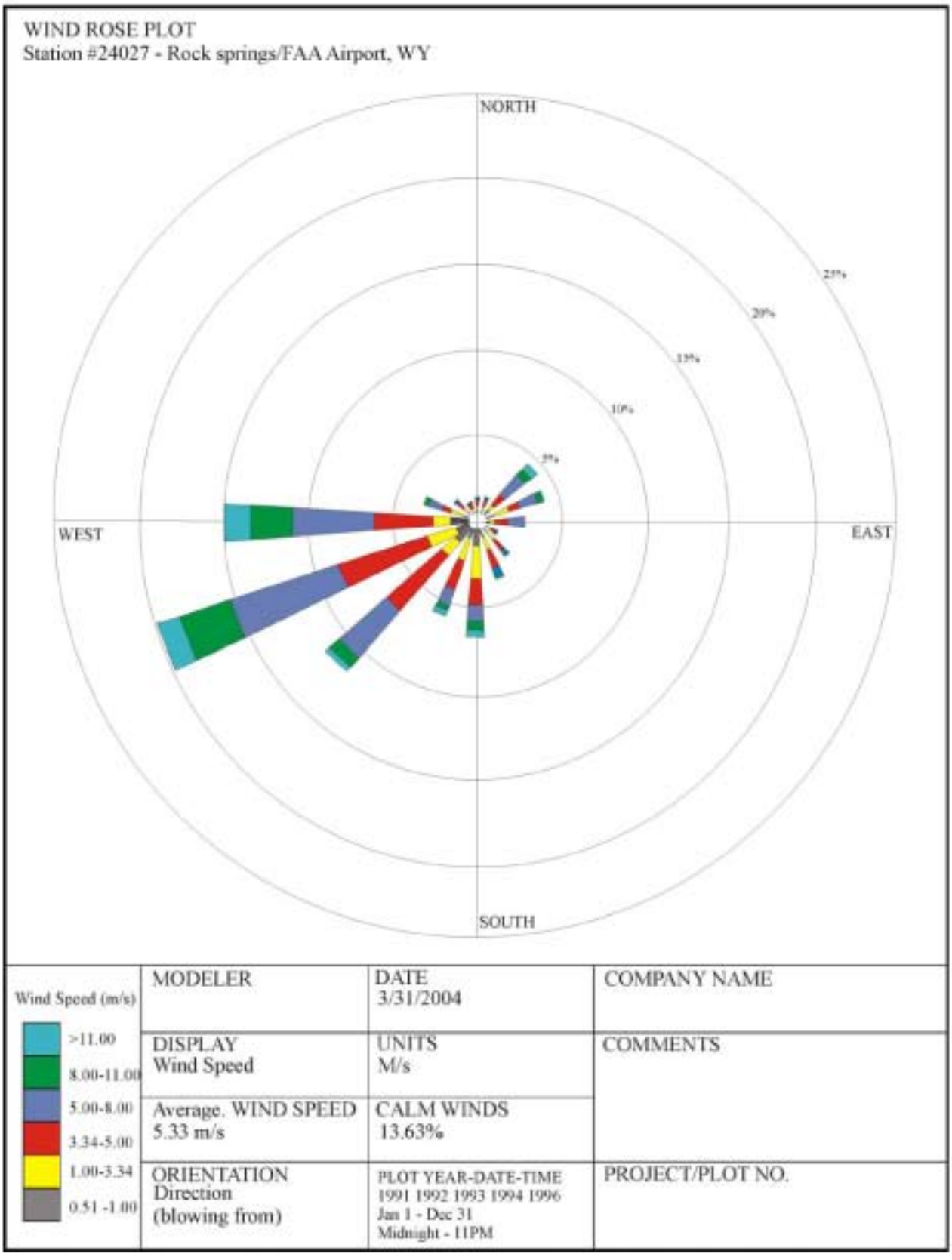


Figure 3.2 Representative Wind Rose for Rock Springs, Wyoming



sources are associated with coal crushing, storage, and handling facilities. In general, particulate matter (PM_{10}) is the major pollutant from coal mine point sources. Overburden blasting is also sometimes responsible for producing NO_2 from the incomplete combustion of explosives used in the blasting process.

As part of the ongoing operations, PM_{10} and meteorological data are collected at several locations at the existing Black Butte Mine (**Figure 3.3**) and reported on a quarterly basis as required by BBCC's Quality Assurance Project Plan submitted to WDEQ in March 1996.

Ambient particulate data are collected in the vicinity of the project area by a PM_{10} high volume air sampler (PM_{10}859) and a PM_{10} low volume Rupprecht & Patashnick tapered element oscillating microbalance (TEOM) continuous monitor (PM_{10}868). Meteorological data, including temperature, wind speed and direction, are also collected on site (METEO station in **Figure 3.3**).

Criteria Air Pollutants

Criteria air pollutants are those for which national concentration standards have been established. Pollutant concentrations greater than these standards represent a risk to human health or welfare. Criteria air pollutants include CO, NO_2, SO_2, O_3, PM_{10}, $PM_{2.5}$, and lead. Criteria air pollutant concentrations are compared to NAAQS and WAAQS to determine compliance.

Table 3.5 presents background concentrations of criteria air pollutants in southwest Wyoming identified as a potential concern for the Proposed Action. Background concentrations are in compliance with applicable WAAQS and NAAQS.

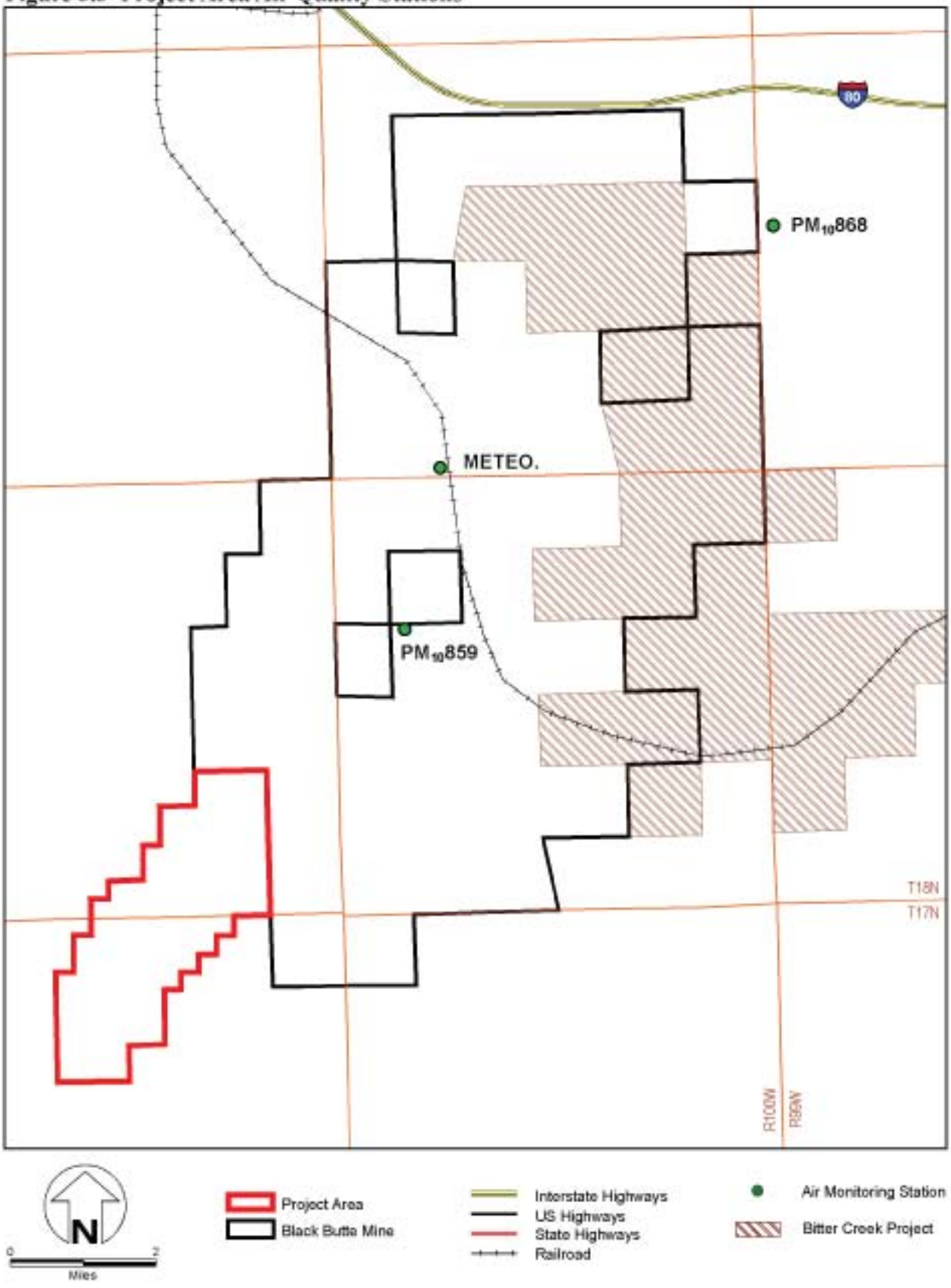
Table 3.5 Criteria Pollutant Standards and Background Concentrations

Pollutant	Averaging Period	Wyoming Standard (µg/m3)	National Standard (µg/m^3)	PSD Increments (µg/m3)		Regional Concentration (µg/m3)
				Class I	Class II	
PM_{10}	24-hour	150	150	8	30	18-35
	Annual Arithmetic Mean (AAM)	50	50	4	17	8-10
NO_2	AAM	100	100	2.5	25	4
SO_2	3-hour	1,300	1,300	25	512	132
	24-hour	260	365	5	91	43
	AAM	60	80	2	20	9

Source: PM_{10} – data collected at Bridger Power Plant, Site 901 from Jan. 1999 to Dec. 2000; Black Butte Mine, Site 863, from Jan. 1999 to Dec. 2000; and Seedskadee National Wildlife Refuge, 1989-2001. NO_x – Green River Visibility Study, period of record 1996-1999. SO_2 –LaBarge Study Area, Northwest Pipeline Craven Creek Site. (BLM 2004b)

Some criteria air pollutant concentrations are compared to Prevention of Significant Deterioration (PSD) increments. The goal of the PSD program is to protect public health and welfare from air pollution effects, notwithstanding attainment and maintenance of the NAAQS, and "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores and other areas of special national or regional natural, recreation, scenic, or historic value." PSD increments have been established for NO_2, SO_2 and PM_{10}.

Figure 3.3 Project Area Air Quality Stations



Particulate Matter

Particulate matter (i.e., fugitive dust, soil particles, pollen, etc.) is essentially the small particles suspended in the air which settle to the ground slowly and may be re-suspended if disturbed. Separate allowable concentration levels for particulate matter are based on the relative size of suspended particles:

- PM_{10}, are small enough to be inhaled and can cause adverse health effects.
- $PM_{2.5}$, are so small that they can be drawn deeply into the lungs and cause serious health problems. These particles are often a cause of visibility impairment.

PM_{10} data were collected at a SLAMS site in Rock Springs in 2003. Reported concentrations of PM_{10} at the Rock Springs SLAMS site ranged from 6 to 82 $\mu g/m^3$ and were 4 to 55 percent of the applicable 24-hour WAAQS (**Table 3.5**).

Between 2000 and 2004, annual mean PM_{10} concentrations were reported to be approximately 16.7 $\mu g/m^3$ at the Black Butte Mine monitoring station PM_{10}859 and 22.9 $\mu g/m^3$ at monitoring station PM_{10}868-TEOM (**Figure 3.3**), both levels being well below the annual WAAQS level of 50 $\mu g/m^3$ (IML 2000 - 2004). However, regulatory monitoring of 24-hour average particulate matter near Black Butte Mine indicated concentrations that are not in compliance with applicable WAAQS. On June 27, 2005, WDEQ issued BBCC a Notice of Violation for 13 exceedances of the 24-hour PM_{10} standard between 2000 and 2005 (**Table 3.6**).

Table 3.6 Reported PM_{10} Exceedances with Daily Meteorological Data

Date	PM_{10} 24-Hour Average (µg/m3)	Wind Speed Average (MPH)	Wind Speed Maximum (MPH)	Predominant Wind Direction (%)	Temperature Range (Celsius)
10/23/2001	214.9	23.7	31.9	54.2 from W	-2.7 – 10.9
1/20/2002	174.7	18.9	28.0	54.1 from WSW	-11.4 – -4.4
2/8/2002	415.0	21.9	35.1	66.7 from W	-7.9 – -1.1
2/28/2002	175.6	17.2	24.7	33.3 from W	-12.7 – 2.0
5/22/2002	182.1	24.5	36.6	50.0 from WSW	2.3 – 10.6
3/6/2003	196.5	25.6	38.5	75.0 from WSW	-1.8 – 4.7
11/28/2004	283.7	20.1	28.5	66.7 from NNE	-12.5 – -7.1
11/30/2004	516.2	7.6	12.9	33.3 from SSW	-13.6 – 4.7
12/1/2004	156.9	9.9	17.2	33.3 from W	-13.1 – -4.9
12/2/2004	306.3	9.8	15.8	45.8 from WSW	-18.3 – -4.2
12/20/2004	258.9	20.0	33.2	58.3 from W	-7.7 – 2.2
3/12/2005	229.7	20.0	33.1	50.0 from W	-4.8 – 12.9
3/17/2005	340.7	22.6	35.9	58.3 from W	-4.3 – 4.8
2/15/2006[1]	459.6	14.9	19.6	41.7 from NNE	-15.1 – -6.7
3/9/2006	156.2	15.7	30.4	41.7 from W	-9.3 – -0.2
3/15/2006	165.1	18.3	29.7	37.5 from W	-5.9 – 1.0
3/26/2006	241.1	21.5	35.1	45.8 from W	-4.5 – 4.6

[1] Exceedance event is under investigation to determine whether monitor interference occurred.

Between 2000 and 2004, the average annual precipitation reported at the Black Butte Mine was approximately 6.68 inches per year, which is well below the average annual precipitation of 8.84 inches per year recorded in the region (**Table 3.4**). This low precipitation in the area over the past several years, coupled with the high winds generally reported on days where PM_{10} exceedances were recorded, may

have exacerbated the fugitive dust conditions observed at the Black Butte Mine. On July 9, 2005, BBCC responded to the Notice of Violation by submitting a Fugitive Dust Action Plan to WDEQ. In the first three months of 2006, four PM_{10} exceedances have occurred within the Black Butte Mine (**Table 3.6**). The Fugitive Dust Action Plan (BBCC 2006) was finalized in the spring of 2006 and includes mitigation measures the mine is implementing to reduce fugitive dust emissions. Resource protection measures summarized in Chapter 2 include the mitigation measures in the Fugitive Dust Action Plan.

Nitrogen Dioxide

NO_2 is a red-brown gas formed during operation of internal combustion engines. Such engines emit a mixture of nitrogen gases, collectively called nitrogen oxides (NO_x). NO_2 can contribute to "brown cloud" conditions and ozone formation, and can convert to ammonium and nitrate particles and nitric acid which can cause visibility impairment and acid deposition ("acid rain"). Bacterial action in soil can be a natural source of nitrogen compounds.

NO_2 data are not currently collected at the Black Butte Mine or at the Rock Springs SLAMS station. Other nitrogen compound pollutants of interest include NO_3, HNO_3, and NH_4. Because the chemistry of nitrogen-containing pollutants is very complex and because monitoring of these air pollutants typically does not adhere to reference methods, it would be inappropriate to infer NO_2 concentrations from concentrations of HNO_3, NO_3, and NH_4, or to compare these concentrations to the NO_2 WAAQS, NAAQS or PSD increments. It would, however, be unlikely that high NO_2 concentrations would occur where low concentrations of other nitrogen-based pollutants are reported.

Nitrogen compound data have been collected at the Pinedale CASTNet site (PND165) since 1989 and at the WARMS Pinedale site since 2000. **Table 3.7** presents regional air quality monitoring data for nitrogen and sulfur compounds collected at the CASTNet PND165 site between January 1989 and December 2003. WARMS data collected for nitric acid between December 2002 and June 2005 and for nitrate and ammonium between January 2000 and June 2005 is also presented. Regional monitoring of nitrogen-containing pollutants shows concentrations typical for remote areas (Seinfeld 1986, Stern *et al.* 1973).

Table 3.7 Regional Nitrogen and Sulfur Compound Monitoring Data

Compound	CASTNet (PND165) Mean Annual Concentration ($\mu g/m^3$)	WARMS Pinedale Site Average Weekly Concentration ($\mu g/m^3$)	Typical Range For Remote Area[1,2] ($\mu g/m^3$)	Typical Range For Urban Areas[1,2] ($\mu g/m^3$)
HNO_3	0.35	0.55	0.05-0.8	8-129
NO_3	0.15	0.74	≤0.5	≥2.5
NH_4	0.20	0.26	≤0.2	≥1
SO_2	0.36	0.49	2.6-26	52-520
SO_4	0.53	0.72	≤2.5	≥10

[1] Ranges for HNO_3 and SO_2 from Seinfeld 1986
[2] Ranges for NO_3, NH_4 and SO_4 from Stern *et al.*1973

Sulfur Dioxide

SO_2 forms during combustion from trace levels of sulfur in coal or diesel fuel, and can convert to ammonium sulfate and sulfuric acid (H_2SO_4), which can cause visibility impairment and acid deposition. Volcanoes are natural sources of SO_2. Although generally not considered a significant direct result of surface coal mining, sulfur compound emissions from coal combustion have been identified as a potential concern from the Proposed Action.

Background concentrations of SO_2 (as measured at the CASTNet PND165 site between 1989 and 2003) ranged from 0.29 to 0.46 $\mu g/m^3$. Other monitoring of sulfur compounds shows concentrations of SO_2 and particulate SO_4 are typical for remote areas. Although monitoring for SO_2 and SO_4 typically does not adhere to reference methods, and resulting data cannot be used to determine WAAQS compliance, the collected concentration data contributes to our understanding of air quality.

Sulfur compound data have been collected at the Pinedale CASTNet site (PND165) since 1989 and at the WARMS Pinedale site since 2000. **Table 3.7** presents regional air quality monitoring data for sulfur (and nitrogen) compounds collected at the CASTNet PND165 site between January 1989 and December 2003. WARMS data collected for SO_2 and SO_4 between January 2000 and June 2005 is also presented. Regional monitoring of these sulfur-containing pollutants shows concentrations typical for remote areas (Seinfeld 1986, Stern *et al.* 1973).

Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health problems, such as chronic respiratory disease, reproductive disorders, or birth defects. The EPA has classified 189 air pollutants as HAPs, including formaldehyde, benzene, toluene, ethylbenzene, xylenes, and n-hexane. Potential concentrations of HAPs are compared to inhalation reference concentrations to estimate the risk of health effects. An increase in HAPs concentrations resulting from the Proposed Action has not been identified as a concern for this project.

Other Concerns

Although generally not considered a significant direct result of surface coal mining, mercury, and carbon dioxide (CO_2) emissions from coal combustion at Pacificorp's Jim Bridger Power Plant have been identified as a potential concern for the Proposed Action. The Jim Bridger Power Plant receives a substantial portion of its coal supply from the Black Butte Mine. Mercury emissions may impact public health and aquatic ecosystems due to toxicity. CO_2 is considered a greenhouse gas potentially contributing to global warming.

Mercury emissions are a significant source of anthropogenic mercury. The public health impact of greatest concern is neuro-toxicity associated with ingestion of dietary methyl-mercury by pregnant women. Although consumption of fish is the primary cause for human and wildlife exposure to methyl-mercury, EPA does not advise the typical U.S. consumer of fish from restaurants and grocery stores to limit fish consumption.

Because mercury accumulates most efficiently in the aquatic food web, fish-eating birds and mammals are more highly exposed to mercury than any other known components of aquatic ecosystems. Adverse effects of mercury exposure to fish, birds and mammals include death, reduced reproduction, impaired growth and development, and behavioral abnormalities.

Table 3.8 shows typical mercury concentrations in coal throughout the United States. The general mercury content of coal in the Almond Formation is similar to mercury concentrations in other western United States sub-bituminous coals. Samples analyzed by BBCC of the Almond Formation in Pit 8 indicate a mercury concentration ranging from 0.02 to 0.13 ppm, with a mid-range of 0.075 ppm.

EPA has identified emissions from coal-fired power plants as a significant source of atmospheric mercury. Mercury emission volumes from power plants depend on coal chemistry and air pollution controls. Emissions from all reported sources in Sweetwater County, Wyoming were 640 pounds of mercury compounds in 1999, with approximately 65 percent (413 pounds) reported from the Jim Bridger Power Plant. Emissions from all reported sources throughout Wyoming were 2,013 pounds of mercury compounds in 1999.

Table 3.8 Typical Mercury Concentrations in Coal throughout the United States

Coal Rank	Mercury (ppm)
Appalachian Bituminous	0.095
Illinois Basin Bituminous	0.067
Western Bituminous	0.040
Western Sub-bituminous	0.058
Fort Union Lignite	0.083
Gulf Coast Lignite	0.125

3.2.1.3 Visibility

The IMPROVE network has measured visibility in national parks and wilderness areas in the United States since the 1980s. Visibility data are calculated for each day, ranked from cleanest to haziest, and reported into three categories:

- 20 percent cleanest: mean visibility for the 20 percent of days with the best visibility
- 50 percent average: the annual mean visibility
- 20 percent haziest: mean visibility for the 20 percent of days with the poorest visibility

Visibility data were collected at the Bridger Wilderness (BRID1) IMPROVE site from 1989 to 2003 (**Figure 3.1**). Mean annual visual range varies from 156 to 186 miles on clear days, 111 to 128 miles on average days and 71 to 91 miles on hazy days. These data are most representative of the assessment area.

Additional visibility data is collected in the region at the Brooklyn Lake (BRLA1), Mount Zirkel Wilderness (MOZI1), and Rocky Mountain National Park (RMHQ1) IMPROVE monitoring sites. Visibility at these sites, as well as the BRID1 site, is summarized in **Table 3.9**.

Table 3.9 Visual Range Recorded at Regional IMPROVE Visibility Monitoring Sites

IMPROVE Monitoring Site	Years	Miles From Project Area	Visual Range (Miles)		
			20 Percent Cleanest Days	Average Days	20 Percent Haziest Days
Bridger Wilderness	1989-2003	113	156-186	111-128	71-91
Mt. Zirkel[1]	1995-2003	124	145-179	101-123	72-87
Brooklyn Lake[1]	2001-2003	128	178-195	117-127	71-81
Rocky Mountain NP[1]	1989	186	162	97	56

Source: Visibility Information Exchange Web System 2005
[1] Outside of assessment area

3.2.1.4 Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and is reported as the mass of material deposited on an area (kilograms per hectare – year [kg/ha-year]). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of particles and adherence of gaseous pollutants to soil, water, and vegetation). Substances deposited include:

- acids: such as H_2SO_4 and HNO_3; this acid deposition is sometimes referred to as "acid rain"
- air toxics: such as pesticides, herbicides, and volatile organic compounds
- nutrients: such as NO_3 and NH_4

The estimation of atmospheric deposition is complicated by the contribution to deposition by several components: rain, snow, cloud water, particle settling and gaseous pollutants. Deposition varies with precipitation which, in turn, varies with elevation and time. **Table 3.10** presents a summary of atmospheric deposition data collected in the region.

Table 3.10 Summary of Current Atmospheric Deposition

Deposition Component	Description	Miles From Project Area	Levels of Concern
Precipitation pH	Precipitation pH (lab measurements) is within natural range Pinedale, WY NADP WY06 Site: 5.12 – 5.38 South Pass City, WY NADP WY97 Site: 5.08 – 5.25	 113 70	Increase or decrease of 0.1-0.2 pH units
Total Nitrogen Deposition	Total nitrogen deposition is less than levels of concern Pinedale : 1.3 - 2 kg/ha-year	 113	> 10 kg/ha-year
Total Sulfur Deposition	Total sulfur deposition is less than levels of concern Pinedale: 0.65 - 1 kg/ha-year	 113	> 20 kg/ha-year
Lake Chemistry[1, 2]	Acid neutralizing capacity (ANC) and sensitivity – Bridger Wilderness Black Joe: 69.0 µeq/L (sensitive) Deep: 61.0 µeq/L (sensitive) Hobbs: 68.0 µeq/L (sensitive) Upper Frozen: 5.8 µeq/L (extremely sensitive)	 76 86 85 114 206	Sensitive = 25<ANC<100 µeq/L Very Sensitive = 210<ANC<25 µeq/L Extremely Sensitive = ANC<10 µeq/L
[1] BLM 2004a [2] USFS 2003			

Wet Deposition

The NADP monitoring network assesses wet deposition by measuring the chemical composition of precipitation (rain and snow). The natural acidity of rainwater is considered to be represented by a range of pH values from 5.0 to 5.6 (Ahrens 1993). Precipitation pH values lower than 5.0 may be considered acidifying and may cause adverse effects to plants and animals. A voluntary level-of-concern for change in pH has been estimated to be 0.1 - 0.2 pH units (USFS 1989).

Wet deposition data have been collected in Pinedale, WY at the WY06 NADP site since 1982. Mean annual precipitation pH measurements collected between 2000 and 2004 ranged from 5.12 to 5.38 pH units. These data are the most representative of the project region.

Dry Deposition

Dry deposition refers to the transfer of airborne gaseous and particulate material from the atmosphere to the Earth's surface. The previously discussed CASTNet system measures dry deposition of O_3, SO_2, SO_4, NO_3, HNO_3, and NH_4. Deposition data collected in Pinedale, WY (CASTNet site PND165) from 1990 through 2003 are the most representative of the project region.

There are no standards, thresholds, or levels of concern established for dry deposition. Dry deposition, measured by CASTNet, is added to wet deposition, measured by NADP, to estimate total deposition.

Total Deposition

Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition. Total nitrogen deposition is calculated by summing the nitrogen portion of wet and dry deposition of nitrogen compounds, and total sulfur deposition is calculated by summing the sulfur portion of wet and dry deposition of sulfur compounds.

Total deposition voluntary levels of concern have been estimated for several areas (USFS 1989). Estimated total deposition guidelines include the "red line" (defined as the total deposition that the area can tolerate) and the "green line" (defined as the acceptable level of total deposition). Total nitrogen deposition guidelines for Bridger Wilderness include the red line (set at 10 kg/ha-year) and the green line (set at 3 to 5 kg/ha-year).

Total sulfur depositions guidelines for Bridger Wilderness include the red line (set at 20 kg/ha-year) and the green line (set at 5 kg/ha-year). Total deposition voluntary guidelines are currently under review and may be re-set to lower values.

Total deposition data were calculated at Pinedale, WY from 1990 to 2003. Mean annual total nitrogen deposition ranges from 1.3 to 2 kg/ha-year. Mean annual total sulfur deposition ranges from 0.65 to 1 kg/ha-year.

Lake Chemistry

Atmospheric deposition can cause acidification of lakes and streams. One expression of lake acidification is change in ANC, the lake's capacity to resist acidification from atmospheric deposition. Atmospheric deposition of nitrogen and sulfur compounds can affect the ANC of sensitive lakes. Acid neutralizing capacity is expressed in units of micro-equivalents per liter (μeq/L). Lakes with ANC values from 25 to 100 μeq/L are considered to be sensitive to atmospheric deposition, lakes with ANC values from 10 to 25 μeq/L are considered to be very sensitive and lakes with ANC value of less than 10 are considered to be extremely sensitive. **Table 3.10** summarizes the current sensitivity of selected sensitive lakes in the Bridger Wilderness Area.

3.2.2 Emissions

An emissions inventory was compiled using the WDEQ/AQD New Source Review (NSR) database identifying major and minor emissions sources within 50 kilometers (31.1 miles) of the project area. The emissions inventory identified facilities, facility owners, facility classification, most recent NSR permit or waiver number and issue date since 1996, as well as permitted (not actual) pollutant emissions for each facility (**Appendix E**). **Table 3.11** summaries the facility types, number of facilities and relatively recent total permitted emissions levels for PM_{10}, NO_x and sulfur compounds (SO_x) from these permitted facilities.

An additional review of the 1999 National Emissions Inventory (NEI) completed by the EPA was also conducted to assess estimated emissions and sources within Sweetwater County (EPA 2003) (**Appendix F**). The NEI is an estimate of actual emissions from each facility considered a major source and includes emissions sources not included in the NSR above. Approximately 30 major sources of PM_{10}, NO_x and/or SO_2 were identified in Sweetwater County. The estimated total emissions from all major sources of PM_{10}, NO_x and/or SO_2 were 10,508, 51,857, and 38,651 tons per year, respectively. The only coal mining facility identified in the NEI was the Bridger Coal Company – Jim Bridger Mine. Reported emissions of PM_{10}, NO_x and/or SO_2 at the Jim Bridger Mine were 664, 208, and 12 tons per year, respectively. The Black Butte Mine facility was not identified in the NSR search (the last permit issued to Black Butte Mine was in 1995 and the database started tracking new permits and waivers issued in southwest Wyoming after January 1, 1996) or 1999 NEI search (Black Butte Mine is not considered a major source).

Table 3.11 Emissions Inventory of Permitted Sources within 50 km of the Project Area

Facility Type	Number of Facilities	Permitted PM_{10} Emissions (tons/year)	Permitted NO_x Emissions (tons/year)	Permitted SO_x Emissions (tons/year)
Compressor Station	31	-	1,686.6	-
Crushing and Screening	3	7.8	4.8	0.1
Dehydration	122	-	18.7	74.4
Generation	6	0.2	14.5	0.4
Incineration	2	0.1	-	-
Miscellaneous	6	135.8	891.6	2,594.4
Pipeline Station	1	-	0.9	-
Power Plant	1	1.4	-	-
Production Site	319	-	350.7	1.9
Soil Remediation Unit	1	-	0.3	-
Sour Gas Plant	2	-	2,713.9	80.6
Storage Tank Battery	11	-	24.3	0.1
Surface Coal Mine	1	87.1	-	-
Sweet Gas Plant	2	-	223.8	-
Transloading Facility	1	0.1	-	-
Unknown	5	-	18.4	-
TOTAL	514	232.5	5,948.5	2,751.9

3.3 GEOLOGY AND MINERAL RESOURCES

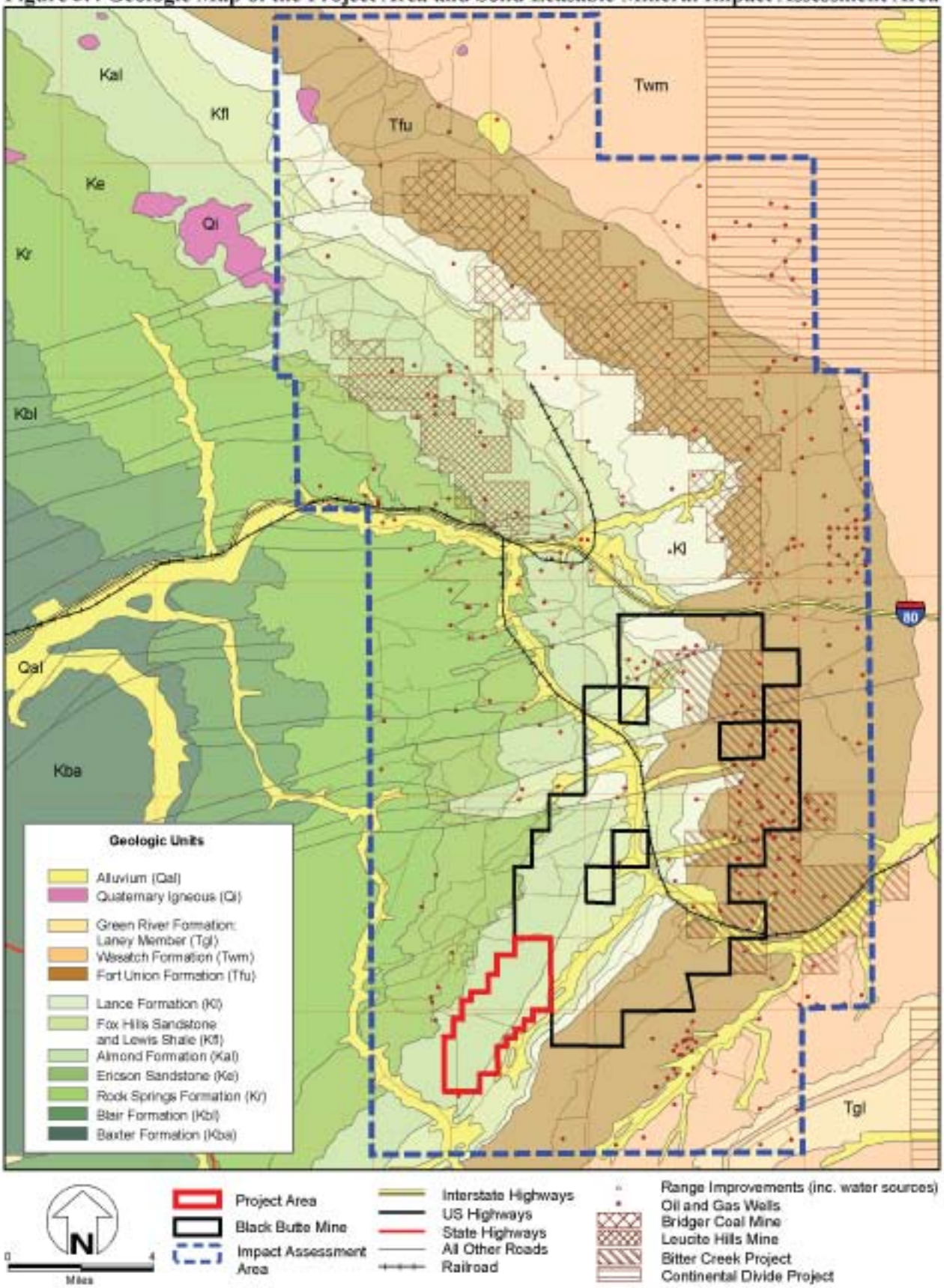
Mineral resources present in the project area include solid leasable minerals (coal) and fluid leasable minerals (liquid and gas petroleum hydrocarbons and methane gas associated with coal occurrences). The description of mineral resources is based on the assessment areas for solid leasable minerals and fluid leasable minerals being analyzed.

The assessment area for solid leasable minerals is that portion of the east flank of the Rock Springs Anticline containing the existing Black Butte, Bridger Coal, and Leucite Hills Mines (**Figure 3.4**). The assessment area is 277,120 acres, including 131,872.61 acres of BLM-administered land, 144,411.27 acres of private land, and 836.11 acres of State of Wyoming land. Total estimated existing disturbance is 21,931 acres or 7.91 percent of the assessment area.

The assessment area for fluid leasables includes lands south of Interstate 80, and east of Highway 430 within the BLM RSFO boundary area (Figure 3.5). The assessment area is 902,223 acres, and includes 530,383.52 acres of BLM-administered land, 357,534.10 acres of private land, and 14,305.37 acres of State of Wyoming land. Total estimated existing disturbance is 19,483 acres or 2.16 percent of the assessment area.

The project area is located on the eastern limb of the Rock Springs Anticline. The anticline structure has an axis that trends north-south. The anticline is asymmetrical with the eastern limb dipping less steeply than the western (Love and Christiansen 1985). The target coal-bearing geologic formation at the project area is the Cretaceous-aged Almond Formation. Relatively thin deposits of Quaternary alluvium, colluvium, and aeolian sediments overlie the Almond Formation where outcrops are not present. The Almond Formation is also overlain by the Cretaceous-aged Lewis Shale, Fox Hills Sandstone, and the Lance Formation to the east of the project area (Roehler 1979). Tertiary-aged formations overlie these formations further to the east. **Figure 3.4** presents a geologic map of the project area.

Figure 3.4 Geologic Map of the Project Area and Solid Leasable Mineral Impact Assessment Area



Outcrops of the Almond Formation have a bedding dip ranging between three and 10 degrees to the east-southeast in the project area (BBCC 2004a). The Almond Formation averages 325 feet in thickness. It consists of three distinct units, based on differing lithology. The lower unit is composed of a dark-gray shale interbedded with a similarly colored fine grained sandstone approximately 100 feet in thickness. The middle unit is made up of 75 feet of a dark gray shale and interbedded gray siltstone, gray fine-grained sandstone, gray and brown carbonaceous shale, and coal. The upper unit is 150 feet of dark-gray shale, light-gray sandstone, and siltstone (BBCC 2004a).

The topography of the project area reflects the interbedded lithologies and is composed of ridges of resistant sandstone separated by swales of less resistant shale and coal. A large high angle reverse fault, the Brady Fault, is present five miles east of the project area. No significant structural features, with the exception of the Rock Springs Anticline, are present in the project area.

3.3.1 Solid Leasable Minerals (Coal)

The project area contains about 34.6 million tons of in-place minable coal within the Almond Formation. The coal is in four seams that split and can be discontinuous. Interbeds of sandstone, siltstone, and shale separate the coal. The four coal seams (referred to as seams AG, AF, AFL, and AE) are on average, 3.0, 4.4, 5.0, and 5.7 feet thick, respectively. The average quality of the coal is 10,020 British Thermal Units per pound (btus/lb) with an ash content of 7.6 percent and a sulfur content of 0.53 percent (Wiig 2005).

Ownership of the coal mineral rights identified for mining is split between federal (BLM administered) and private owners. The mineral estate ownership of the entire project area, including property not proposed for mining is 2,039 acres of federal, 2,159 acres of private, and 160 acres of state minerals.

The Black Butte Mine permit area contains numerous coal seams that have been mined for decades. The coal occurs in the Fort Union, Lance, and Almond Formations in seams from two to 25 feet thick. Total coal produced at the Black Butte Mine through 2002 was approximately 84 million tons with an expected production of 97.2 million tons through the year 2008 (BBCC 2005a). The remaining in-place minable reserves in the existing permit area beginning in 2005 was estimated at 8.9 million tons of coal. The total current unreclaimed area of surface disturbance in the Black Butte Mine is 6,743 acres. The reclaimed surface disturbance area is 3,814 acres.

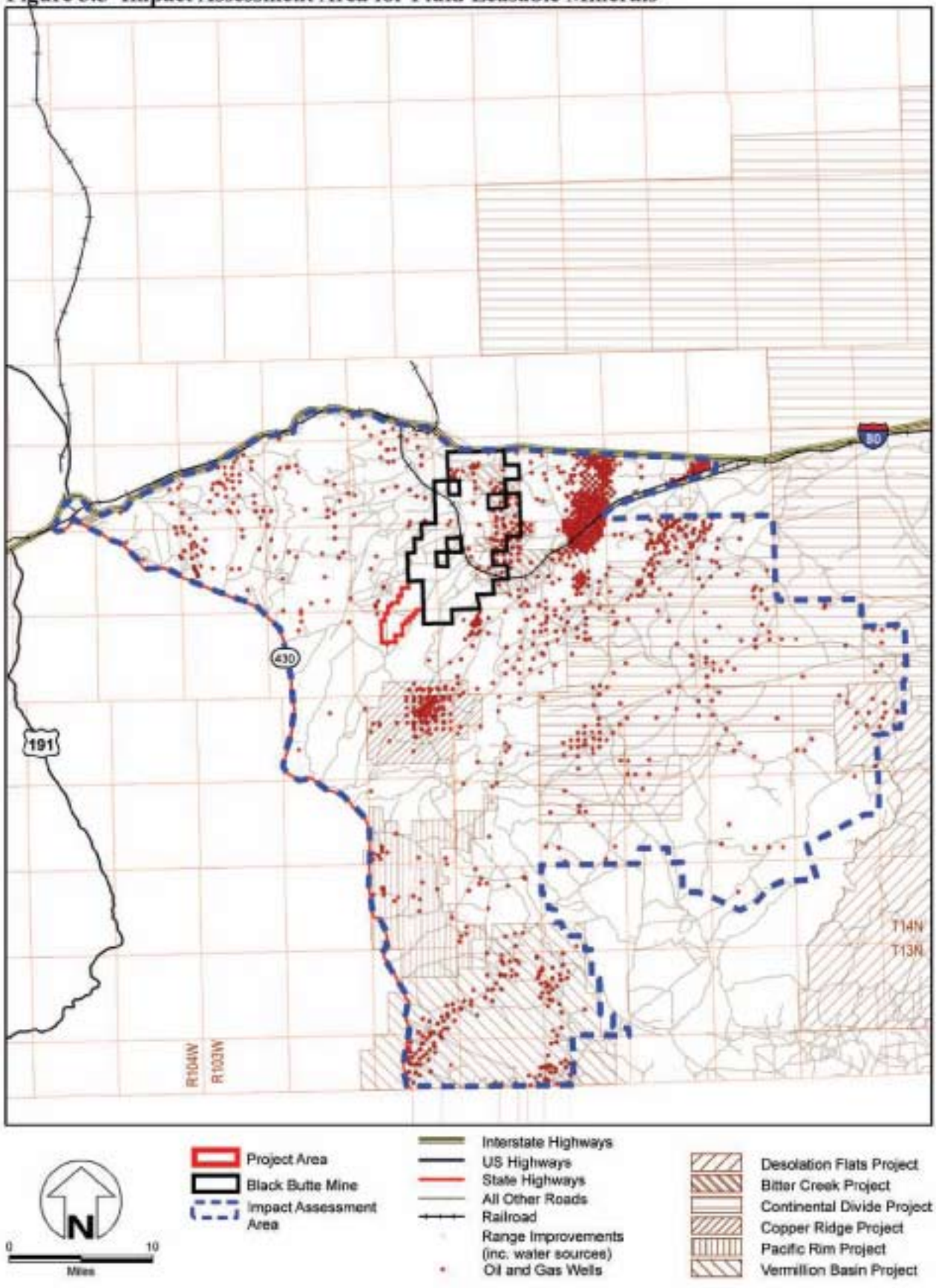
The Leucite Hills Mine, located north of Interstate 80 and adjacent to the Black Butte Mine, produces coal from the Almond Formation and has an estimated 3.8 million tons of in-place minable coal (McCarthy 2005). The anticipated mine life is three years. The total current unreclaimed area of surface disturbance in the Leucite Hills Mine is 1,772 acres. The reclaimed surface disturbance area is 512 acres.

The Bridger Coal Mine to the north of the project area and Interstate 80 is a surface coal mine that has been transitioning to underground operations. The surface mining of coal is expected to continue for the next few years. The mine is producing from the Fort Union Formation. The Bridger Coal Mine has an estimated 121 million tons of in-place minable coal (BLM 2004b). The anticipated mine life is 15 to 20 years. The total current unreclaimed area of surface disturbance in the Bridger Coal Mine is 6,532 acres. The reclaimed surface disturbance area is 2,980 acres.

3.3.2 Fluid Leasable Minerals

According to Wyoming Oil and Gas Conservation Commission records, approximately 1,197 wells have been drilled in the assessment area (**Figure 3.5**). There has been little conventional oil and gas exploration activity in the immediate vicinity of the project area. Available data suggest that productive conventional oil and gas reservoirs do not occur within the project area (BLM 2005b).

Figure 3.5 Impact Assessment Area for Fluid Leasable Minerals



Parts of five oil and gas leases overlie the project area. If productive wells are not established on these leases they will expire at the end of their 10-year terms (the lease expiration dates range between 2006 and 2011). The leases can be developed for conventional oil and gas or for CBNG. The BLM Wyoming Reservoir Management Group, as of July 2005, had not been advised of any proposed CBNG unit development for the project area. The nearest producing CBNG wells are more than four miles away from the project area (BLM 2005b). The two townships that encompass the project area, T. 18 N., R. 101 W. and T. 17 N., R. 101 W., contain only one active CBNG well.

Conventional oil and gas exploration and production have occurred to the east and southeast of the project area in the Churchill and Brady Deep Units as well as outside of these units. Cretaceous, Jurassic, and Pennsylvanian age rocks of the Almond, Rock Springs, Blair, Dakota Sandstone, Nugget, Park City, and Weber Formations are the host formations of those discoveries and exploration efforts. Occurrences of oil and gas in these units are related to the Brady Fault and two small anticlinal structures that have formed structural traps. Additional production occurs in discontinuous stratigraphic traps. The depth of the producing zones range between 5,900 and 14,300 feet (Roehler 1979).

To estimate conventional oil and gas reserves from producing wells in reservoir formations located near the project area, BLM performed decline analyses on producing conventional oil and gas wells in the four townships closest to the project area (T. 17-18 N. R. 100 W. and T. 17-18 N. R. 101 W.). The results of the analyses for the formation reservoirs are presented in **Table 3.12**.

Table 3.12 Oil and Gas Production and Reserves in the Vicinity of the Project Area

Reservoir	No. Wells	Av. Well Life (years)	Reservoir Average Cumulative Production Gas (MCF[1])	Reservoir Average Estimated Ultimate Recovery Gas (MCF)	Reservoir Average Cumulative Production Oil (BBL[2])	Reservoir Average Estimated Ultimate Recovery Oil (BBL)
Almond	12	29	1,434,743	1,323,324	296	3,276
Almond Coal	29	5	154,416	197,218	8,344	11,100
Amsden-Darwin	1	8	0	0	313	511
Blair	2	9	162,628	272,162	1,315	1,584
Dakota	5	20	284,848	400,060	364	617
Entrada	1	23	1,981,380	2,541,583	79,580	79,580
Lance	4	3	4,716	5,090	0	0
Mesa Verde	4	24	389,584	406,545	130	130
Nugget	7	48	830,869	1,715,209	150,456	1,844,903
Phosphoria	2	24	1,360,273	2,388,863	58,618	90,439
Weber	3	39	1,985,451	6,503,264	247,069	268,750

Production data from IHS Energy Records; decline analyses prepared using IHS Powertools software. (BLM 2005b)
[1] MCF= Thousand Cubic Feet
[2] BBL = Barrels of Oil

Despite the reserves estimated to be present outside of the project area (**Table 3.12**), there is no evidence that productive reservoirs containing conventional oil and gas are present in the project area. This is due to several factors. There are no small geologic/anticlinal structures similar to those in the Brady Unit, or productive sands similar to the Churchill Unit, known to occur in the project area. Other formations that produce in surrounding areas are less geologically favorable in the project area due to shallow depths, different geologic/depositional environments, surface erosion or other factors. Further, the failure of the nearest exploratory wells to achieve economic production suggests that economic conventional resources may not occur within the project area (BLM 2005b).

Oil and gas production does occur from the Almond Formation from both sandstone and coal interbeds to the east of the project area (BLM 2005b). The lack of distinction between producing zones in the formation makes the categorization of the oil and gas occurrence as conventional or CBNG difficult. In any case, the Almond Formation at the project area is relatively shallow, which decreases the likelihood that either conventional or CBNG oil and gas resources will occur.

The Bitter Creek Project CBNG area overlaps the eastern portion of the existing Black Butte Mine (to the northeast of the project area). The Almond Formation is a target reservoir in the Bitter Creek Project CBNG area. Reservoir studies indicate the upper Almond Formation sandstones and thin coal seams produce gas (BLM 2003b). Shallow gas occurrences in the assessment area near the Black Butte Mine generally are at a depth of 2,000 to 3,000 feet in the Bitter Creek Project CBNG area (Clawson 2005b).

As mentioned previously, the nearest producing CBNG wells are located three to four miles southeast of the project area. The wells are located in the North Copper Ridge Unit and are completed in the Almond Formation. Although there is some ambiguity concerning the well completions, two of these wells can be identified as, or strongly inferred to be, true coalbed completions. These wells have minimal reserves (one to six MCF of gas) and economic lives of approximately one year. Although reported as CBNG wells, the remaining wells either have completed sandstones adjacent to the coals or lack sufficient data to resolve their completion intervals. Due to the shallower depths and resulting lower hydrostatic pressures in the minable coal seams in the project area, the methane storage capacity of the Almond coals would be expected to be even lower in the project area than in the North Copper Ridge Unit (BLM 2005b).

Except in federal units or areas where special spacing orders have been established, the typical oil and gas well spacing in a producing field would include 160 acres for natural gas and 40 acres for oil wells. The surface disturbance generally required for each well, inclusive of well pad, access roads, and gathering pipelines would be four and a half to five acres (BLM 2005b).

3.3.3 Geologic Hazards

No active faults are known to be present at the project area (BLM 1996). There are no other geologic hazards such as landslide areas, 100 year-floodplains, or hydrogen-sulfide producing wells on the project area. Subsidence due to underground mining is not a concern because none occur in the project area. Rock fall is possible on steeper slopes, but is not likely due to the less severe slopes in the project area relative to adjoining steep buttes and large hillsides.

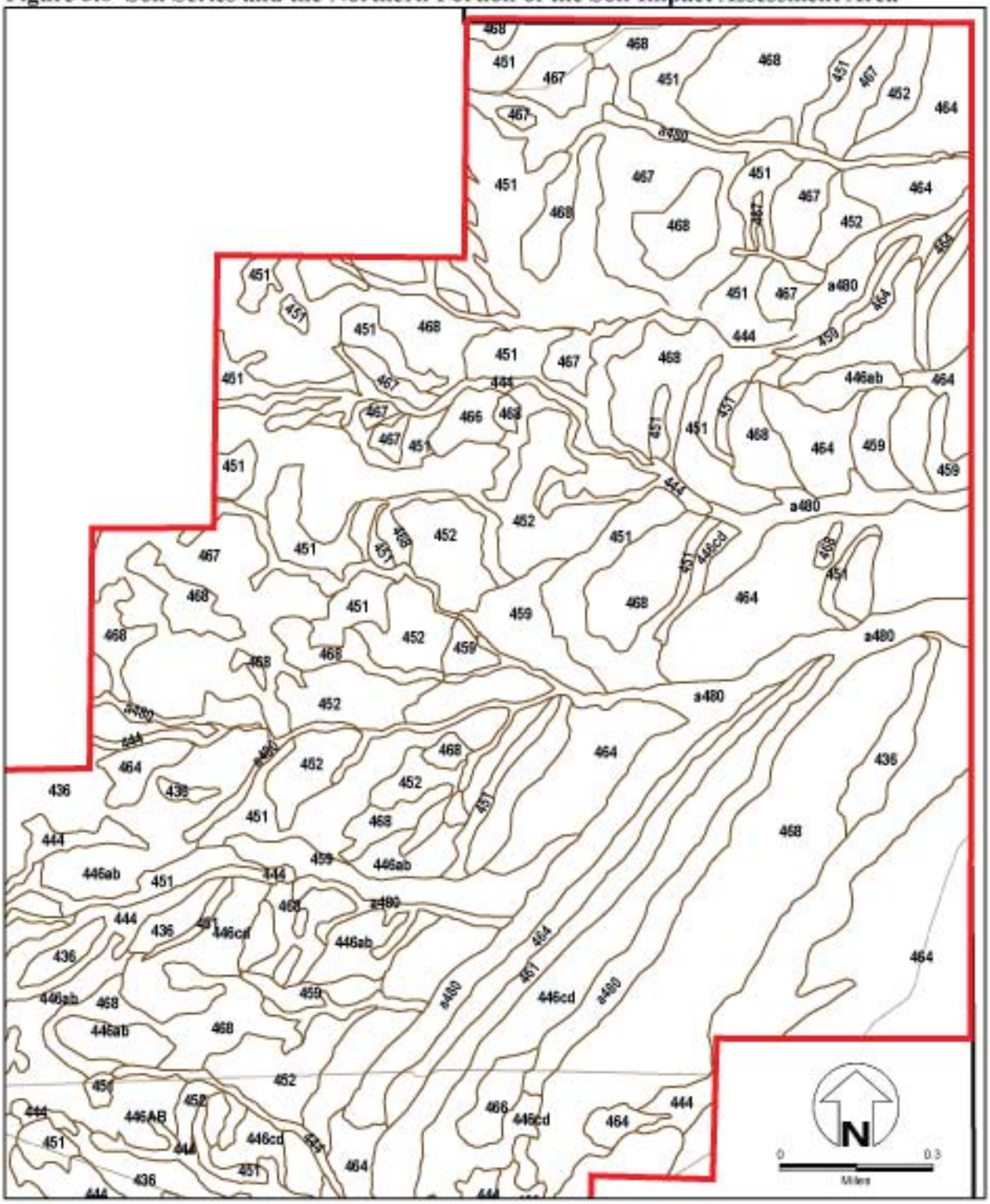
3.4 SOILS

The soils resources assessment area is the project area (**Figure 3.6** and **Figure 3.7**). The assessment area is 4,359 acres in size, and includes 2,199.20 acres of BLM-administered land and 2,159.40 acres of private land. Total estimated existing disturbance is three acres or 0.07 percent of the assessment area.

A detailed Order 1-2 soil survey of the project area was conducted in 2003 and is presented in **Appendix G** (Nyenhuis 2003). The soil series in the analysis area are presented on **Figure 3.6** and **Figure 3.7**. The Order 1-2 soil survey was completed in accordance with WDEQ-LQD Guideline No. 1, which outlines the soils information required for a coal mining permit. The survey included field inventories, sampling, and laboratory analysis of soil samples.

Table 3.13 presents the soil series that occur within the project area, their erosion potential and recommended salvage depths (Nyenhuis 2003).

Figure 3.6 Soil Series and the Northern Portion of the Soil Impact Assessment Area



Project Area and Impact Assessment Area
Roads
8 = Winton Channery Loam
10 = Kandaly Loamy Sand
80 = Not described in soils report
436 = Teaguff - Huguston - Terada Complex
444 = Thayer Fine Sandy Loam
446AB = Horsely - Haterton Complex
446CD = Horsley - Haterton Complex
451 = Tasselman - Winton Complex
452 = Queelman - Leckman
458EF = Winton - Horsley - Rock Outcrop
459 = Rock Outcrop
461 = Rock Land
464 = Boltus-Horsley Complex
466 = Huguston - Rock Outcrop
467 = Huguston - Horsely - Haterton Complex
468 = Kandaly - Huguston - Teaguff Complex
476 = Not described in soils report
A480 = Chrisman - Dines Complex

Figure 3.7 Soil Series and the Southern Portion of the Soil Impact Assessment Area

Project Area and Impact Assessment Area
Roads

8 = Winton Channery Loam
10 = Kandaly Loamy Sand
80 = Not described in soils report
436 = Teaguff - Huguston - Terada Complex
444 = Thayer Fine Sandy Loam
446AB = Horsely - Haterton Complex
446CD = Horsley - Haterton Complex
451 = Tasselman - Winton Complex
452 = Queelman - Leckman
458EF = Winton - Horsley - Rock Outcrop
459 = Rock Outcrop
461 = Rock Land
464 = Boltus-Horsley Complex
466 = Huguston - Rock Outcrop
467 = Huguston - Horsely - Haterton Complex
468 = Kandaly - Huguston - Teaguff Complex
476 = Not described in soils report
A480 = Chrisman - Dines Complex

Table 3.13 Soils Series that Occur within the Project Area

Map Unit No.	Map Unit Name	Erosion Potential	Recommended Salvage Depth (inches)
8	Winton very channery sandy loam, 0 to 45% slopes	None	6
10	Kandaly loamy sand, six to 15% slopes	None	32 or 50
436	Teagulf-Huguston-Terada complex, 0 to 6% slopes	None to Slight	25
444	Thayer fine sandy loam, 0 to 6% slopes	Slight	48
446AB	Horsley-Haterton complex, 0 to 6% slopes	Slight	10
446CD	Horsley-Haterton complex, six to 15% slopes	Slight	10
451	Tasselman-Winton complex, three to 30% slopes	None to Slight	9
452	Huguston-Teagulf complex, three to 10% slopes	None to Slight	20
458EF	Winton-Horsley-Rock Outcrop association, very steep	None to Slight	4 (Rock Outcrop = 0)
459	Rock Outcrop-Winton-Horsley association, steep	None to Slight	3 (Rock Outcrop = 0)
461	Rock Land, 0 to 75% slopes	-	0
464	Boltus-Horsley complex, 0 to 30% slopes	Moderate to Slight	6
466	Huguston-Rock Outcrop-Terada complex six to 30% slopes	None to Slight	15 (Rock Outcrop = 0)
467	Huguston-Horsley-Haterton complex, six to 30% slopes	None to Slight	12
468	Kandaly-Huguston-Teagulf complex, three to 30% slopes	None to Slight	25
a480	Monte loam, 0 to 6% slopes	Slight	53

The soil types and salvage depths in the project area are similar to soils currently being salvaged and used for reclamation at the existing BBM.

Several soil types in the project area are characterized in Appendix 5-5 of the Green River RMP and ROD (BLM 1997) as Sandy Soils (468 Kandaly-Huguston-Teagulf complex, four percent to 15 percent slopes) and Erosive Soils (464 Boltus-Horsley complex, eight percent to 30 percent slopes). These soil types were described in the soil survey as having none to slight erosion potential (468 Kandaly-Huguston-Teagulf complex, three to 30 percent slopes) and moderate erosion potential (464 Boltus-Horsley complex, 0 percent to 30 percent slopes).

3.5 WATER RESOURCES

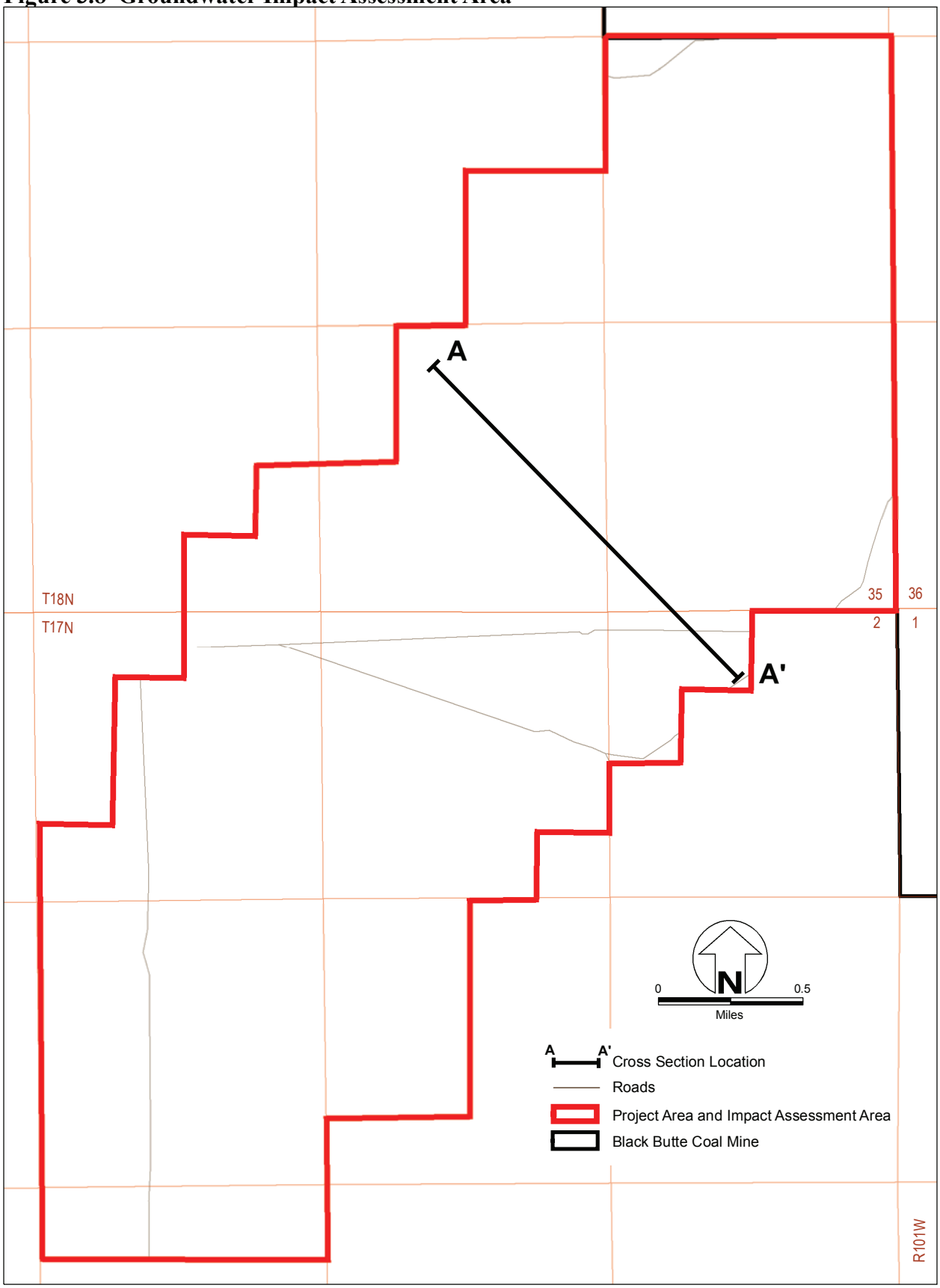
3.5.1 Groundwater Quality and Quantity

The assessment area for groundwater is the project area (**Figure 3.8**). The assessment area is 4,359 acres in size, and includes 2,199.20 acres of BLM-administered land and 2,159.4 acres of private land. Total estimated existing disturbance is three acres or 0.07 percent of the assessment area.

Within the project area there are three potential water bearing geologic units that could be affected by coal mining activities. In descending order of age, the units are alluvial sediments (Quaternary and Recent), the Almond Formation (Cretaceous), and the Ericson Sandstone (Cretaceous) (**Figure 3.4**). The Ericson Sandstone underlies the coal-bearing Almond Formation and is considered since it is the water supply for the Black Butte Mine and is a regionally important aquifer.

WDEQ/WQD classifies groundwater suitability based various constituents and parameters for domestic use (Class I), agricultural use (Class II) and livestock use (Class III) (WDEQ/WQD 2005). The guidelines include standards for total dissolved solids (TDS) concentrations, sodium adsorption ratio (SAR) values, and other constituents. For Class I water, TDS concentrations must be below 500 milligrams per liter

Figure 3.8 Groundwater Impact Assessment Area



(mg/l) and SAR values are not specified. For Class II water, TDS concentrations must be below 2,000 mg/l and SAR values below eight. For Class III water, TDS concentrations must be below 5,000 mg/l and SAR values are not specified.

3.5.1.1 Alluvial Aquifers

In the project area the surface drainages are generally dry washes with thin accumulations of alluvium, colluvium, or slope wash. The alluvial aquifers in the region are laterally discontinuous precluding significant storage and movement of groundwater (Ogle and Wood 2004).

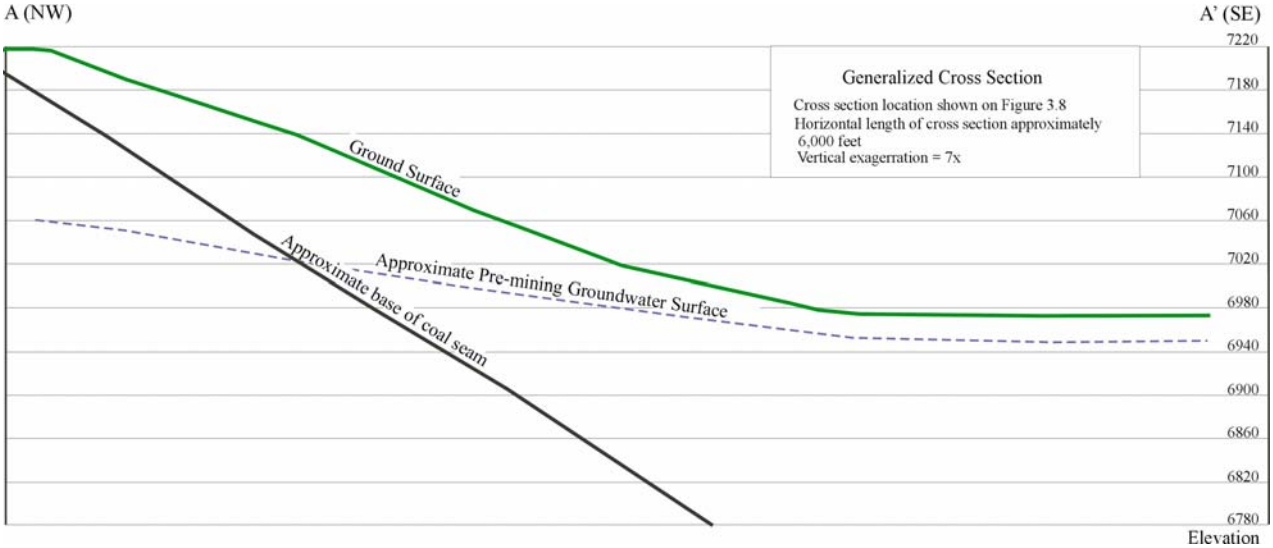
3.5.1.2 Almond Aquifer

The Almond aquifer consists of interbedded sandstones, shales, and coal seams. The formation generally grades from alluvial deposits at the base upward to marines facies. The sandstones in the Almond Formation have limited areal extent and are therefore considered local aquifers. The coal units in the formation have a greater areal extent but have relatively low permeability.

The hydrologic properties of the Almond aquifer are dependent on lithology. Sandstones in the formation have transmissivity ranging from 0.17 ft^2/day to 37.1 ft^2/day and average about 7.0 ft^2/day. Aquifer tests on two wells completed in the Upper Sand unit within the Almond Formation in the vicinity of the project area indicated hydraulic conductivity ranging from 7.7 to 15.7 ft^2/day. Aquifer tests on nine monitoring wells completed in the Coal Seam 2 indicated hydraulic conductivity in the coal units ranges from 0.1 to 2.9 ft^2/day (Ogle and Wood 2004).

The groundwater produced from the Almond Formation is generally a sodium sulfate or sodium bicarbonate type. TDS measurements from groundwater samples from several monitoring wells completed in the Almond Formation at the Black Butte Mine range from 1,500 to 2,300 mg/l and 40 to 70 SAR (Ogle and Wood 2004). The water produced from the formation is generally unsuitable for domestic or irrigation use. The depth to groundwater in two monitoring wells installed in the project area is between 19.6 and 24.1 feet below ground surface (bgs) in well SW-1 and between 79.2 and 80.7 bgs in well SW-2. **Figure 3.9** presents a cross-section of the pre-mine estimated groundwater profile.

Figure 3.9 Cross Section Showing Approximate Pre-mining Groundwater Surface



3.5.1.3 Ericson Aquifer

The Ericson Sandstone is generally made up of massive sandstones and conglomerates in the vicinity of the project area. The unit is up to 700 feet thick and is laterally continuous in the region. It is considered the best aquifer in the area relative to production and water quality (Ogle and Wood 2004).

The water produced from the Ericson Sandstone has a reported TDS range from 500 to 1,200 mg/l. The predominant ions present are calcium, sodium, and sulfate. Wells at the Black Butte Mine exceed Class I and Class II requirements for sulfate, iron and manganese. The water generally falls in the livestock class (Class III) (Ogle and Wood 2004).

3.5.1.4 Groundwater Recharge

Low annual precipitation (8.84 inches) combined with a high annual evaporation rate (45 inches) limits potential aquifer recharge in the project area (USFWS 2002). Recharge occurs primarily in upland areas where bedrock is exposed at or near the ground surface. Groundwater recharge in the vicinity of the Black Butte Mine is estimated to be about 0.01 inch per year (BBCC 2004b) In the project area, the bedrock formations with the greatest potential for groundwater storage and transmission are generally located on the topographic highs further reducing potential recharge by limiting the amount and duration of surface water contact with the formations.

3.5.1.5 Water Rights

A search of groundwater rights by well location was conducted using the Wyoming Sate Engineer's Office records. The search identified five wells in the vicinity of the project area. Two of the wells are Black Butte Mine monitoring wells and are completed 102 and 124 feet bgs. One is listed as a monitoring well with a completion depth of 224 feet bgs. The remaining two are listed as stock/irrigation/domestic use and are reported to be completed 400 feet bgs.

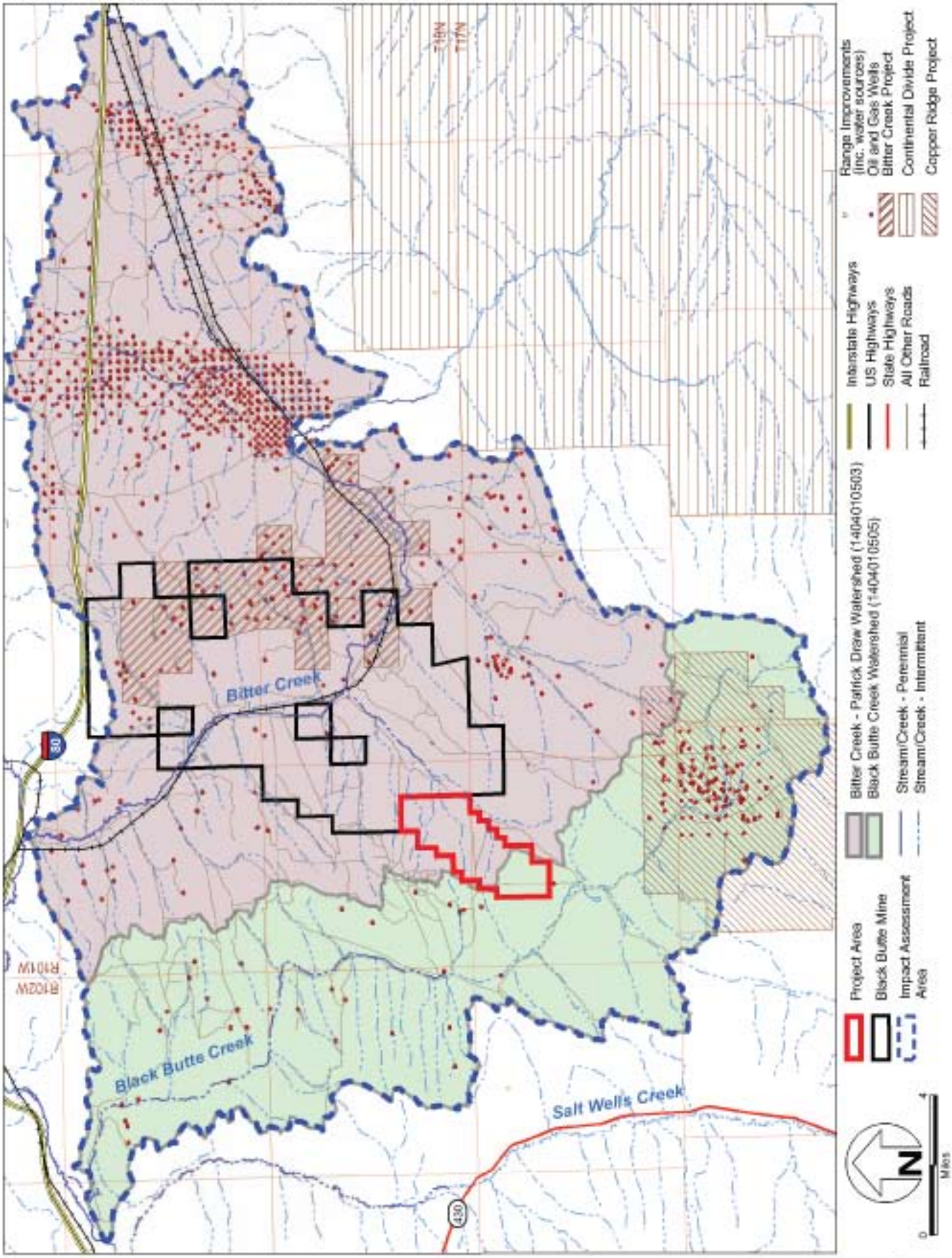
3.5.2 Surface Water Quality and Quantity

The assessment area for surface water includes the two 5th order watersheds that include the project area and the affected portion of the 6th order watershed within the two 5th order watersheds, Bitter Creek – Patrick Draw and Black Butte Creek (**Figure 3.10**). The assessment area is 271,169.23 acres in size, and includes 131,351.02 acres of BLM-administered land, 137,834.22 acres of private land, and 1,983.99 acres of State of Wyoming land. Total estimated existing disturbance is 14,611 acres or 5.39 percent of the assessment area.

The Bitter Creek drainage basin is within the Upper Green River drainage basin, a tributary of the Colorado River. Bitter Creek is considered an intermittent stream that carries water most of the time over most of its length, although there are periods and reaches of no flow. Most flow within the vicinity of the project area occurs in the spring during snowmelt or after storm events. The Bitter Creek watershed (approximately 2,200 square miles) discharges into the Green River near the town of Green River, Wyoming.

Multiple ephemeral stream channels that generally drain to the southeast incise the topography of the project area. No perennial or intermittent streams exist within the project area. Ten ephemeral drainages that flow only in response to rainfall or snowmelt events have been identified within the project area. These drainages have been identified as jurisdictional "Other Waters of the U.S," in accordance with 33 CFR 328.3 (BBCC 2004b). No wetlands or riparian vegetation are associated with these drainages (BBCC 2004b). No wetlands were identified within the project area on the National Wetland Inventory maps. Wetland inventories of the Project Area in 2002 and 2005 did not indicate the presence of

Figure 3.10 Surface Water Locations and Impact Assessment Area



wetlands. The northern portion of the project area drains into an ephemeral stream channel that flows northeast to Bitter Creek.

The southern portion of the project area drains into an ephemeral channel that flows southeast to Black Butte Creek, an intermittent tributary to Bitter Creek. Minor flows from the project area result from snowmelt during the late winter and early spring. More voluminous flows result from rainfall events. No surface water storm event or snowmelt flow gauging has been conducted in the project area.

USGS Gauging Station 09216562, Bitter Creek above Salt Wells Creek near Salt Wells, Wyoming, was maintained from 1975 through 1981. The mean annual streamflow recorded at this location on Bitter Creek, which was immediately upstream of the Salt Wells Creek confluence, ranged from 3.6 cubic feet per second (cfs) (in 1978) to 15.7 cfs (in 1980). The average flow for the record period is 6.4 cfs with an average annual runoff of 4,800 acre-feet. The median unit area annual runoff was 3.5 acre-feet per year. The minimal flow for the record period was 0 cfs. Instantaneous peak discharges at this site ranged from 280 cfs (in 1980) to 888 cfs (in 1979).

Surface water samples collected at the gauging station indicate that the water quality in Bitter Creek downstream of the project area is generally suitable for livestock. The water quality of Bitter Creek over the six-year period studied is classified as sodium sulfate type with an average TDS concentration of 3,670 mg/l, average total suspended solids (TSS) concentration of 5,130 mg/l and average sodium and sulfate concentrations of 720 mg/l and 1,780 mg/l, respectively (Ogle and Wood 2004). Bitter Creek is classified as a non-game fishery (Class 2C) and is listed as a 303(d) impaired water body (due to fecal coliform and chlorides) downstream of the project area below the confluence with Killpecker Creek, over 40 miles west of the project area (WDEQ 2004b).

3.6 VEGETATION

The assessment area for vegetation, including special status plants and invasive species, is the project area (**Figure 3.11**). The assessment area is 4,359 acres in size, and includes 2,199.20 acres of BLM-administered land and 2,159.40 acres of private land. Total estimated disturbance is three acres or 0.07 percent of the assessment area.

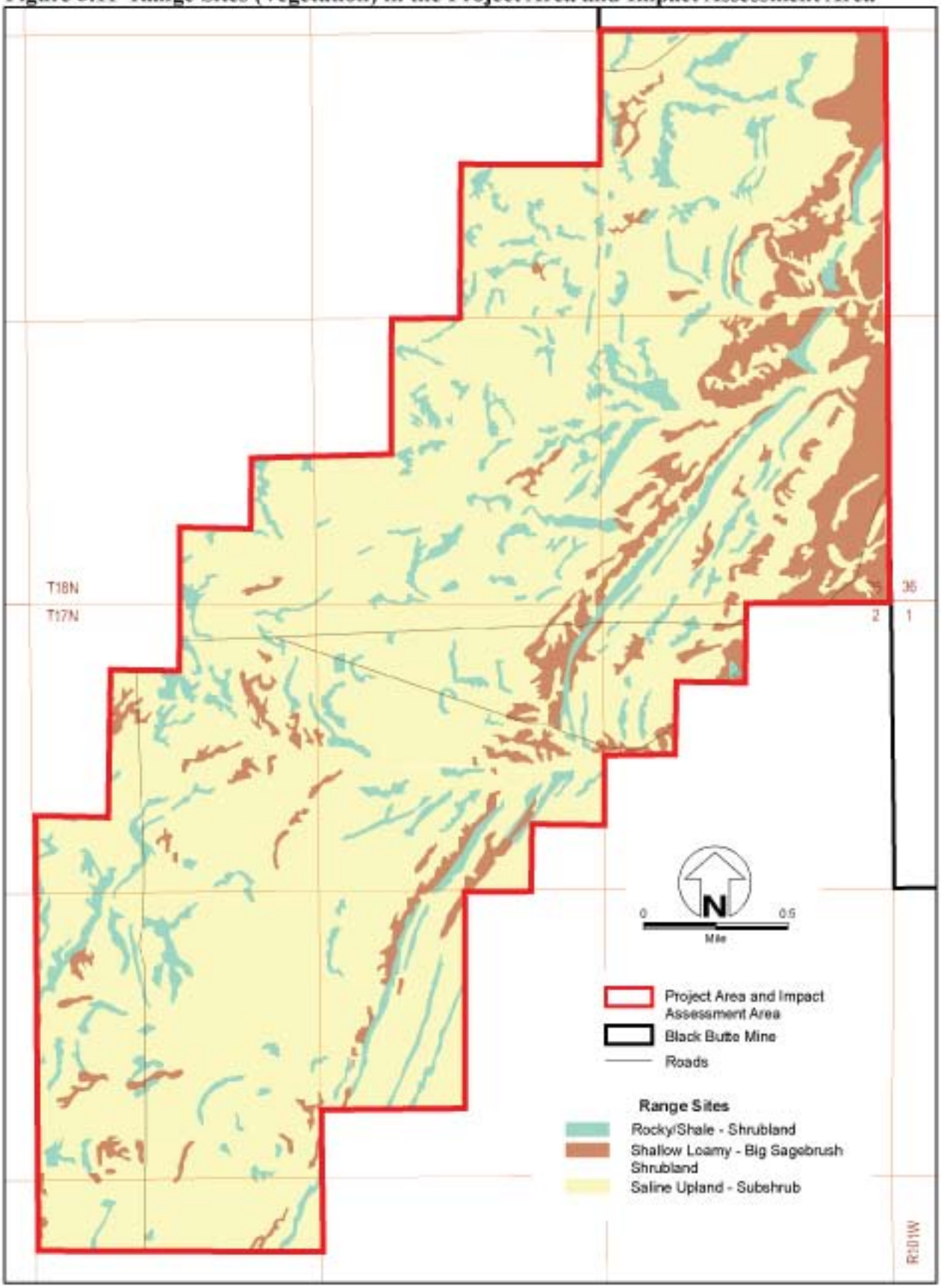
3.6.1 Vegetation Range Sites

A vegetation inventory of cover and production within the project area was conducted in 2001 and 2002 (**Figure 3.11**). Three vegetation types (hereafter referred to as range sites) occur within the project area including shallow loamy - big sagebrush shrubland, saline upland - subshrub, and rocky/shale - shrubland (BBCC 2004c). These range sites, and their associated acreages and percentages, are listed in **Table 3.14**. No wetland or riparian vegetation is associated with the ephemeral drainages within the project area (BBCC 2004a; 2004b). Accordingly, wetlands and riparian areas are not further discussed in this document.

Table 3.14 Range Sites Found Within the Project Area

Range Site	Approximate Acres	Approximate Percentage of the Project Area
Shallow Loamy - Big Sagebrush Shrubland	3,429	80
Saline Upland - Subshrub	478	10
Rocky/Shale - Shrubland	452	10
Total	4,359	100
Source: BBCC 2004b		

Figure 3.11 Range Sites (Vegetation) in the Project Area and Impact Assessment Area



3.6.1.1 Shallow Loamy - Big Sagebrush Shrubland

The shallow loamy - big sagebrush shrubland range site is comprised of approximately 60 percent shrubs, 29 percent perennial grasses, six percent perennial forbs, four percent subshrubs, and less than one percent each of annual grasses and annual forbs (BBCC 2004b). The dominant shrub species is big sagebrush (*Artemisia tridentata*), and associated shrub species include Douglas rabbitbrush (*Chrysothamnus viscidiflorus*) and spiny hopsage (*Grayia spinosa*). Dominant perennial grasses and forbs include western wheatgrass (*Agropyron smithii*), Sandberg bluegrass (*Poa secunda*), Indian ricegrass (*Oryzopsis hymenoides*), and Hood's phlox (*Phlox hoodii*). Annual vegetation production was the lowest of all three range sites for shallow loamy – big sagebrush shrubland, and dominated by perennial grasses (BBCC 2004b).

3.6.1.2 Saline Upland - Subshrub

The saline upland - subshrub range site is comprised of approximately 58 percent subshrubs, 36 percent perennial grasses, two to three percent each of perennial forbs and shrubs, and one percent succulents (BBCC 2004b). Dominant subshrub species include Gardner's saltbush (*Atriplex gardneri*), fringed sagebrush (*Artemisia frigida*), and winterfat (*Krascheninnikovia lanata*). Dominant perennial grasses include Sandberg bluegrass, western wheatgrass, and Indian ricegrass. The succulent is an *Opuntia* species. Annual vegetation production was the highest of all three range sites for saline upland - subshrub, and dominated by subshrubs (BBCC 2004b).

3.6.2 Rocky/Shale - Shrubland

The rocky/shale - shrubland range site is comprised of approximately 38 percent shrubs, 36 percent perennial grasses, 13 percent perennial forbs, 12 percent subshrubs, and less than one percent each of annual forbs and succulents (BBCC 2004b). The dominant shrub species is big sagebrush, and associated shrub species include Douglas rabbitbrush and shadscale (*Atriplex confertifolia*). Dominant perennial grasses include bluebunch wheatgrass (*Agropyron spicatum*), Sandberg bluegrass, western wheatgrass, and Indian ricegrass. Dominant perennial forbs include Hooker's sandwort (*Arenaria hookeri*) and tufted milkvetch (*Astragalus spatulatus*), while dominant subshrub species include Gardner's saltbush and fringed sagebrush. The succulents were an *Opuntia* species. Annual vegetation production was the second highest of all three range sites for rocky/shale – shrubland, and split almost evenly by perennial grasses and subshrubs (BBCC 2004b).

3.6.3 Special Status Plant Species

The BLM identified four plants with potential to occur within the project area. These species include one federally threatened species, the Ute ladies'-tresses (*Sprinathes diluvialis*), and three BLM sensitive plants species, including the Nelson's milkvetch (*Astragalus nelsonianus*), Ownbey's thistle (*Cirsium ownbeyi*), and Wyoming tansymustard (*Descurainia torulosa*).

Nelson's milkvetch occurs on poorly developed soils and on erodible alkaline slopes, shale bluffs, ridgetops, gullies and flats. The known Wyoming occurrences are found in sparsely vegetated sagebrush plant communities at elevations of 5,200 to 7,600 feet (Heidel 2003). Ownbey's thistle is found on similar sparsely vegetated slopes in juniper and sagebrush communities (Wyoming Rare Plant Technical Committee 1994). Suitable riparian and wet meadow habitat for the Ute ladies'-tresses does not occur within the project area, and Wyoming tansymustard occurs only at high elevations (8,300 to 10,000 feet), much higher than the project area (Wyoming Rare Plant Technical Committee 1994).

Vegetation surveys in 2001 and 2002, and wetland inventories in 2002 and 2005 did not indicate the presence of any of these special status plants. In coordination with the Wyoming Natural Diversity

Database (WNDD) via letter dated July 12, 2005 (**Appendix H**), BLM has concluded that no special status plant species occur within the project area.

Because special status plant species were not found during site-specific inventories, they are not affected or impacted. Therefore, this resource is dropped from further consideration.

3.6.4 Invasive Species

Three species of noxious weeds were observed during vegetation inventories conducted in 2001 and 2002 (BBCC 2004b). Canada thistle (*Cirsium arvense*), perennial pepperweed (*Lepidium latifolium*), and black henbane (*Hyoscyamus niger*) are currently found within the project area. Black henbane is included on Wyoming's 2005 Declared Weed and Pest List (Wyoming Weed and Pest Council 2005). Noxious weeds are not abundant within the project area (BBCC 2004c).

3.7 WILDLIFE AND FISHERIES

For the purpose of this document, wildlife and fisheries refers to both general and special status wildlife and fisheries. General wildlife and fisheries refers to species or groups of species that do not have federal status (as defined in the BLM 6840 Manual, including ESA-related species) but may have other federal or state protection (e.g., under the federal Migratory Bird Treaty Act) and are of concern to management authorities, Native American tribes, the general public, or groups (e.g., birders, hunters, etc.) with particular interest in a species. Special status refers to ESA-related species and BLM sensitive species.

Wildlife and fisheries groups considered in this document include big game, raptors, special status (ESA-related and BLM sensitive) wildlife species, and fisheries.

Amphibians are found in and adjacent to aquatic habitats including wetlands, rivers and streams, mountain lakes, run-off pools in rock formations, and both ephemeral and permanent livestock watering ponds. Water sources are lacking within the area of project area, and limited within the assessment area as a whole. Accordingly, it is unlikely that amphibians are found within the project area. Therefore, they are not further discussed. Five migratory species (four passerines and one raptor) listed by the BLM as sensitive, or wildlife of special concern, have been identified in the project area and are discussed further in the special status species analysis in Section 3.7.3.1. Numerous raptor species identified through annual raptor monitoring have been identified as well. These species are discussed in Section 3.7.2 (Raptors).

3.7.1 Big Game

Three big game species are known to occur within the project area including the pronghorn (*Antilocapra americana*), mule deer (*Odocelius hemonius*), and elk (*Cervus elaphus*). Big game populations are managed by the WGFD, which delineates two scales of management units including herd units and hunt areas. Herd units, the larger of the two, encompass most of the year-long seasonal use ranges for particular herds. The smaller hunt areas are administratively designated, found within herd units, and are the level at which site-specific harvest regulations are managed.

In addition to management units, WGFD has designated seasonal use ranges. Five big game seasonal use ranges occur within the vicinity of the project area, including yearlong, winter/yearlong, crucial winter/yearlong, crucial winter, and undetermined. Definitions of the terms used to designate these seasonal use ranges follow:

- Spring/Summer/Fall – Spring/Summer/Fall seasonal use areas are occupied during spring calving, summer feeding, and/or fall breeding. In the Green River RMP and ROD (BLM 1997), big game calving and fawning areas are protected to ensure continued utilization by limiting disruptive activities in seasons critical for big game, and limiting the amount of habitat that is disturbed.

- Yearlong - Yearlong ranges (yearlong, winter/yearlong, crucial winter/yearlong) are occupied throughout the year and there is not an influx of additional animals from other areas in the winter.
- Crucial - Crucial range (crucial winter/yearlong and crucial winter) has been documented as a determining factor in a population's ability to maintain itself at a specified level (theoretically, at or above the population objective) over the long term. The BLM considers all state-designated crucial ranges to be high-value habitat, and the Green River RMP and ROD (BLM 1997) provides seasonal restrictions and rehabilitation standards for these habitats.
- Crucial Winter – Crucial winter range is an area that is available, relatively intact, and supports most of the local population at its target abundance and in adequate body condition. These areas are typically used eight or more out of 10 winters (BLM 1997). In the Green River RMP and ROD (BLM 1997), big game crucial winter ranges are protected to ensure continued utilization by limiting disruptive activities during critical seasons of big game use and limiting the amount of habitat that is disturbed.
- Undetermined – Undetermined areas have not been evaluated for their seasonal importance to population maintenance.

3.7.1.1 Pronghorn

The assessment area for pronghorn is the affected habitat in the project area, in the Bitter Creek Herd Unit (Herd Unit 414) (**Figure 3.12**). The assessment area is 1,603,167 acres, and includes 1,075,789.95 acres of BLM-administered land, 501,967.71 acres of private land, and 25,409.34 acres of State of Wyoming land. Total estimated existing disturbance is 35,083 acres or 2.19 percent of the assessment area.

The Bitter Creek Herd Unit includes 1,835,828 acres of habitat (WGFD 2003), and the population objective of 6,500 animals (WGFD 2004). The 2003 post-hunt population estimate was 4,900 (WGFD 2004). The entire project area is winter/yearlong pronghorn range, which accounts for 0.5 percent of the total assessment area winter/yearlong range within the Bitter Creek Herd Unit. Though no designated crucial winter range or calving areas have been identified for pronghorn within the project area, crucial winter/yearlong range for the pronghorn occurs does occur within the assessment area (**Figure 3.12**).

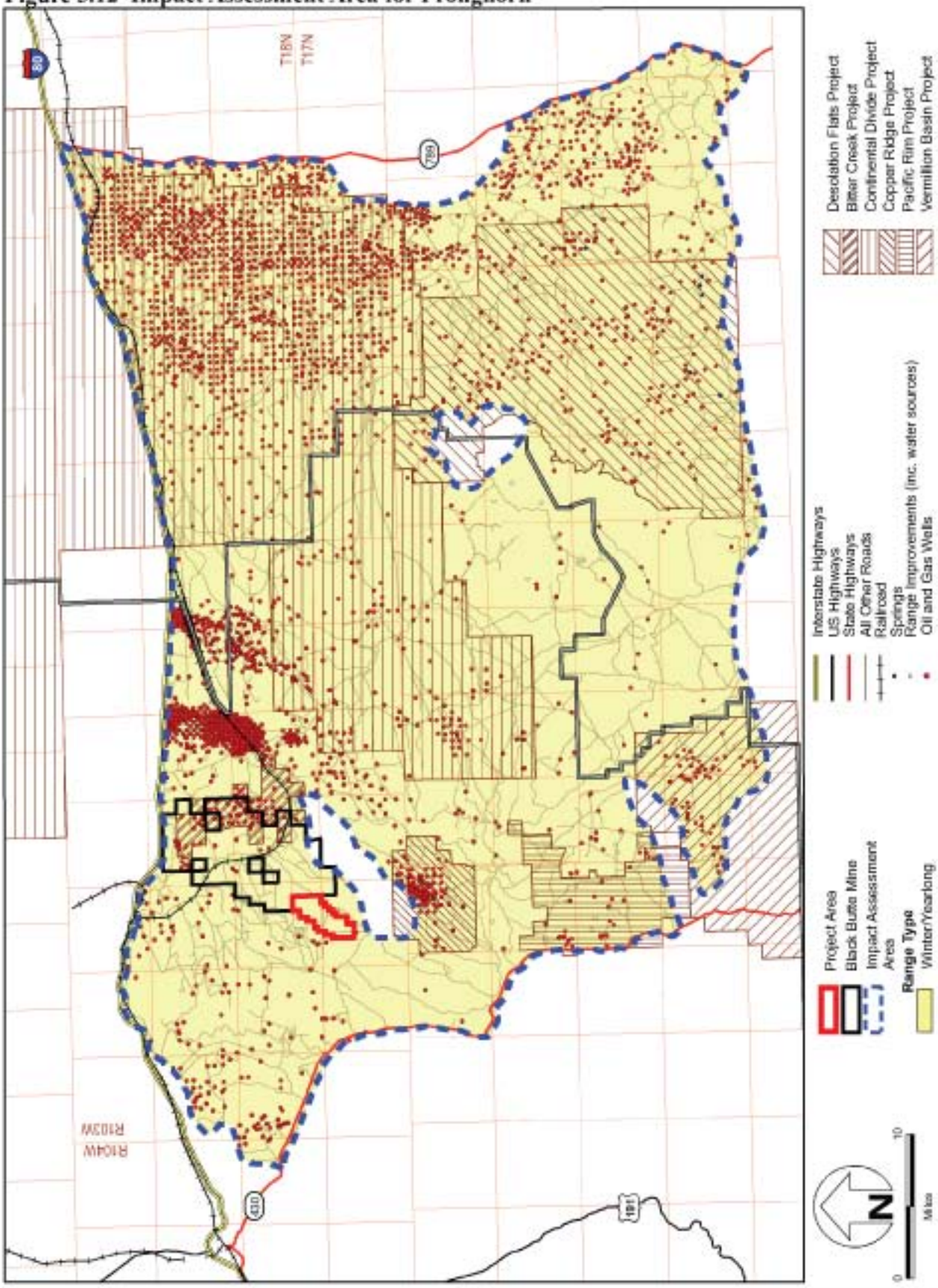
3.7.1.2 Mule Deer

The assessment area for mule deer is the affected habitat, as it occurs in the project area, in the South Rock Springs Herd Unit (Herd Unit 424) (**Figure 3.13**). The assessment area is 1,134,282 acres, and includes 752,877.12 acres of BLM-administered land, 22,567.53 acres of Forest Service-administered land, 306,198.39 acres of private land, 1,217.99 acres of open water, and 51,420.96 acres of State of Wyoming land. Total estimated existing disturbance is 14,108 acres or 1.24 percent of the assessment area.

This entire South Rock Springs Herd Unit includes 1,378,461 acres of habitat, with a population objective of 11,750 mule deer (WGFD 2004). Animals in this migratory herd move between Wyoming, Colorado, and Utah. Accordingly, it is difficult to estimate abundance of the Wyoming portion of the population. However, the 2003 post-hunt population estimate was approximately 7,200 mule deer (WGFD 2004).

The entire project area provides mule deer habitat, including crucial winter/yearlong and winter/yearlong seasonal use ranges. One-quarter (approximately 25.3 percent or 1,102.7 acres) of the project area (along the western portion) is classified as crucial winter/yearlong range. The remaining portion of the project area (approximately 74.7 percent or 3,256.3 acres) is classified as winter/yearlong range. Together, these designated habitats within the project area comprise less than one percent of the crucial winter/yearlong, and winter/yearlong range within the South Rock Springs Herds Unit. No designated mule deer fawning areas have been identified within the project area.

Figure 3.12 Impact Assessment Area for Pronghorn



3.7.1.3 Elk

The assessment area for elk is the affected undetermined habitat, as it occurs in the project area, in the entire Petition Herd Unit (Herd Unit 430) (**Figure 3.14**). The assessment area is 1,453,728 acres, and includes 933,993.63 acres of BLM-administered land, 499,561.00 acres of private land, and 20,173.37 acres of State of Wyoming land. Total estimated existing disturbance is 18,574 acres or 1.28 percent of the assessment area.

The Petition Herd Unit (Herd Unit 430) for elk includes 903,863 acres of habitat within the assessment area. The population objective has been determined to be 300 elk (WGFD 2004). The 2003 post-hunt population estimate was 300 elk (WGFD 2004). Elk in the Petition Herd Unit consist of isolated groups that use higher elevation ridges and adjacent habitats within a matrix of desert. Because the animals are spread out over a large area, and a portion of the migratory herd intermixes with animals in Colorado, this population size is difficult to estimate.

The project area accounts for 0.6 percent of the total 1,453,728 acres of undetermined elk habitat within the Petition Herd Unit. No designated crucial winter range or calving areas have been identified for elk within the project area.

3.7.2 Raptors

The assessment area for raptors (birds of prey) comprises the project area, the existing Black Butte Mine, and a two-mile buffer (**Figure 3.15**). The assessment area is 107,860 acres in size, and includes in this area are 53,006.11 acres of BLM-administered land, 54,694.31 acres of private land, and 159.39 acres of State of Wyoming land. Total estimated existing disturbance is 9,812 acres or 9.10 percent of the assessment area.

Raptors found in and around the project area include hawks, eagles, falcons, and owls. These species inhabit a variety of ecosystems and consume a wide range of prey species. Some raptor species and individual pairs are sensitive to disturbance from human and other sources, particularly during the breeding season. Accordingly, raptors are protected from disturbance by the following federal acts: the Migratory Bird Treaty Act of 1918, Eagle Protection Act of 1962 (as amended), and ESA of 1973 (as amended; for federally listed species only). In addition, the BLM has developed spatial buffers designated to protect raptors during nesting, usually between February 1 and July 31. For bald eagles and ferruginous hawks, the buffer is one mile; for all other raptors, the buffer is 0.5 mile (Dunder 2005a).

For proposed disturbances occurring outside of the nest-building and incubation period, a No Surface Occupancy stipulation is applied within 1,968 feet of any active golden eagle nest, 1,313 feet of active ferruginous hawk nests, and 815 feet for all other active raptor nests (Dunder 2005a).

Raptor monitoring by BBCC for the Black Butte Mine permit area has been ongoing for approximately 30 years. The BBCC Raptor Protection and Mitigation Plan for the existing Black Butte Mine permit area (approved by the USFWS, BLM, WGFD, and Wyoming DEQ/LQD), is based upon a regional Raptor Special Studies Plan developed in the 1980s by USFWS and WGFD. This plan currently requires raptor monitoring within the Black Butte Mine permit area and adjacent proposed Pit 14 Coal LBA. Monitoring includes nest monitoring, territory assessment, and prey-base analysis.

Table 3.15 and **Table 3.16** list the nesting raptor species, and number of active nests per year, that have been recorded within the vicinity of the project area (BBCC 2004d). Confirmed raptor species actively nesting within the vicinity of the project area are shown on **Figure 3.15**. It should be noted that an active nest in a given year may or may not be the same active nest in a subsequent year. An active nest refers to a nesting attempt, regardless of success, that took place in any of 2003, 2004, or 2005.

Figure 3.13 Impact Assessment Area for Mule Deer

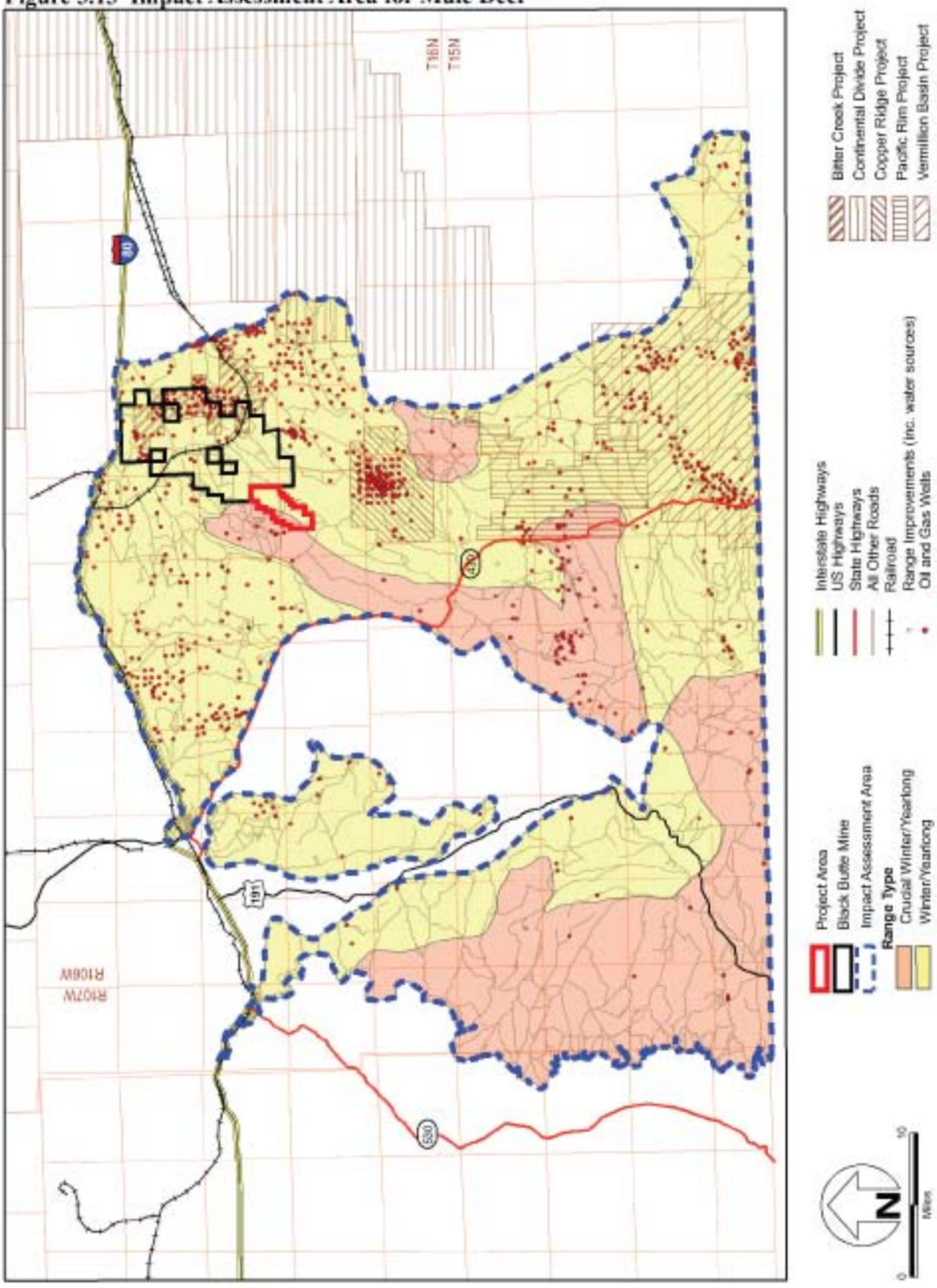


Figure 3.14 Impact Assessment Area for Elk

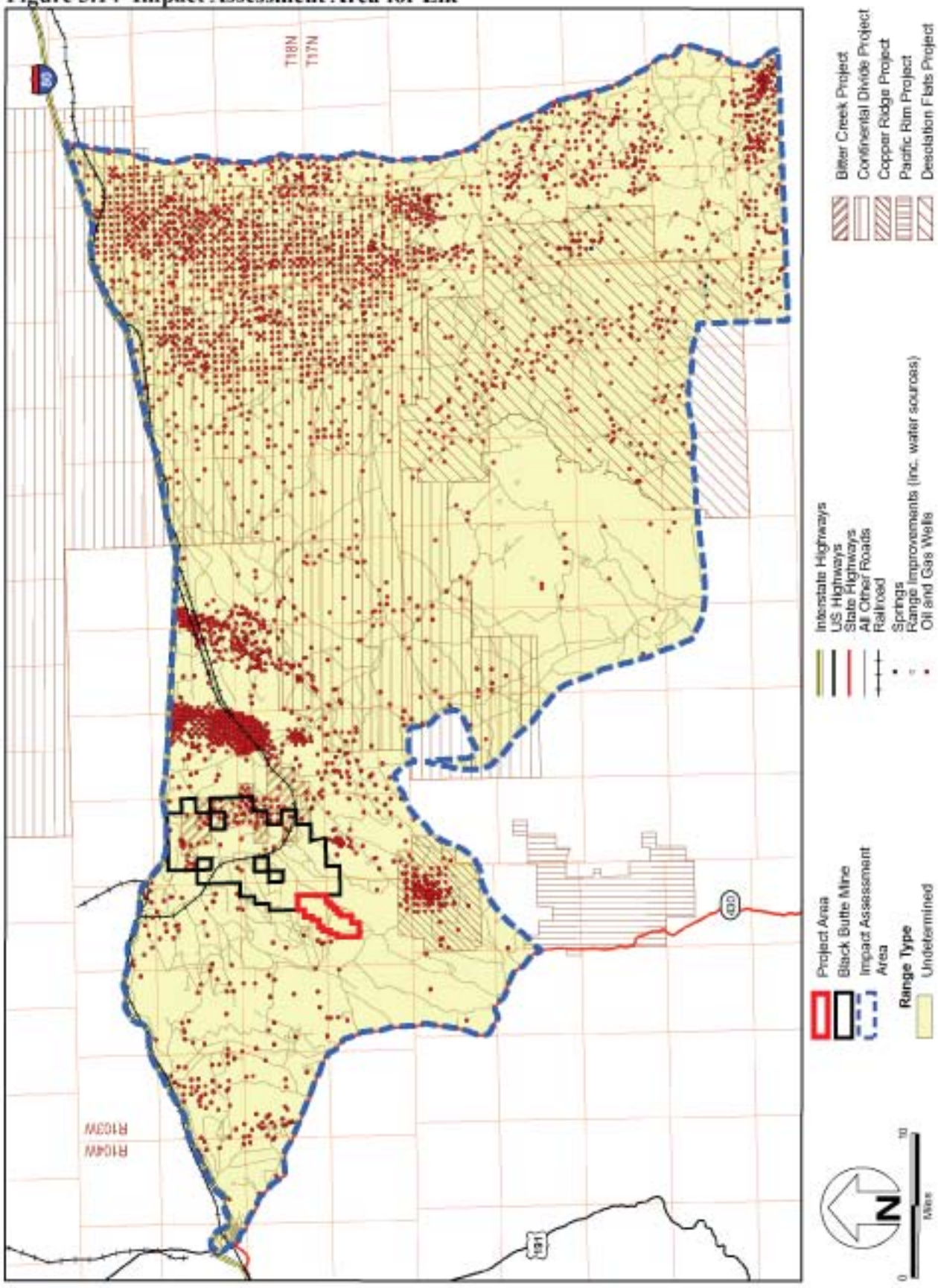


Figure 3.15 Known Active Raptor Nests in the Raptor Impact Assessment Area

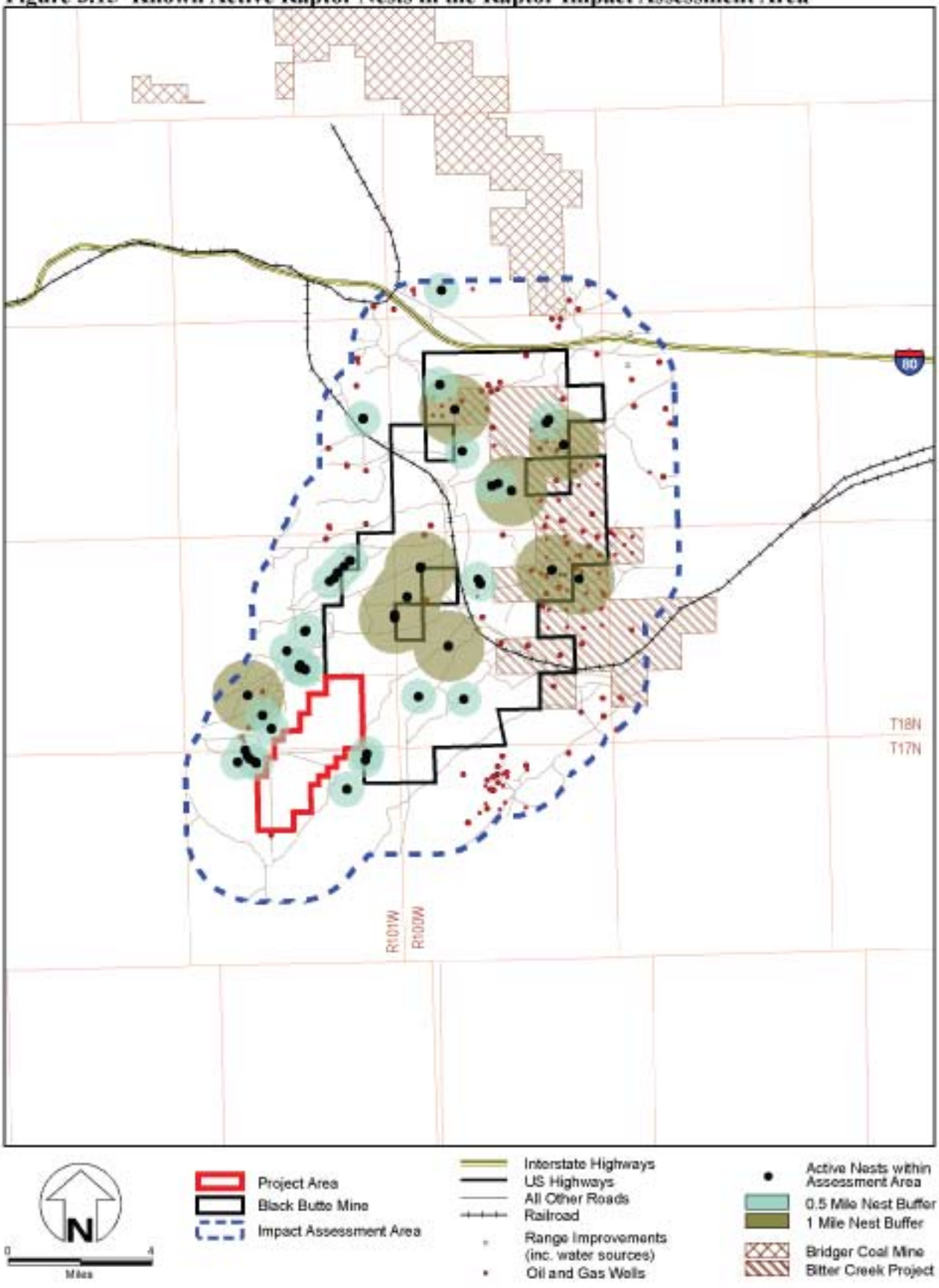


Table 3.15 Active Raptor Nests within the Project Area

Species of Raptor		Number of Active Nests		
		2003	2004	2005
Golden Eagle	*Aquila chrysaetos*	2	1	2
Prairie Falcon	*Falco mexicanus*	2	2	2
Red-tailed Hawk	*Buteo jamaicensis*	1	2	3
Great Horned Owl	*Bubo virginianus*	1	0	1
American Kestrel	*Falco sparverius*	1	1	1

Table 3.16 Active Raptor Nests within the Assessment Area

Species of Raptor		Number of Active Nests		
		2003	2004	2005
Golden Eagle	*Aquila chrysaetos*	6	4	13
Prairie Falcon	*Falco mexicanus*	2	2	7
Ferruginous Hawk	*Buteo regalis*	5	8	5
Red-tailed Hawk	*Buteo jamaicensis*	3	4	12
Great Horned Owl	*Bubo virginianus*	1	0	2
American Kestrel	*Falco sparverius*	5	5	8
Unknown		0	1	0

3.7.3 Special Status Wildlife and Fisheries Species

Eleven special status wildlife species with potential to occur within the sagebrush-steppe habitats within the project area, and two special status fish species that may be present within watersheds in the project area are included in **Table 3.17**. These species are listed as wildlife species of concern by the BLM in Wyoming. Several special status species will not be further discussed due to the relative improbability of occurrence within the project area and assessment areas, or the likelihood of negligible effect on them. These species and the reason for dismissal are presented in **Table 3.18**.

The assessment areas for special status wildlife and fish species vary by species. The following BLM-sensitive species have been carried forward for analysis: migratory birds (sage sparrow, Brewer's sparrow, loggerhead shrike, and sage thrasher), ferruginous hawk, greater sage-grouse, mountain plover, burrowing owl, pygmy rabbit, white-tailed prairie dog, swift fox, and fisheries. No ESA-related species have been carried forward for analysis.

The assessment area for the sage sparrow, Brewer's sparrow, loggerhead shrike, and sage thrasher is the project area. The assessment area is 4,359 acres in size, and includes 2,199.20 acres of BLM-administered land and 2,159.40 acres of private land. Total estimated existing disturbance is three acres or 0.07 percent of the assessment area.

The assessment area for the ferruginous hawk comprises the project area and existing Black Butte Mine, plus a two-mile buffer. The assessment area is 107,860 acres, and includes 53,006.11 acres of BLM-administered land, 54,694.31 acres of private land, and 159.39 acres of State of Wyoming land. Total estimated existing disturbance is 9,812 acres or 9.10 percent of the assessment area.

Table 3.17 Wildlife Species of Concern with Potential to Occur in the Project Area

Species Common Name	Scientific Name
Birds	
Sage Sparrow	*Amphisiza belli*
Burrowing Owl	*Athene cunicularia*
Ferruginous Hawk	*Buteo regalis*
Greater Sage-Grouse	*Centrocercus urophasianus*
Mountain Plover	*Charadrius montanus*
Loggerhead Shrike	*Lanius ludovicianus*
Sage Thrasher	*Oreoscoptes montanus*
Brewer's Sparrow	*Spizella breweri*
Mammals	
Pygmy Rabbit	*Brachylagus idahoensis*
White-Tailed Prairie Dog	*Cynomys leucurus*
Swift Fox	*Vulpes velox*
Fish	
Bluehead sucker	*Catostomus discobouls*
Flannelmouth sucker	*Catostomus latipinnis*

Table 3.18 Special Status Species Eliminated From Detailed Analysis

Species	Scientific Name	Reason Eliminated
Bald Eagle	*Haliaeetus leucocephalus*	The bald eagle, a federally threatened species, is not known to nest or roost within the project area, and the lack of suitable nesting or winter roosting habitat likely precludes the use of this area for such activities by bald eagles. Accordingly, the bald eagle is not further discussed. The Green River, Flaming Gorge Reservoir, Big Sandy Reservoir, and Seedskadee National Wildlife Refuge provide the nearest favorable nesting, roosting, and foraging habitat for bald eagles. The nearest of these areas is the Green River, approximately 30 miles west of the project area. Bald eagles were observed by BLM staff foraging around 10-Mile Marsh (approximately 17 miles north of the project area) during the winter of 1978 (Dunder 2005b).
Black-Footed Ferret	*Mustela nigripes*	The project area was surveyed for white-tailed prairie dog colonies (i.e., potentially suitable habitat for the federally endangered black-footed ferret) in 2001 and 2002. Several active colonies were identified. Although potentially suitable habitat for the black-footed ferret may occur within these towns, no black-footed ferret individuals or sign were observed during the prairie dog surveys (BBCC 2004e).This portion of Wyoming has been cleared by the USFWS so that no black-footed ferret surveys are required in order to assure their lack of occurrence. Therefore, the black-footed ferret is not discussed further.
Long-Billed Curlew	*Numenius americanus*	The long-billed curlew is often found in grassland habitat throughout the arid west (Kaufman 1996). A limited amount of potentially suitable habitat exists within the project area. No curlews were observed during baseline wildlife inventories that were conducted in 2001 and 2002 (BLM 2005c).
Dwarf Shrew	*Sorex nanus*	The dwarf shrew is found in woodland, grassland, and tundra, feeding primarily upon insects, worms, and other invertebrates (UDWR 2005a). The dwarf shrew is common within the project area (Dunder 2005d). However, to the extent that suitable habitat is available surrounding the project area and assessment areas, any effect on this species would be negligible.

Table 3.18 (cont.) Special Status Species Eliminated From Detailed Analysis

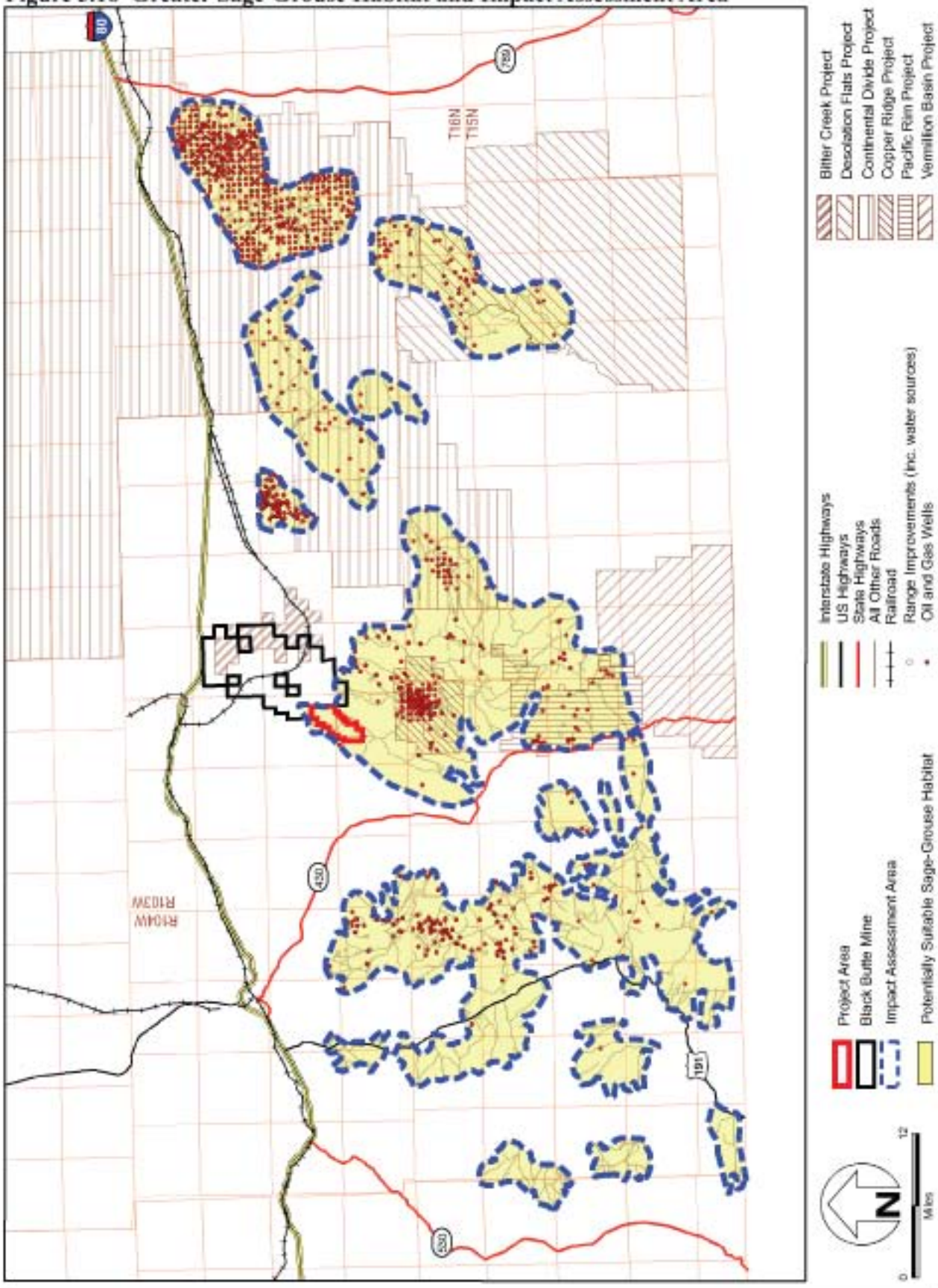
Species	Scientific Name	Reason Eliminated
Long-Eared Myotis	*Myotis evotis*	The long-eared myotis is found in a variety of habitats throughout the western U.S. (Harvey et al. 1999). The long-eared myotis is common within the project area (Dunder 2005d). However, to the extent that suitable habitat is available surrounding the project area and assessment areas, effects on this species would be negligible.
Fringed Myotis	*Myotis thysanodes*	The fringed myotis is found most commonly in oak and pinyon woodlands throughout the western U.S. (Harvey et al. 1999). The WNDD database shows no records of occurrence of the fringed myotis within the project area.
Spotted Bat	*Euderma maculatum*	The spotted bat is found in a variety of habitats throughout the western U.S. It is most closely associated with rough, rocky, arid, and semi-arid terrain (Harvey et al. 1999). The WNDD database, show no records of occurrence of the spotted bat within the project area.
Townsend's Big-Eared Bat	*Plecotus townsendii*	The Townsend's big-eared bat is found in cool, well-ventilated caves and mines throughout the western U.S. (Harvey et al. 1999). The WNDD database shows no records of occurrence of the Townsend's big-eared bat within the project area.
Wyoming Pocket Gopher	*Cratogeomys clusius*	The Wyoming pocket gopher prefers loose, gravelly, upland soils associated with greasewood (Smithsonian 2005). The Wyoming pocket gopher is common within the project area (Dunder 2005d). However, to the extent that suitable habitat is available surrounding the project and assessment areas, effects would be negligible.
Great Basin Spadefoot Toad	*Spea intermontana*	The Great Basin spadefoot toad prefers drier habitats than most amphibians and is found in grassland and open woodland with loose soils for burrowing. It does need a water source for breeding, so potentially suitable habitat is limited to that found near water (Ministry of Environment 2005). This toad is common within the project area and to the extent that suitable habitat is available surrounding the project area and assessment areas (Dunder 2005d), effects on this species would be negligible.
Spotted Frog	*Rana luteiventris*	The spotted frog is an aquatic specialist and is more dependent upon permanent aquatic habitats than other frogs in the same genus (*Federal Register* 2002). Aquatic habitats may include ponds, streams, lakes, and springs adjacent to conifer and subalpine forest, grassland, and shrubland (*Federal Register* 2002). The WNDD database shows no records of occurrence of the spotted frog within the project area.
Northern Leopard Frog	*Rana pipiens*	The northern leopard frog is found in a variety of aquatic habitats, particularly near cattails and other aquatic vegetation. However, it may be found foraging relatively far from water sources. During the cold winter months, this species is inactive and remains sheltered under water or in damp burrows (UDWR 2005b). The WNDD database shows no records of occurrence of the northern leopard frog within the project area.

The assessment area for the greater sage-grouse includes potentially suitable habitat within the following borders: Interstate 80 on the north, the Wyoming/Colorado state line on the south, the Baggs Road on the east, and Flaming Gorge Reservoir and the Green River on the west (**Figure 3.16**). The assessment area is 711,526 acres, and includes 443,365.57 acres of BLM-administered land, 10,054.49 acres of Forest Service-administered land, 231,617.60 acres of private land, and 26,488.34 acres of State of Wyoming land. Total estimated existing disturbance is 13,830 acres or 1.94 percent of the assessment area.

The assessment area for the mountain plover, burrowing owl, pygmy rabbit, white-tailed prairie dog, and swift fox is the project area. The assessment area is 4,359 acres in size and includes 2,199.20 acres of BLM-administered land and 2,159.40 acres of private land. Total estimated existing disturbance is three acres or 0.07 percent of the assessment area.

The assessment area for fisheries comprises the project area, existing Black Butte Mine, and the combined Black Butte Creek and Bitter Creek – Patrick Draw fifth order watersheds. The assessment area

Figure 3.16 Greater Sage-Grouse Habitat and Impact Assessment Area



is 271,169.23 acres, and includes 131,351.02 acres of BLM-administered land, 137,834.22 acres of private land, and 1,983.99 acres of State of Wyoming land. Total estimated existing disturbance is 14,611 acres or 5.39 percent of the assessment area.

3.7.3.1 Special Status Migratory Birds

Migratory birds travel from one region to another, usually annually, for breeding or feeding purposes. Generally, they nest in temperate North America and over-winter in the New World tropics, including portions of Mexico and Latin America. Migratory birds represent a diversity of species, including shorebirds, waterfowl, passerines (perching birds), and raptors. Migratory birds may nest in any or all of the vegetation types within the project area, though habitat for shorebirds and waterfowls is nonexistent within the project area. Sagebrush-steppe habitat within the project area does provide nesting and foraging habitat for a variety of migratory birds in the project area.

The sage sparrow, Brewer's sparrow, loggerhead shrike, and sage thrasher are associated with large expanses of sagebrush, grasslands in the open desert and along foothills characteristic of the project area (Kaufman 1996). Each of these species utilizes the sagebrush-steppe habitats in different ways. The sage sparrow and Brewer's sparrow are generalists and utilize a wide-array of habitat within sagebrush and grassland communities. The loggerhead shrike requires open country with hunting perches such as posts, wires, trees, etc. where is feeds primarily on small birds, rodents, and large insects. The sage thrasher is sagebrush-obligate and therefore, prefers areas dominated by heavy concentrations of mature sagebrush (Kaufman 1996).

Surveys for migratory birds, and surveys along designated transects for migratory birds of high federal interest have been conducted by BBCC in accordance with WDEQ/LQD mine permit requirements for the Black Butte Mine, and as approved by the USFWS (BBCC 2005b). These four species were observed during baseline inventories conducted in the vicinity of the Black Butte Mine and the project area in 2001and 2002 (BBCC 2004e). During surveys conducted by BBCC in the Black Butte Mine area and project area, no migratory birds of high federal interest were identified (BBCC 2005b), nor were these four species identified within the project area.

3.7.3.2 Burrowing Owl

The burrowing owl is a long-legged owl that inhabits open grassland and disturbed areas. It often lives in abandoned prairie dog burrows, is diurnal, and eats mostly insects and small mammals (Kaufman 1996). In surveys conducted during the summer of 2005 by BBCC in accordance with WDEQ/LQD mine permit requirements for the Black Butte Mine, and as approved by the USFWS (BBCC 2005b), five active burrowing owl locations within active prairie dog towns were observed on the existing Black Butte Mine. Prairie dog towns and burrowing owl presence were not observed within the project area.

3.7.3.3 Ferruginous Hawk

The ferruginous hawk is a raptor that inhabits semi-arid and arid landscapes of the western U.S., and feeds on small to medium-sized prey (Kaufman 1996). The entire project area is suitable ferruginous hawk habitat for foraging, nesting, and roosting. As discussed in the raptors subsection, above, surveys for this hawk and other raptors have been ongoing for approximately 30 years. During the 2003, 2004, and 2005 surveys conducted by BBCC in accordance with WDEQ/LQD mine permit requirements for the Black Butte Mine, and as approved by the USFWS (BBCC 2005b), no active ferruginous hawk nests were found within the project area. However, five active nests in 2003, eight active nests in 2004, and five active nests in 2005 were identified within the two-mile buffer of the project area.

3.7.3.4 Greater Sage-Grouse

Approximately 80 percent of the project area consists of sagebrush-dominant habitats. The greater sage-grouse, primarily found within this habitat, relies upon sagebrush for food (leaves and buds), shelter and nesting. Strutting grounds (or leks), nesting and brood-rearing sites, or wintering locations, consist of a single area or many smaller areas distributed throughout sagebrush habitat.

The Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats (Connelly et al. 2004) evaluates a variety of factors contributing to the migratory or residential status of greater sage-grouse populations throughout the western United States. Although migratory populations may travel much farther distances between seasons, it was concluded that the majority of individuals within a migratory population nest within 11 miles of strutting grounds. Within the 11-mile buffer established within and around the project area, approximately 101,336 acres of potentially suitable habitat for leks, nesting/brood-rearing, and wintering has been identified (BLM 2005b) (**Figure 3.16**). The greater sage-grouse populations found around the project area (i.e., within approximately 11 miles) are likely migratory, and could make year-round use of strutting grounds and wintering habitats that are located between five and 11 miles apart (Dunder 2005c).

Records of known lek locations provided by the BLM RSFO (in cooperation with WGFD) show one active lek located outside, but within two miles, of the project area. Approximately 1,568 acres, or 36 percent, of the project area occurs within two miles of this active lek.

BBCC in accordance with WDEQ/LQD mine permit requirements for the Black Butte Mine, and as approved by the USFWS (BBCC 2005b), conducted a survey of the project area in April of 2005; theexisting lek was confirmed as active and no additional strutting grounds were detected within the project area. Approximately five additional leks are located within the assessment area. In the Green River RMP and ROD (BLM 1997), leks located within the project area are to be avoided by approximately one quarter mile from 6:00 pm until 9:00 am between March 1 and June 15, and nesting habitat located within two miles of a lek is to be avoided between March 1 and June 30 (BLM 1997).

3.7.3.5 Mountain Plover

The mountain plover nests throughout Wyoming and prefers breeding sites of sparsely vegetated habitat, such as sagebrush and areas with perennial grasses (Kaufman 1996). BBCC conducted mountain plover surveys within the project area in 2001, 2002, and 2004. Although no individuals were observed during the survey efforts, potentially suitable grassland habitat was noted within the project area (BBCC 2004e).

3.7.3.6 Pygmy Rabbit

As the name suggests, the pygmy rabbit is the smallest rabbit in North America. It is dependent upon sagebrush for food, and digs its own burrows in deep, loose soil (Pacific Biodiversity Institute 2005). Suitable habitat for the pygmy rabbit exists within the project area (Dunder 2005d), and this species has been observed during wildlife surveys in 2006.

3.7.3.7 White-Tailed Prairie Dog

The white-tailed prairie dog inhabits grassland and shrubland, often with loose, sandy soils (WNDD 2005). It is diurnal, almost exclusively vegetarian, and hibernates during the winter (Desert USA 2005) between November and February (Dunder 2005b). The project area was surveyed for white-tailed prairie dog towns in 2001 and 2002, and four active towns were identified adjacent to the project area, one of which enters the project area at three different locations (BBCC 2004e).

3.7.3.8 Swift Fox

The swift fox is the smallest canid in North America. It is native to the Great Plains and prefers grassland with little or no shrub component. It is nocturnal, non-territorial, and feeds on a variety of prey species, including rabbits, prairie dogs, ground squirrels, mice, birds, reptiles, amphibians, and insects, as well as berries and seeds. Three swift fox sightings occurred near Interstate 80 (outside of the project area), and potentially suitable habitat exists within the project area (Dunder 2005d).

3.7.3.9 Fisheries

Two BLM sensitive fish species, the bluehead and flannelmouth suckers, are known to occur within the Green River watershed, which is supported, via the perennial Bitter Creek, by ephemeral flows from within the project area. The Green River watershed is a component of the Upper Colorado River Basin. The bluehead sucker is found in larger rivers and streams of the Green River watershed, but has not been recorded within the portion of Bitter Creek that runs through the existing Black Butte Mine and near the project area. The flannelmouth sucker is known to occur within the portion of Bitter Creek between the towns of Bitter Creek and Rock Springs, Wyoming. However, in a search conducted by the WNDD for this project, no records of occurrence of the flannelmouth sucker were identified in that portion of Bitter Creek.

3.8 WILD HORSES

The assessment area for wild horses is the Salt Wells Creek Herd Management Area (HMA) (**Figure 3.17**). The Salt Wells Creek HMA for wild horses extends from Interstate 80 on the north to the Wyoming/Colorado border on the south, and from Highway 191 on the west to a RSFO boundary - Kinney Rim on the east, approximately 15 miles from the project area. The assessment area is 1,170,717 acres, and includes 690,356.63 acres of BLM-administered land, 441,091.98 acres of private land, and 39,268.38 acres of State of Wyoming land. Total estimated existing disturbance is 21,014 acres or 1.79 percent of the assessment area.

The appropriate herd management level for the Salt Wells Creek HMA, as determined by the BLM, is 251-365 horses (BLM 1997). As of the summer of 2005, the population estimate of the wildhorse herd was approximately 600 wild horses. In the fall of 2005, the herd was reduced, via gathering, to the herd management level of 251 horses (D'Ewart 2005).

3.9 LAND USE

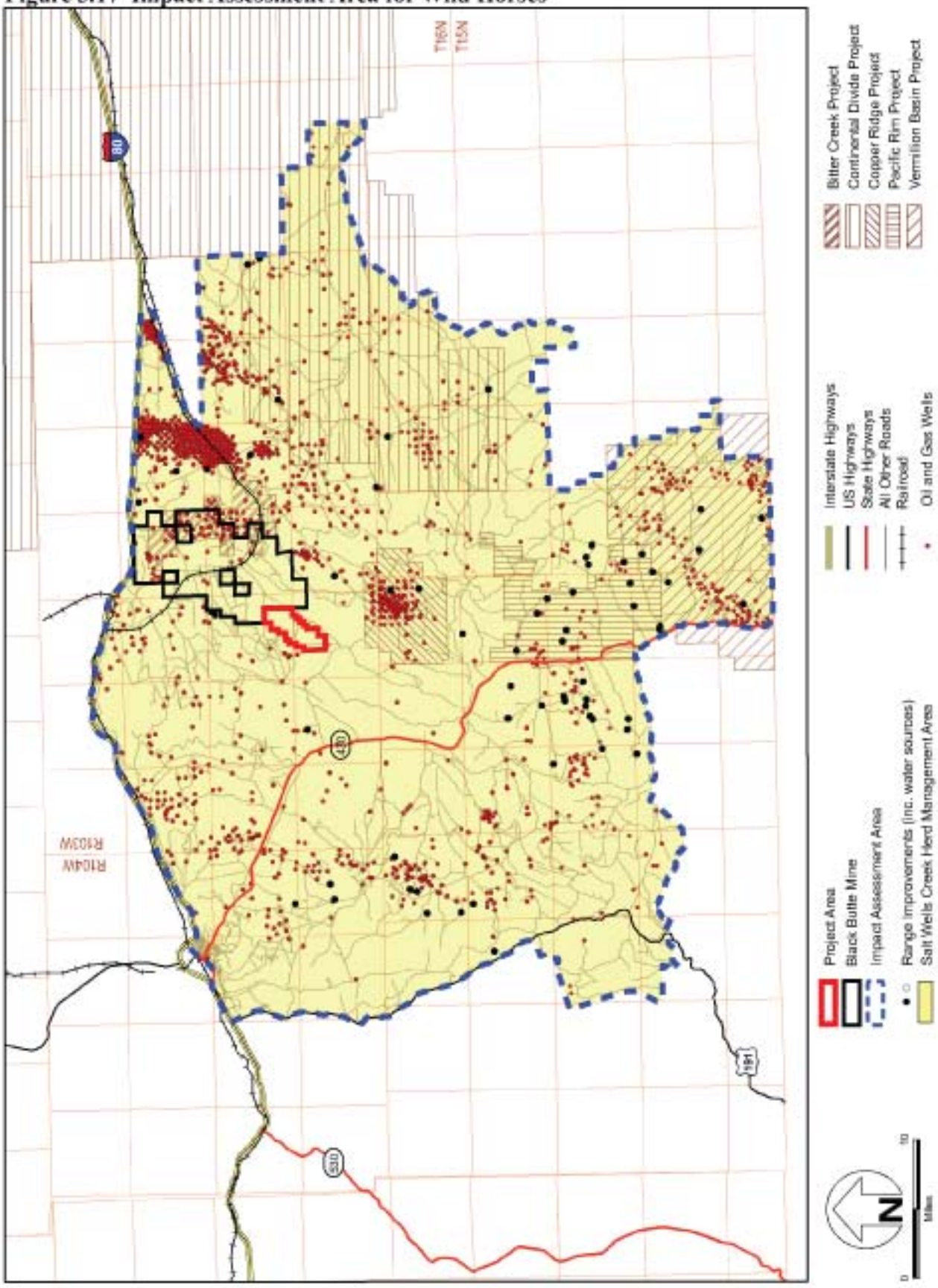
3.9.1 Land Status and Prior Rights

The land status and prior rights assessment area is the project area (**Figure 1.2**). The assessment area is approximately 4,359 acres in size, and includes 2,200 acres of BLM-administered land and 2,159 acres of private land. Total estimated existing disturbance is three acres or 0.07 percent of the assessment area.

The surface ownership pattern within and adjacent to the project area is checker boarded (**Figure 1.2**), with even numbered sections being federally owned (BLM), and odd-numbered sections being privately owned. Generally, the surface owner in this area owns mineral rights. Anadarko is the private owner.

Major land uses in the project area and surrounding land include domestic grazing and wildlife habitat. A secondary land use is dispersed recreation. Areas of disturbance within the project area include multiple two-track dirt roads. There are no utilities/easement corridors, ranch access roads, or mine monitoring access roads.

Figure 3.17 Impact Assessment Area for Wild Horses



Parts of five oil and gas leases overlie the project area. If productive wells are not established on these leases they will expire at the end of their 10-year terms. The lease expiration dates range between 2006 and 2011. The leases can be developed for conventional oil and gas or for CBNG.

The U.S. Supreme Court has ruled that CBNG rights belong to the owner of the oil and gas rights (Ruling No. 98-830). Therefore, the oil and gas lessees have the right to develop the CBNG in the coal as well as the right to develop conventional oil and gas on the tract. The development of a surface coal mine would not preclude the development of oil and gas resources in a project area except on active areas of a mine. Development conflicts between coal and oil and gas production would require the two holders of the valid rights to resolve any land use conflict.

The BLM Wyoming Reservoir Management Group indicates that it has not been advised that CBNG development has been proposed for the project area. The nearest producing CBNG wells are more than four miles away from the project area (BLM 2005b).

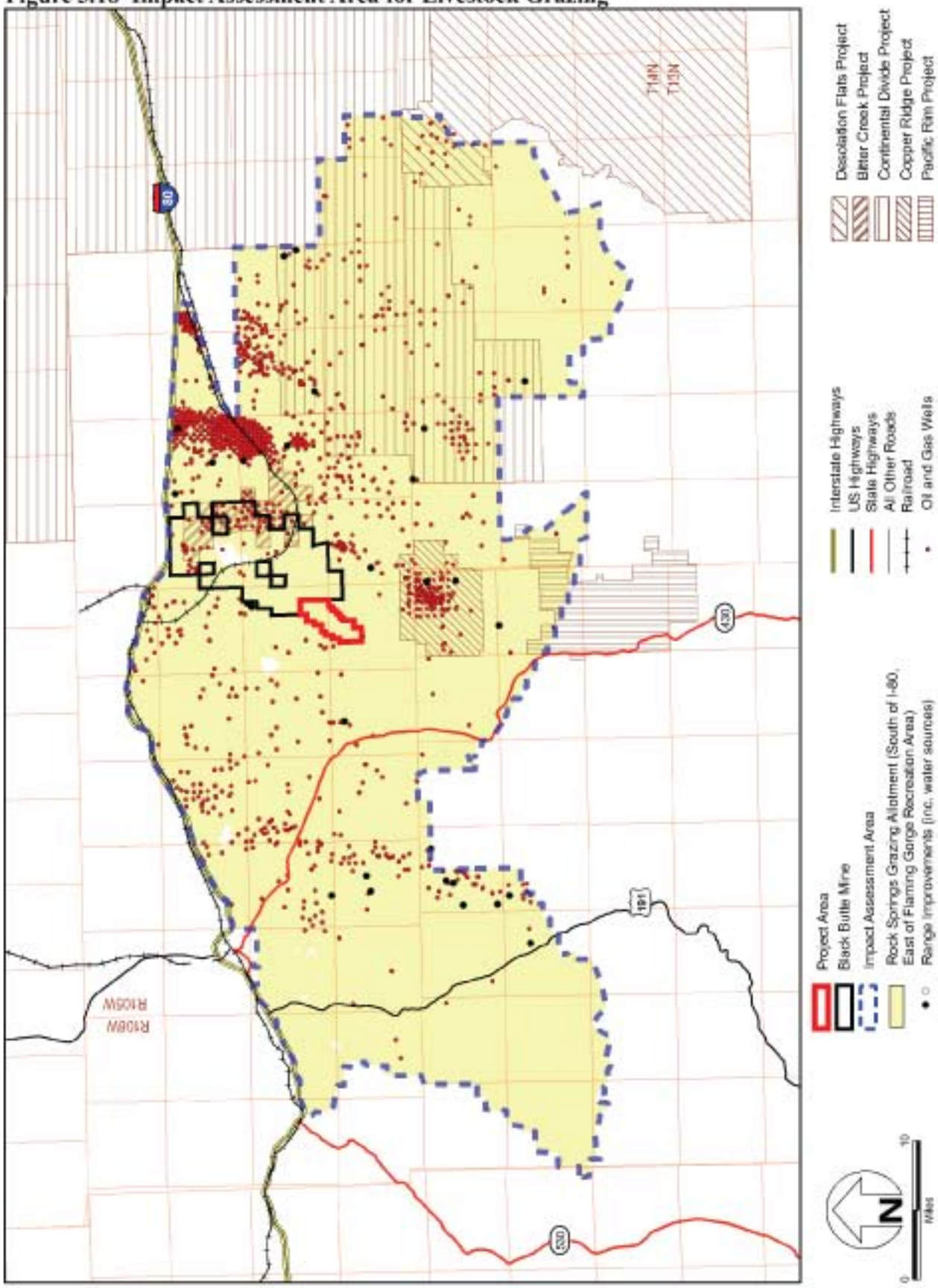
Coal mining is a dominant land use in the area surrounding the project area. The Black Butte Mine is an operating coal mine located just north of the project area. Sweetwater County has no applicable countywide land use plans, and the project area has no designated zoning classification. The Sweetwater County Comprehensive Plan (Sweetwater County 2002) provides general land use goals and policies for state and federal coal leases in the county.

3.9.2 Livestock and Grazing Management

The assessment area for livestock and grazing is the portion of the Rock Springs Allotment south of Interstate 80 and east of the Flaming Gorge National Recreation Area within the RSFO area (**Figure 3.18**). The assessment area is 1,011,718 acres and includes 514,899.91 acres of BLM-administered land, 39.55 acres of Forest Service-administered land, 478,247.53 acres of private land, 18,486.93 acres of State of Wyoming land, and 44.09 acres of water. Total estimated existing disturbance is 17,964 acres or 1.78 percent of the assessment area.

Livestock grazing is a major land use in the region and the project area. The Rock Springs Allotment (#13018) is utilized by 21 individual permittees and one grazing association which are authorized for grazing. Livestock use is authorized according to number of livestock by class (sheep, cattle, and/or horses), timing of start and finish, and animal unit months (AUMs). Permitted livestock use in the Rock Springs Allotment allows for a maximum of 342,912 sheep; 23,909 cattle; and 15 horses to graze during various periods between March 1 and February 28, with most use occurring during the winter months. Currently, active AUMs for the allotment total 108,021, with an additional 40,564 historic AUMs suspended.

Figure 3.18 Impact Assessment Area for Livestock Grazing



3.9.3 Recreation

The assessment area for recreation includes the project area, Black Butte Mine, and southern Sweetwater County south of Interstate 80 (**Figure 3.19**). The assessment area is 1,572,997 acres, and includes 1,046,565.37 acres of BLM-administered land, 499,555.16 acres of private land, and 26,876.46 acres of State of Wyoming land. Total estimated existing disturbance is 18,329 acres or 1.17 percent of the assessment area.

Hunting is the principal recreational activity in the project area. Game includes pronghorn, mule deer, elk, coyotes, ground squirrels, prairie dogs, cottontails, greater sage-grouse, and mountain lions. Pronghorn are the predominant species hunted (BBCC 2004a). Hunting is managed by WGFD, which delineates two scales of management units including herd units and hunt areas. (See Section 3.7.1 for more information.) **Table 3.19** portrays the WGFD Big Game (pronghorn, mule deer, and elk) Demand Index for non-residents and residents in hunting areas that include the project area.

Table 3.19 Wyoming Game and Fish Big Game Demand Index

	Hunt Area	Type[1]	Quota	1st Choice	2nd Choice	3rd Choice	Odds (%)
Pronghorn							
2005 Non-Resident Antelope	58	1	18	154	148	135	11.69
2005 Resident Antelope	58	1	117	363	253	146	32.23
Mule Deer							
2005 Non-Resident Deer	101	1	14	143	179	17	9.79
2005 Resident Deer	101	1	98	443	908	58	22.12
2005 Resident Deer	101	2	0	0	2	0	0
Elk							
2005 Non-Resident Elk	124	1	1	48	15	5	2.08
2005 Non-Resident Elk	124	2	6	0	3	0	100
2005 Resident Elk	124	1	8	168	176	111	4.76
2005 Resident Elk	124	2	57	52	86	29	100

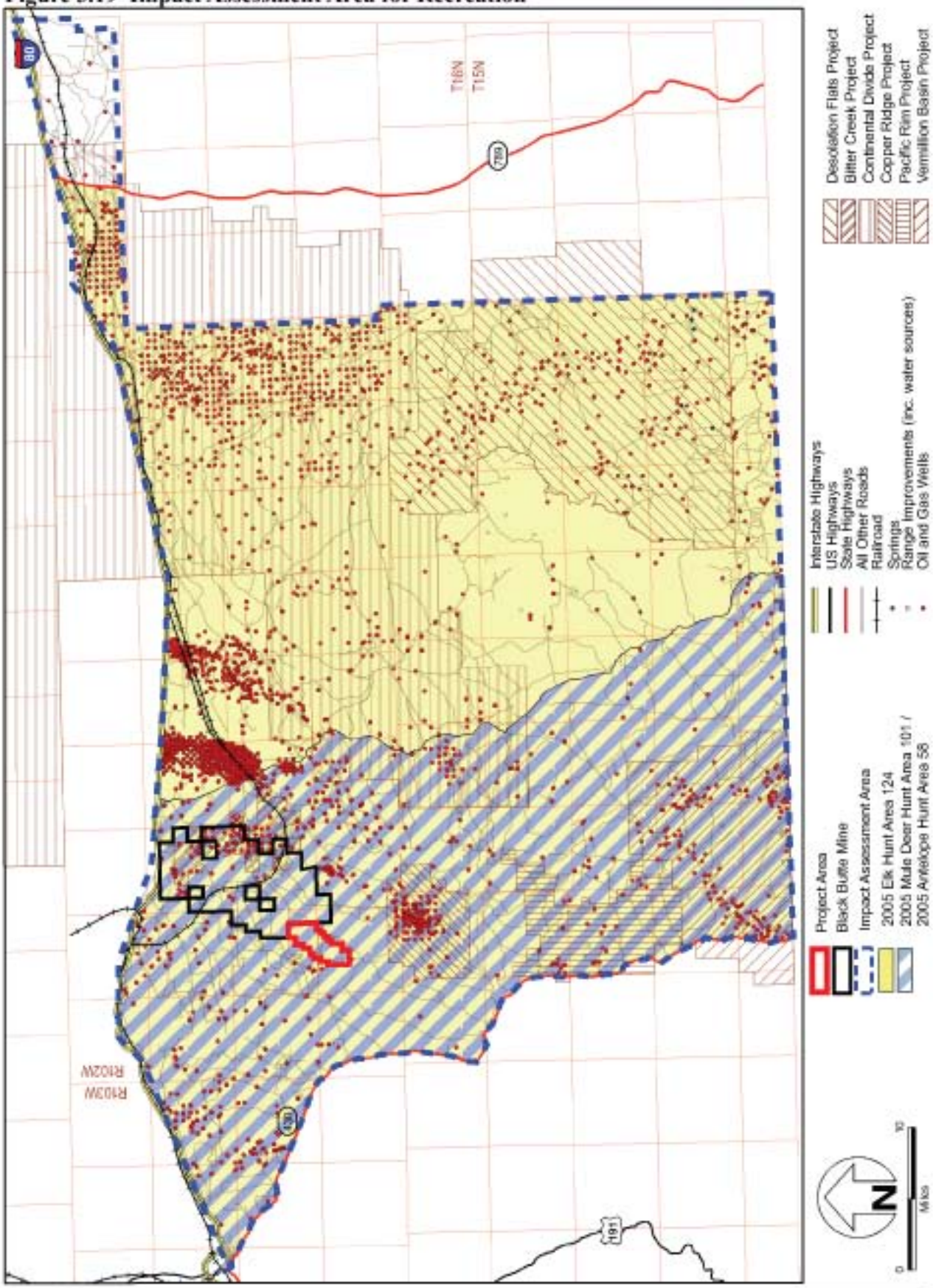
Source: http://gf.state.wy.us/wildlife/hunting/stats/demand/index.asp

[1] The number in the type column indicates a limitation for that license. The limitation may restrict the hunter to the taking of a specific sex of animal, a specific season, a specific type of weapon, or a portion of the area. If there is no type number opposite the hunt area number, the area is valid for general license.

The project area is located entirely within Hunt Area 58 for pronghorn. Hunter success in this hunt area during the 2003 season was 84 percent, with a harvest of 158 pronghorn (WGFD 2003). Of the total pronghorn harvested in the Bitter Creek Herd Unit (424 animals), Hunt Area 58 accounted for approximately 37 percent of the harvest (WGFD 2003). For mule deer, the project area is located entirely within Hunt Area 101. Hunter success in this area during the 2003 season was seven percent, with a harvest of 87 bucks (WGFD 2003). For elk, the project area is located entirely within Hunt Area 124, which includes all of the Petition Herd Unit. Hunter success in this hunt area during the 2003 season was 70 percent, with a harvest of 53 elk (WGFD 2003).

Coyotes are classified as predators in Wyoming and therefore, no data exist for the project area. Due to the relatively small population in this area, greater sage-grouse hunting has been considered poor (BBCC 2004a). Fall hunting of greater sage-grouse is regulated by the WGFD, and occurs in Upland Gamebird Management Areas (UGMAs). The project area is within UGMA 6, and WGFD estimates that 186 birds

Figure 3.19 Impact Assessment Area for Recreation



were harvested in this UGMA during the 2003 season, which accounts for 3.5 percent of the estimated total state harvest (WGFD 2003).

Secondary recreational uses include dispersed mountain biking and OHV, use including snowmobiling. OHV use is limited to existing roads and trails. The most popular road is an unimproved road about 10 miles long, extending along the eastern edge of the project area from the Overland Stage Trail to County Road 4-26 (Foster 2005). It is locally referred to as the Salt Wells Road (**Figure 3.20**). Camping, hiking, and mountain biking generally occur near, or along, existing roads as well. There are no developed recreational sites within the project area. Non-consumptive uses of wildlife, such as bird watching and nature photography are becoming increasingly popular, and it is possible that lands within the project area could be used for this purpose (BBCC 2004a).

Secondary recreational uses are largely unregulated and therefore difficult to quantify. Due to mixed federal, state, and private land ownership with limited access for recreation, and availability of other, potentially more appealing and better developed places for nearby recreation (e.g., Flaming Gorge), secondary recreational use within the project area is likely to occur only at low levels.

3.9.4 Transportation and ROWs

The assessment area for transportation and ROW is the project area (**Figure 3.20**). The assessment area is 4,359 acres in size, and includes 2,199.20 acres of BLM-administered land and 2,159.40 acres of private land. Total estimated disturbance is three acres or 0.07 percent of the assessment area.

Transportation resources near the project area include Interstate 80, Black Butte Road (i.e., County Road to Mine), County Road 4-26, and several unimproved two-track roads (i.e., "Salt Wells Road") (**Figure 3.20**). Interstate 80 is about 10 miles north of the project area. The Interstate is a paved four-lane road that generally runs east-west. Black Butte Road is a paved two-lane county road, which runs south from Interstate 80 to the Black Butte Mine office and is located approximately four miles north to northeast of the project area. County Road 4-26 is located south of the project area, and trends east and west. The two-track, unimproved dirt roads include one that runs north and south from the Black Butte Mine east of the project area (i.e., "Salt Wells Road"), and 2.4 miles of road in the project area that are used for recreation and livestock grazing permittees.

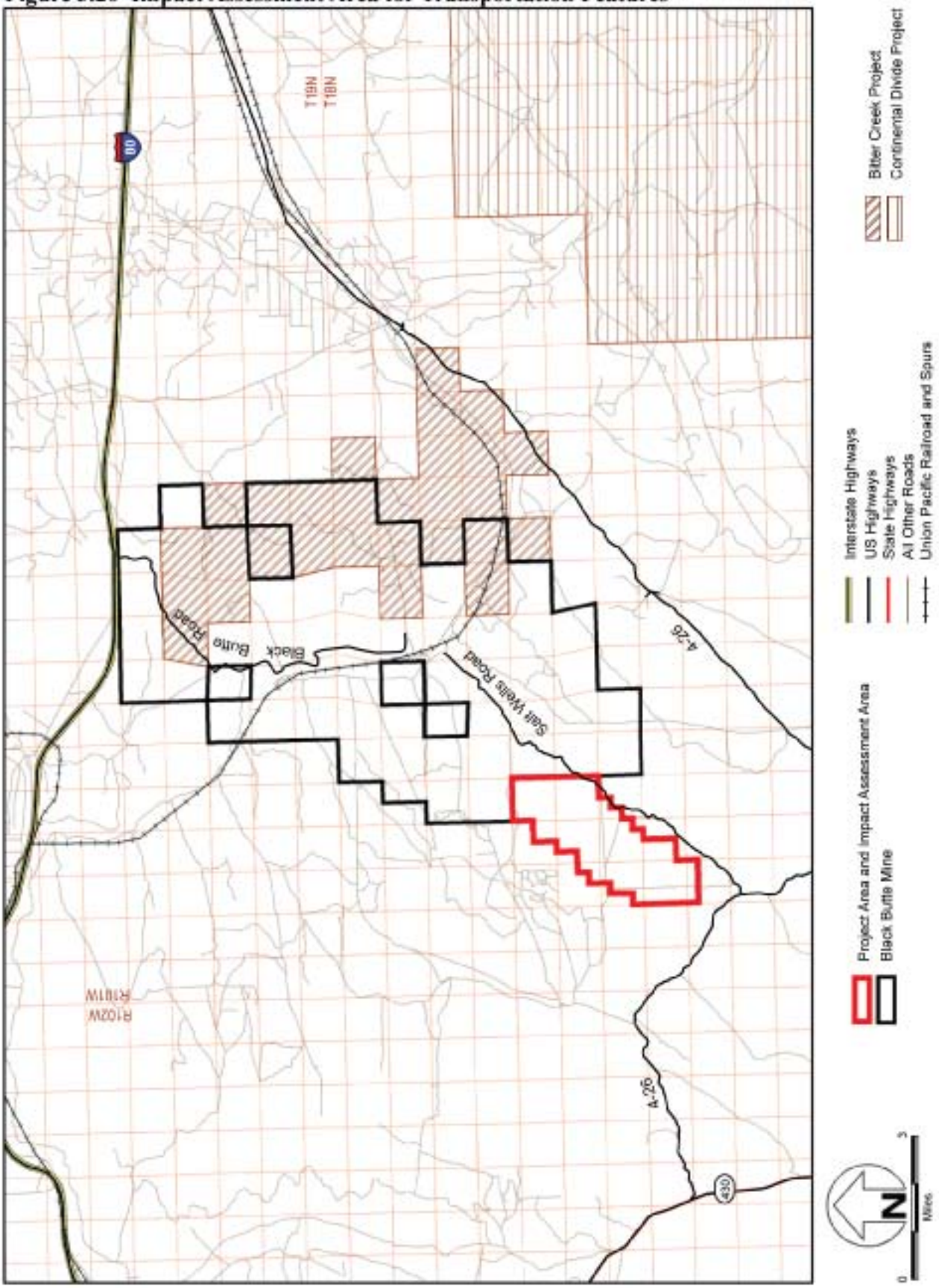
The nearest railroad facilities are the Union Pacific Railroad and spurs accessing the Black Butte Mine approximately four miles northeast of the project area. Oil and gas pipelines, power lines, and associated ROWs are found to the north of the project area. A ROW is a legal right for use, occupancy, or access across land or water areas for specified purposes. However, no ROWs are located within the project area.

3.10 VISUAL RESOURCES

The assessment area for visual resources is the checkerboard lands south of Interstate 80 and within the RSFO (**Figure 3.21**). The assessment area is 697,910 acres, and includes 342,110.12 acres of BLM-administered land, 349,316.16 acres of private land, and 6,483.72 acres of State of Wyoming land. Total estimated existing disturbance is 17,570 acres or 2.52 percent of the assessment area.

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Rolling sagebrush and short-grass prairie are commonly viewed throughout the project area. Existing surface mines form a somewhat continuous band on the north and south side of Interstate 80 east of Point of Rocks, Wyoming. The Black Butte Mine and Leucite Hills Mine facilities and mining activities are visible from Interstate 80, as well as from surrounding roads, including the Black Butte Road and the Jim Bridger Power Plant Road.

Figure 3.20 Impact Assessment Area for Transportation Features



Other artificial visual intrusions in the project vicinity include signs of grazing (fences, trailers, and livestock) and oil and gas development (pumpjacks, pipeline ROWs, well shelters, and compressor stations). Transportation facilities (roads and railroads), and electric power transmission lines can also be seen. The natural scenic quality in the immediate project area is relatively low due to the above intrusions and the existing surface coal mining operations.

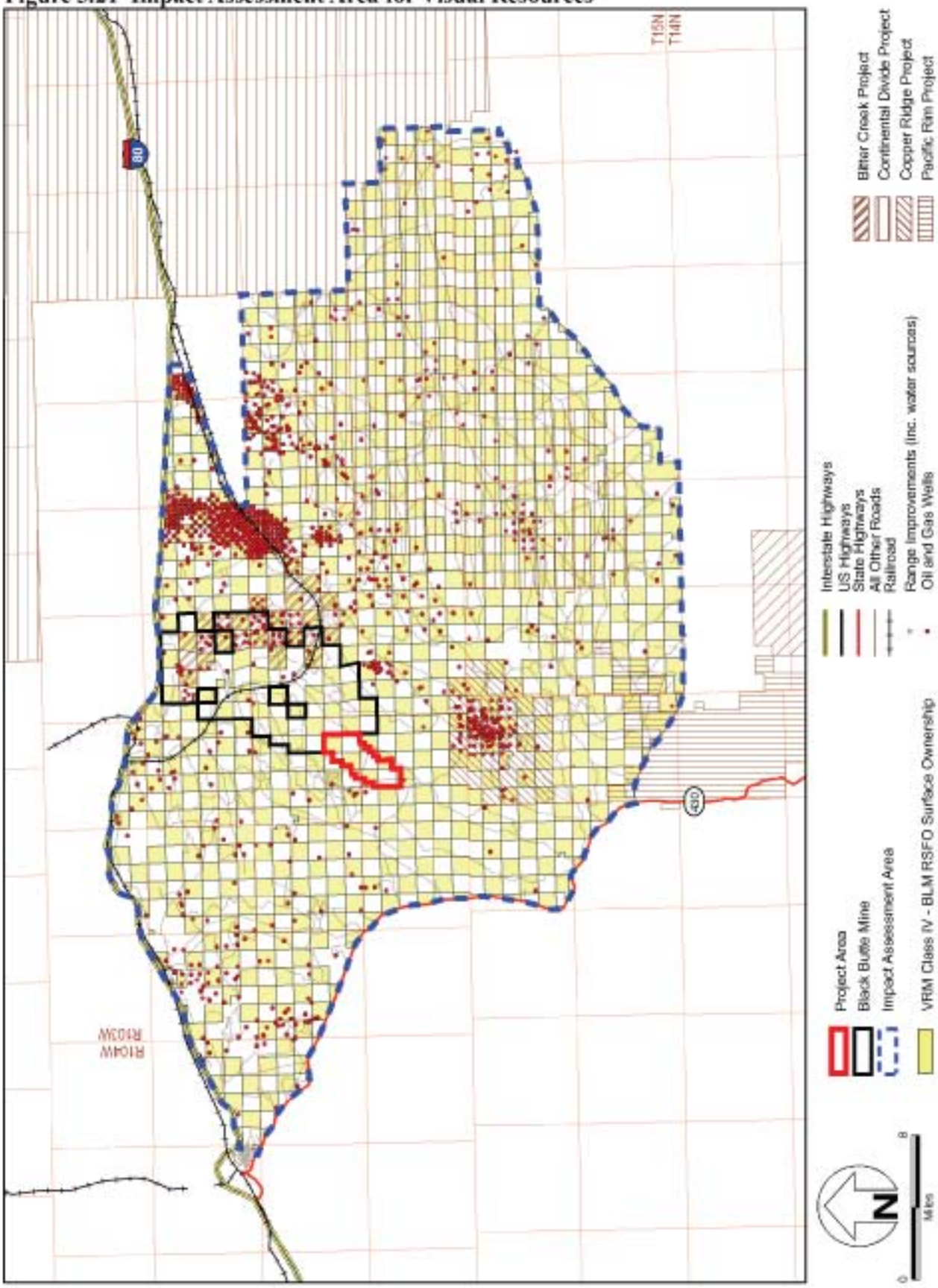
For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the Green River RMP and ROD (BLM 1997).

The inventoried lands were classified into visual resource management (VRM) classes as follows:

- Class I - The objective of this class is to maintain a landscape setting that appears unaltered by humans. It is applied to wilderness areas, some natural areas, wild portions of the wild and scenic rivers, and other similar situations where management activities are to be restricted.
- Class II - The objective of this class is to design proposed alterations so as to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III - The objective is to design proposed alterations to partially retain the existing character of the landscape. Contrasts to the basic elements (form, line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.
- Class IV - The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape. The District Manager is required to determine whether the structure(s) meet the acceptable VRM class standards, and if not, whether they add acceptable visual variety to the landscape.
- Rehabilitation Area - Change is needed or change may add acceptable visual variety. This class applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it into character with the surrounding landscape. This class would apply to areas identified where the quality class has been reduced because of unacceptable modification. The contrast is inharmonious with the characteristic landscape. It may be applied to areas that have the potential for enhancement; i.e., add acceptable visual variety. It should be considered an interim or short-term classification until another VRM class objectives can be reached through rehabilitation or enhancement. The desired VRM class should be identified.

Lands in and adjacent to the project area are classified as VRM Class IV. The existing mining activity is visible from several sites in the project area. VRM Class III is present along the Interstate 80 corridor. The closest VRM Class II area is 11 miles southeast of the project area.

Figure 3.21 Impact Assessment Area for Visual Resources



3.11 CULTURAL RESOURCES

3.11.1 Cultural Historic Context and Chronology

The assessment area for cultural resources includes the portion of the east flank of the Rock Springs Uplift overlapping the Black Butte, Leucite Hills, and Bridger Coal mines (**Figure 3.22**). The assessment area is 277,120 acres, and includes 131,872.61 acres of BLM-administered land, 144,411.27 acres of private land, and 836.11 acres of State of Wyoming land. Total estimated existing disturbance is 21,931 acres or 7.91 percent of the assessment area.

Archaeological investigations in the Rock Springs Anticline (see Section 3.3) indicate humans have inhabited the area for at least 12,000 years. The accepted cultural chronology of the Rock Springs Uplift is based on a model for the Wyoming Basin by Metcalf (1987), revised by Thompson and Pastor (1995).

The Wyoming Basin prehistoric chronology is documented in **Table 3.20**. Cultural resources, protected under the National Historic Preservation Act of 1966, as amended, are defined as the nonrenewable remains of past human activity.

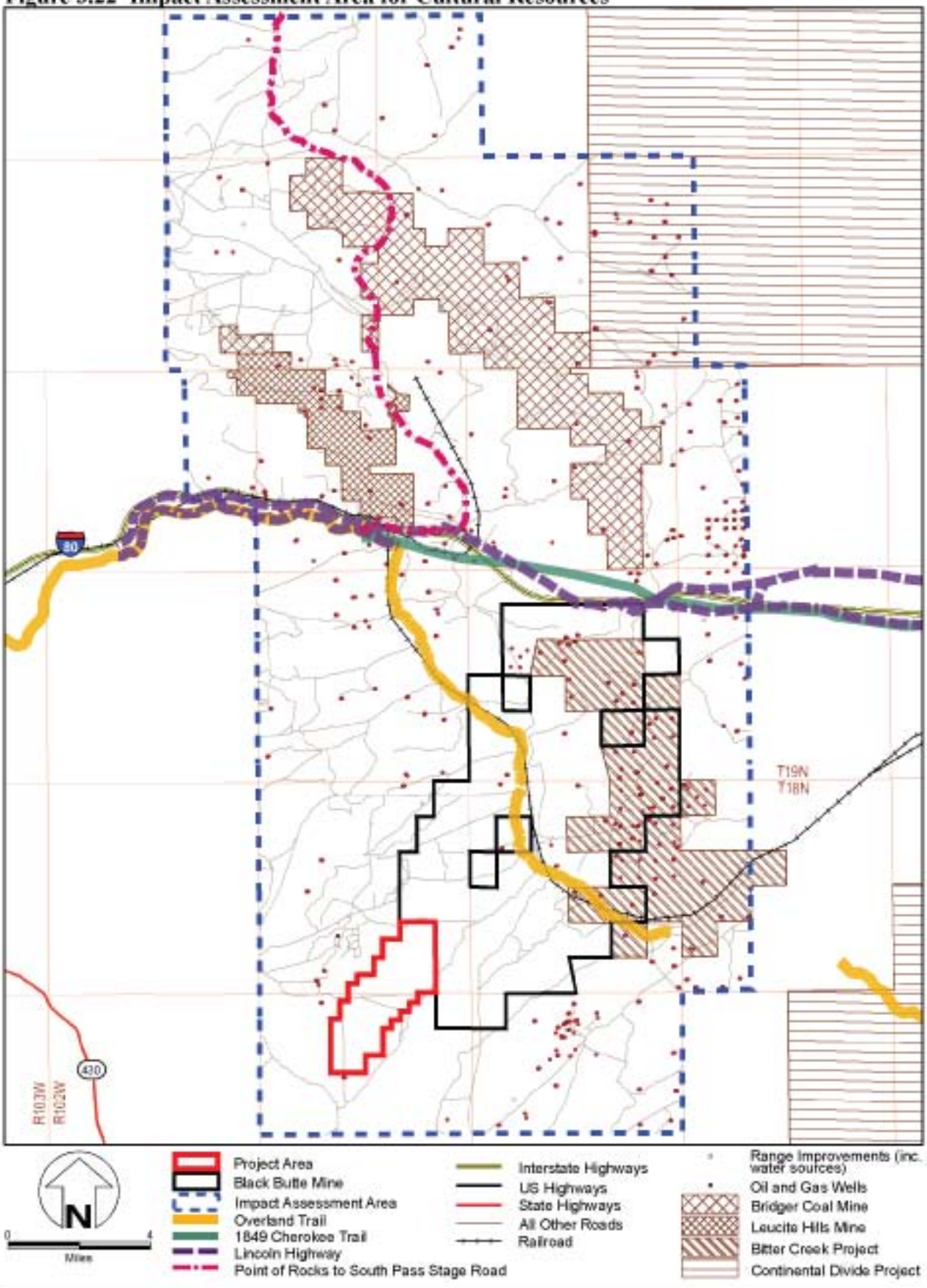
Table 3.20 Prehistoric Chronology of the Wyoming Basin

Period	Phase	Years Before Present (b.p.)
Paleoindian		12,000 – 8,500
Early Archaic	Great Divide	8,500 – 6,500
	Opal	6,500 – 4,300
Late Archaic	Pine Spring	4,300 – 2,800
	Deadman Wash	2,800 – 2,000/1,800
Late Prehistoric	Uinta	2,000/1,800 – 650
	Firehole	650 – 300/250
Source: (Metcalf 1987), as modified by (Thompson and Pastor 1995)		

Known Paleoindian sites are rare in southwestern Wyoming. However, isolated surface finds of Paleoindian projectile points are not uncommon, which suggests that site preservation or visibility may be a major factor affecting the number of known sites. The Paleoindian period includes a series of cultural complexes identified by distinctive large projectile points (spear points) often associated with the remains of large, extinct mammals (e.g., mammoth, bison, camel) (BLM 2004a). The Archaic period is characterized by large side- and corner-notched dart points, slab-lined features, and housepits. It is also characterized by more generalized subsistence pursuits including gathering plants (Newberry and Harrison 1986). This lifestyle continued until the Late Prehistoric period, which is marked by a technological change (from dart projectiles to bows and arrows) and by the appearance of ceramics. Large-scale seed processing and an increase in the number of features including housepits and roasting pits is also noted in the Late Prehistoric period.

The Proto-Historic period began sometime after 300 b.p. with the first European trade goods to reach the area, and ends with the development of the Rocky Mountain fur trade approximately 150 years ago. The most profound influence on native cultures during this time was the introduction of the horse, which enabled Native Americans to expand their range. All forms of rock art denoting horses, metal implements, and other European American goods are associated with the Proto-Historic period.

Figure 3.22 Impact Assessment Area for Cultural Resources



Historic use (**Table 3.21**) of the area by European immigrants is associated with limited ranching and grazing activities. Filing on water rights occurred as early as 1906 on Black Buttes Creek. Filing on water rights for mineral development occurred as early as 1924, west of the project area.

Table 3.21 Historic Chronology

Phase	Age a.d.
Proto-Historic	1720-1800
Early Historic	1800-1842
Pre-Territorial	1842 –1868
Territorial	1868-1890
Expansion	1890-1920
Depression	1920-1939
Modern	1939-Present
Source: Massey 1989	

3.11.2 Site Types

Information was obtained from the Wyoming Cultural Records Office for previously documented projects and cultural resources in the project area. Records at Western Archaeological Services (WAS) were reviewed for previous work in the project area and consultation with the RSFO archaeologist was conducted. There have been 13 projects conducted in the project area resulting in the recordation of 76 sites. Of these projects, there were 10 Class III surveys, including one seismograph survey, one road survey, one well survey, two pipeline surveys, one historic overview, one survey for core holes, and three mine block surveys. Three Class II sampling surveys have been conducted in the project area including one well and access road survey and two mine block surveys. Field work in the project area has resulted in the documentation of cultural resources through survey, testing, examination of ethnographic records, and historic record research. Five excavations have been conducted in the project area. The historic assessment of the Road to Black Butte documents historic use of the area.

In 2001 and 2002, WAS conducted the Class III inventory and testing for the BBCC Salt Wells Mine Expansion Project (Stainbrook et al. 2002), now known as the Pit 14 LBA. Thirty-five of the seventy-six recorded sites have been evaluated as not eligible for inclusion to the National Register of Historic Places (NRHP), and 41 sites have been evaluated as eligible for inclusion. **Table 3.22** includes a summary of the results of the Class III Cultural Resource Inventory. The site types include 44 prehistoric camps (58 percent), two prehistoric camps with living structures (2.6 percent), one prehistoric camp/historic cairn (1.3 percent), one prehistoric camp/historic debris (1.3 percent), 19 lithic scatters (25 percent), eight historic cairns (10.5 percent), and one historic scatter (1.3 percent).

The Overland Trail, 48SW1226, parallels the Union Pacific Mainline Railroad, 48SW6357, north and east of the project area. Both these historic linear sites have been evaluated as eligible for inclusion in the NRHP. The segment of the Overland Trail in the assessment area follows the Bitter Creek valley to the Green River. The historic trail has been, in some areas, replaced by modern transportation routes such as crowned and ditched roads. Accordingly, the majority of the trail within the assessment area has been determined to be non-contributing to its overall eligibility for inclusion to the NRHP. The Overland Trail was a major wagon and stage route through southern Wyoming beginning in the late 1850s and continuing through 1869 with completion of the Transcontinental Railroad. Stage stations were important to westward migration. The Black Buttes (48SW1821) and the Point of Rocks (48SW802) stage stations, located north of the project area, were stops along the Overland Trail. In addition to the trail and railroad line, two other historic transportation routes exist within the assessment area. These include the Point of Rocks to South Pass Stage Road and Lincoln Highway.

Table 3.22 Results of the Class III Cultural Resource Inventory of the Project Area and the Surrounding Analysis Area

Type	Location
Prehistoric Sites 1. housepits 2. lithic scatter 3. pottery fragment sites 4. bone bead production	1. 48SW13504, 48SW13901, 48SW13509, 48SW13552, 48SW270, 48SW5057, 48SW1090, & 48SW5655 2. 19 lithic sites 3. 48SW13490,48SW13896, 48SW13908, & 48SW6287 4. 16 bone bead production areas
Historic Sites 1. debris scatter 2. cairns 3. trails 4. stage stations 5. rail stations 6. mines and coal camps 7. inscriptions 8. airmail navigation beacon	1. one site 2. eight sites 3. 48SW1226, 48SW3680, 48SW6357, & 48SW1834 4. 48SW1821 & 48SW802 5. 48SW3464, 48SW6359, & 48SW7770 6. 48SW1823 & 48SW1822 7. 48SW4037 & 48SW13775 8. 48SW15990
Sources: McKibbin et al. 1989, McNees et al. 1992, Harrell 1987, Darlington et al. 2004, Stainbrook et al. 2002	

The Cherokee Trail (48SW3680) was used in the 1850s by members of the Cherokee Tribe en route from the Oklahoma Reservation to the California gold fields. The Queensbury and Mitchell route trended west crossing the northern edge of the Haystacks, then turned northwest crossing north of Sand Butte and Quaking Aspen Mountain, crossed Little Bitter Creek, then turned north on the east flank of Wilkins Peak and joined the Overland Trail near Kanda (Fletcher et al. 1999). The Road to Black Buttes (48SW12421) is an expansion era road that connected the rural population of Vermillion Creek/Coyote Creek area of southern Sweetwater County with the Union Pacific Railroad. Portions of the Road to Black Buttes skirt the eastern boundary of the project area. A historic overview of the Road to Black Buttes determined the road is not eligible for nomination to the NRHP (Johnson 2001).

3.11.3 Native American Sensitive Sites and Traditional Cultural Properties

Consultation with Native American tribes pertaining to areas of concern for traditional, cultural, and religious purposes occurred in accordance with the American Indian Religious Freedom Act of 1978, as amended, and BLM Manual 8160-1 Handbook. Native American consultation occurred within the context of specific development proposals, but is also an ongoing process among BLM and affected Indian tribes and traditional cultural leaders (BLM 1997).

Human burials, rock alignments, and rock art have been identified as sensitive or sacred to Native Americans. Although human burials or rock art have not been documented in the project area, it is important to be cognizant of the possibility that such resources could exist. Several such sites have been documented in areas surrounding the project area. Project boundaries were changed to remove site 48SW6287 and the associated land from the project area because the site is sensitive to Native American concerns and contains prehistoric cairns (Stainbrook et al. 2002). The Tolar Inscriptions (48SW13775) is another Native American sensitive site, and contains prehistoric, proto-historic, and historic inscriptions. The Tolar Inscriptions site is located north of the project area and west of Point of Rocks, Wyoming.

3.12 SOCIAL AND ECONOMIC VALUES

The assessment area for social and economic resources is Sweetwater County, Wyoming. The assessment area is 6,720,899.60 acres in size and includes 4,397,739.98 acres of BLM-administered land,

1,830,561.45 acres of private land, 187,135.01 acres of State of Wyoming land, 54, 816.04 acres of Forest Service land, 202,017.80 acres of Bureau of Reclamation land, 15,786.65 acres of Fish and Wildlife Service land, and 32,842.68 acres of open water.

Socioeconomic conditions potentially affected by the project and existing Black Butte Mine operation include the local economy (primarily employment and earnings in the mining industry and other sectors of the economy), population, housing, community services, and local, state, and federal tax revenues.

A comprehensive analysis (Socioeconomic Analysis Technical Support 2005) of the socioeconomic condition found in western Wyoming was prepared for the Jonah Infill Project. A summary of that analysis was published in the FEIS for the Jonah Infill Project and can be found on the internet at http://www.wy.blm.gov/nepa/pfodocs/jonah/index.htm. The discussion below incorporates by reference and summaries that socioeconomic data in the Jonah Infill Project to the extent it pertains to Sweetwater County. Information from other sources is also used in the discussion.

3.12.1 Social Life

Sweetwater County is the largest county in Wyoming and the third most populous. Sweetwater County is also the most industrialized county in Wyoming, due to the local abundance of coal, natural gas, oil, and trona (soda ash). According to the Sweetwater Economic Development Association (SWEDA), over half of the workforce is employed by industry, principally trona mining/soda ash manufacturing, coal mining, petroleum, and power generation related services.

Rock Springs and Green River are the two largest cities in the county and are located approximately 12 miles apart. Rock Springs claims to be home to over 56 nationalities. The town was founded in 1868 with the coming of the Transcontinental Railroad. The original settlers came to the area to work the coal mines and were largely of European origin. Many of their descendants remain in the area. Local residents take pride in that the various ethnic groups were generally desegregated and that historically, there was very little conflict between groups (Radosevich 2005).

Green River is historically a railroad town, but much of the town's (and county's) economy is based on trona and coal production. The abundance of trona has brought in national and international chemical and manufacturing industries. Trona is used in manufacturing glass, baking soda (including Arm & Hammer, which is produced in the area), fertilizer, fabric softener, and other commodities.

Until recently, the county has experienced a net loss of population. However, according to Dorothy Radosevich at SWEDA, in the past couple of years the area has seen "tremendous growth" (Section 3.12.2). Many of the newcomers are moving into the area to work in mining, natural gas extraction, and related services. Migration from the southeastern oil patch states of Texas and Louisiana is reportedly apparent (Radosevich 2005). The county is now facing the challenge of recruiting a workforce to provide labor to the growing economy, particularly in the areas of trucking, manufacturing, construction, wholesale trade, health care (Radosevich 2005 and WDE 2005), and retail trade (Allen 2006).

Cattle and sheep ranching occur in the unincorporated, rural parts of Sweetwater County. There is little crop production due to the region's arid climate.

Residents of Sweetwater County enjoy the region's many amenities such as the Flaming Gorge National Recreation Area, fishing, and hunting. Other opportunities include urban-based amenities such as the golf courses, indoor ice skating facilities, recreation centers, and Green River's developed Whitewater Park (Radosevich 2005).

3.12.2 Demographics

The population of Sweetwater County in 2000 was 37,613, down from 38,823 in 1990 and 41,723 in 1980. Thus, the decrease over the 20-year period was 9.9 percent. According to the most recent population data available from the Wyoming Division of Economic Analysis, the population in the county has increased slightly between 2000 and 2005 (**Table 3.23**). Recent estimates indicate the county population has grown to approximately 38,076 people, representing a net gain of 2.4 percent in the past two years. This compares to a statewide population increase of 1.6 percent. The most recent population forecasts available from the Wyoming Division of Economic Analysis projects that population levels in Sweetwater County would increase by 1.3 percent by 2010, to 38,558.

Table 3.23 Historic and Projected Population in Sweetwater County

	Population			Projected Population		
Location	**1990**	**2000**	**2004**	**2010**	**2015**	**2020**
Sweetwater County	38,823	37,613	37,758	38,558	39,029	39,485
Rock Springs	19,050	18,657	18,746	19,132	19,366	19,592
Green River	12,711	11,808	11,807	12,057	12,205	12,347

Rock Springs, the closest major city to the project area, is the largest incorporated city in the county. In 2000, it had a population of 18,708. The second largest Sweetwater County population center is Green River, which had a population of 11,808 in 2000 (U.S. Census Bureau 2000a). The 2005 Wyoming Division of Economic Analysis estimates now indicate the populations of Rock Springs and Green River are 18,772 and 11,787, respectively.

The median age of the population in Sweetwater County was 34.2 in 2000. The age profile of Sweetwater County shows that in 2002, a little more than half the population was between the ages of 25 to 64 years old. The second largest age group is made up of those 24 and under (38 percent), followed by those 65 and older (U.S. Census Bureau 2000a).

The majority of the population (91.6 percent) of Sweetwater County is made up of white persons (**Table 3.24**). Ten percent of the county's population at that time was Hispanics (of any race), while very small percentages of the population (generally less than two percent) were made up of black, Asian, American Indian, or Pacific Islander persons (Wyoming Housing Database Partnership 2005a).

Table 3.24 2004 Population of Sweetwater County by Ethnicity

Ethnicity	2004 Population[1]	Percent of Population
African American	275	0.7
American Indian	380	1.0
Asian	240	0.6
White	34,461	91.6
Other	1,349	3.6
Persons reporting two of more races	892	2.4
Source: U.S. Census Bureau 2005 – These numbers could have at least a 0.1 percent error.		

3.12.3 Community Services

3.12.3.1 Education

Sweetwater County has two school districts that provide services to approximately 6,954 students (2006 school year). Average student to teacher ratios in the two districts are about 21.5:1. Expenditures per pupil are approximately $8,400 (Sweetwater County School Districts 1 and 2). Enrollment in Rock Springs has increased over the last three years. The five year plan for the Rock Springs School District includes three new schools, two grade 5-6 schools and one K-4 school (pers. comm. Micheal Piccello 9-12-06). The five year plan has not begun construction nor has acquired any land for new schools. A downward trend in school enrollment has been experienced in Green River over the last few years resulting in the closure of two elementary schools.

Western Wyoming Community College is located in Rock Springs and has a satellite campus in Green River. Total student count is approximately 1,346 in the fall of 2006. As of August 1, 2006, the Community College also hosted outsourcing classes for the University of Wyoming.

In-town facilities for young children include the Children's Discovery Station in Rock Springs. This is a facility created by the Children's Discovery Foundation to promote learning through hands-on interactive exhibits. Head Start, serving development needs of preschool children, and their low-income families, is also present in Rock Springs.

3.12.3.2 Law Enforcement

Green River, the county seat, is home to the District and Circuit courts. The Green River Police Department has 36 full-time employees, four part-time employees, and several seasonal employees to assist with nuisance abatement. Rock Springs has 31 full-time police officers.

The Sweetwater County Sheriff's Office provides public safety services to the remainder of the unincorporated county. The office is located in Green River. The Wyoming State Highway Patrol has an office in Rock Springs that serves the western two-thirds of Sweetwater County.

Crime in Sweetwater County

A thorough discussion of crime can be found in the Jonah Infill Project Final EIS (2006). Violent and property crime rates for Sweetwater County were 598.5 for violent crimes and 4,558 for property crimes in 2004, the latest year data is available. The crime rate in Sweetwater County is higher than the overall crime rate in Wyoming of 22.9 and 335.2 respectively in 2004. There were 3,421 arrests made in 2005 in Sweetwater County (Wyoming Attorney General 2004). Generally speaking, arrest totals have decreased for a majority of crimes since 1999; however, the number of arrests for aggravated assault, burglary, and drug offenses and driving under the influence has increased possibly due to the influx of temporary workers (Allen 2005). For further information on area crime, access an article written by J. Jacquet (Jacquet 2005) at www.sublette-se.org and click on the crime link.

Sweetwater County uses a 911 emergency system. Emergency management in Sweetwater County is coordinated by the Sweetwater County Emergency Management Agency (SCEMA), which operates under Federal Emergency Management Agency and EPA guidelines. SCEMA is the agency designated by the Sweetwater County Commissioners to analyze potential hazards, assess emergency response capabilities, plan for and respond to potential events and mitigate the effects of emergencies or disasters. SCEMA coordinates with response agencies, industry, elected officials and volunteer agencies to accomplish its mission of limiting injuries, loss of life, and damage to property. The portion of Sweetwater County that includes the project area is served by emergency response organizations (fire suppression, emergency, medical, and ambulance) located in Rock Springs. Routine injuries are treated at

Memorial Hospital of Sweetwater County. Cases requiring specialized treatment are transported to Salt Lake City by air ambulance services dispatched from Salt Lake City, Craig, or Grand Junction in Colorado. All emergency situations at the Black Butte Mine are handled by their own emergency response teams. Calls to Rock Springs emergency management personnel would only be made if the mine could not handle the situation.

3.12.3.3 Fire Protection

The Sweetwater County Fire Department consists of three full-time employees and 23 volunteer safety officers and firefighters. In addition, there are 10 seasonal wildland firefighters. All members of the Sweetwater County Fire Department are trained and must comply with the Standards for Rural Firefighting set forth by the Wyoming Fire Marshall's Office, Wyoming Division of Forestry, National Wildfire Coordination Group, and the National Fire Protection Association. The county's fire equipment consists of three equipment trucks, two 750-gallon water trucks, one 1,000-gallon water truck, and a 3,000-gallon pumper tanker truck.

The towns of Superior, Wamsutter, Little America, Farson-Eden, Granger, and Reliance have volunteer fire departments. Rock Springs and Green River have municipal fire departments.

3.12.3.4 Ambulance

Castle Rock Medical Center in Green River and Vase Emergency Medical Services in Rock Springs provide ambulance services. Mining companies also maintain company ambulance services in case of an emergency requiring medical transport. Air-Med, a life flight plane, provides service to out-of-area hospitals (such as Salt Lake City) for specialized care.

3.12.3.5 Health Care

There is one primary hospital in the county (Memorial Hospital of Sweetwater County) that contains 100 beds and provides 24-hour emergency care and physician staffing. The Rock Springs Outpatient Clinic located in Rock Springs is also available for emergency needs. Castle Rock Medical Center is a five-physician care center in Green River that provides family and internal medicine, pediatrics, lab, x-ray services; physical, occupational, and speech therapy; and ambulance services. Sage View Manor and Castle Rock Convalescent Center each provide short- and long-term rehabilitation and nursing care services. The Villa is a personal care center for the elderly (SWEDA 2005).

3.12.3.6 Public Assistance

There are numerous social services and welfare organizations located in Green River and Rock Springs. Services offered cover a broad range of health and welfare, including senior services, youth organizations, family support services, food banks, domestic violence crisis centers and safehouses, mental health counseling, substance abuse treatment and support groups, communicable disease testing and counseling centers, family planning, financial counseling centers, etc.

3.12.3.7 Libraries, Parks, Recreation

Recreation opportunities include two indoor recreation centers in Rock Springs and one in Green River, a golf course in each of those cities, a white water park in Green River, and 18 community parks between the two communities with tennis courts, baseball diamonds, and swimming pools. Green River also has a greenbelt walkway and other pedestrian friendly municipal amenities. Flaming Gorge National Recreation Area is located south of the two cities and provides a venue for fishing, boating, swimming, camping,

picnicking, and hiking. Other dispersed recreation in the county is described more completely in Section 3.9.3 of this document.

There are three libraries and five rural branch libraries in the county operating under the Sweetwater County Library System.

Other cultural amenities in the county include the Rock Springs Community Fine Arts Center, Rock Springs Civic Center, the Rock Springs Historical Museum, the Sweetwater County Historical Museum, the Sweetwater Events complex, and the Western Wyoming Community College Art Gallery and Dinosaur Exhibit.

3.12.3.8 Waste

Water

Green River and Rock Springs have wastewater treatment facilities that have available capacity.

Solid

Solid waste is disposed of at Sweetwater County's municipal landfills. The county landfill does allow medical waste, however; there are no other types of hazardous waste disposal facilities located in the county.

3.12.3.9 Employment and Income

An area's economic base is made up of activities which bring money into the local economy from other areas of the state, nation, and world. Sweetwater County has a diversified natural resource-based economy. Basic sectors include oil and gas production and processing, coal mining, electric power generation, trona mining and the manufacturing of soda ash and related products, fertilizer manufacturing, agriculture, and transportation (primarily the Union Pacific railroad). Also, the portions of the retail and service sectors that serve visitors (travel, tourism and recreation) can be considered basic.

The number of people employed full-time and part-time in Sweetwater County was 22,442 as of December 2005 (WDE 2005). The composition of this workforce includes approximately 8,136 employees in the natural resources and mining, construction, and manufacturing sector, 9,313 in the services sector, and 4,005 employed by the government. The unemployment rate reported for March 2006 was 3.1 percent, or about 725 workers. This rate continues an overall downward trend in unemployment from rates that reached more than six percent during the late 1990s.

Recently, employment conditions in Sweetwater County have been changing. Oil and gas service firms are adding employees, both from the local labor pool and from outside of the county. At the same time, the trona/soda ash industry is undergoing a reduction in workforce.

The top employers in the county (SWEDA 2003) include FMC Wyoming Corporation (trona mining and processing), the Sweetwater County School District No. 1, General Chemical Company (trona mining and processing), OCI Chemical Corporation (trona mining and processing), and Halliburton (oil field services). In general, trona and coal mining and related mining support services account for a large portion of the region's existing economy.

The U.S. Department of Housing and Urban Development estimated Median Family Income (MFI) for Sweetwater County was $65,300 in 2005. Note that starting in 2003, the Housing and Urban Development MFI estimates were re-benchmarked using 2000 Census income limits, hence the unusual increase in estimates compared to earlier years (Wyoming Housing Database Partnership 2005a). The MFI for Sweetwater County compares to Wyoming's MFI of $55,250. The reported annual per capita

income in Sweetwater County in 1990 was $16,810 compared to $30,880 in 2001, an 84 percent increase in unadjusted dollars (Wyoming Department of Administration and Information 2002). The cost of living index for Sweetwater County was 99 during the fourth quarter of 2004, compared to a statewide average for Wyoming of 100 (Wyoming Division of Economic Analysis 2005). In 2003, the average annual wage for coal miners in Wyoming (not including benefits) was approximately $64,000 (WMA 2004). The average wage of all other types of employment in Wyoming in 2003 was $29,924. **Appendix I** presents the cumulative personal income levels by employment sector for the year 2000 in Sweetwater County.

3.12.4 Past and Current Coal Production Activity

Approximately 34.6 million tons of in-place minable coal is present in the project area. The value of this coal under current market conditions would be between $467 million and $1.2 billion.

There are three producing coal mines near the project area. These three mines include the existing Black Butte Mine, Leucite Hills Mine, and the Bridger Coal Mine. The project area has not been involved in mining activities in the past. The Leucite Hills and Bridger Coal Mines are located north of the project area on the north side of Interstate 80. Black Butte Mine is located immediately north of the project area (**Figure 1.2**).

Total coal production from the Black Butte Mine through 2002 was approximately 84 million tons with an expected production of 97.2 million tons through the year 2008 (BBCC 2005a). In-place minable reserves in the existing Black Butte Mine permit area beginning in 2005 are estimated at 8.9 million tons of coal. The value of the existing reserves based on current market prices of $13.50 (8,800 btu) to $34.35 (11,100 btu) per ton (Argus 2005) would be between $120 and $305 million.

The Leucite Hills Mine produces coal from the Almond Formation and has an estimated 3.8 million tons of in-place minable coal (McCarthy 2005). The value of this coal at current market prices would be between $51 and $130 million.

The Bridger Coal Mine produces five to 5.5 million tons per year from the Fort Union Formation, and has an estimated 121 million tons of in-place minable coal (BLM 2004b). The value of this coal at current market prices would be between $1.6 and $4.1 billion.

The percentage of revenue from the sale of coal going to pay federal/state/private royalties, severance taxes, and ad valorem is approximately 25 percent (WMA 2004). Coal is ranked third in valuation for Sweetwater County, with a 2004 value of over $95 million (WDE 2005).

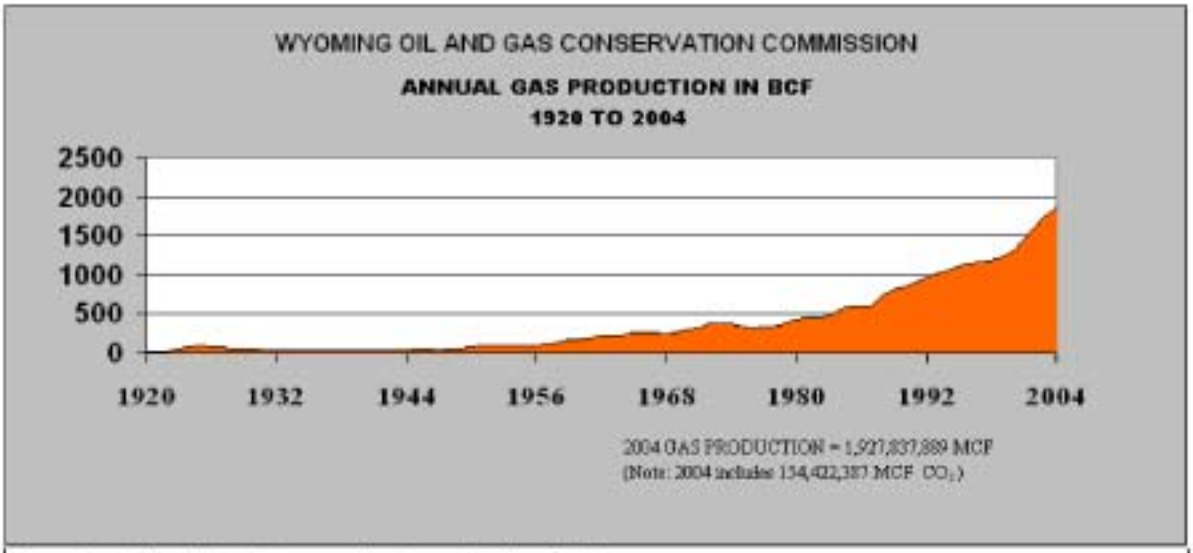
3.12.5 Other Economic Activities Near the Project Area

Production and approved Applications for Permit to Drill (APDs) are two measures of oil and gas activity. As shown in the **Table 3.25**, annual natural gas production in Sweetwater County has generally increased over the past five years. Natural gas production in 2003 was 237 MCF and in 2004 it was 233 MCF. Sweetwater County production accounted for approximately 13 percent of all natural gas produced in Wyoming during 2004 (Wyoming Oil & Gas Conservation Commission 2004). Approved APDs reflect both current and potential future oil and gas activity. Increased drilling could result in increased production if drilling efforts are successful and commodity prices increase or stabilize at economic levels. There were 511 approved APDs in Sweetwater County during 2004.

In 2004, there were a total of 2,501 producing wells (oil and gas) in Sweetwater County. The relatively high levels of natural gas exploration, drilling and production that have occurred in Sweetwater County in recent years have sustained an active natural gas service industry (Robbins 2003). **Table 3.25** presents natural gas production through 2004. Additionally, contractors operating out of Casper, Rawlins, Kemmerer, and Evanston, Wyoming, and Craig, Colorado serve natural gas development in the county.

Sweetwater County produces oil, natural gas, coal, trona, uranium, and sand and gravel, producing a total valuation of $1,212,609,757 for 2004. **Table 3.26** provides the 2004 taxable valuation, approximate percent of statewide valuation, and statewide county rank for production. Each of these is broken out by mineral type.

Table 3.25 Natural Gas Production Through 2004



Wyoming Oil and Gas Conservation Commission 2005

Table 3.26 State-Assessed Mineral Valuations in Sweetwater County During 2004

Mineral	Taxable Valuation	Percent of Statewide Valuation	Statewide County Rank
Oil	16,735,848	1	4 out of 20
Natural Gas	879,077,282	13	3 out of 19
Coal	116,658,528	6	2 out of 5
Trona	198,943,291	100	1 out of 1
Uranium	119,911	13	3 out of 4
Sand and Gravel	1,074,897	7	4 out of 23
Source: Wyoming Department of Revenue 2005			

3.12.6 Housing

Based on the Wyoming Housing Database Partnership's report entitled A Profile of Wyoming Demographics, Economics, and Housing Semiannual Report, Ending June 30, 2005, Volume 1 of II, August 2005, p. 143, the average sales price of new, existing, detached, single-family homes provided by the Sweetwater County Assessor's office in 2006 was $186,796 (Wyoming Housing Database Partnership 2005b). Sweetwater County is experiencing a boom in housing sales averaging 500-600 sales of new or existing detached single family homes a year. A comparison of Sweetwater County and Wyoming's average sales prices between 1997 and 2004, which is displayed in **Table 3.27** below.

The Wyoming Rental Rate Vacancy Survey discussed in the report entitled A Profile of Wyoming Demographics, Economics, and Housing Semiannual Report, Ending June 30, 2005, Volume 1 of II, August 2005, p. 144, has completed a total of 24 surveys that were conducted nine times semiannually during the past four and half years (Wyoming Housing Database Partnership 2005b). Those signified as

'a' in the "year" column of **Table 3.27** are conducted in June/July of each year. Those signified as 'b' are conducted each December**. Table 3.28** summarizes those results.

The most recent survey completed in Sweetwater County was conducted in July 2005. The results of that survey indicated that out of the 1,440 rental units surveyed, 34 were vacant, which translates into a 2.36 percent vacancy rate. This compares to a 0.88 percent vacancy rate one year ago, and a July 2005 vacancy rate of 3.3 percent statewide.

Table 3.27 Average Sales Prices Reported by Assessors, Sweetwater County, 1997 Through 2004

County	1997	1998	1999	2000	2001	2002	2003	2004
Sweetwater ($)	106,000	105,356	108,324	108,633	111,056	114,838	121,652	142,688
% Change		-0.61	2.82	0.29	2.23	3.41	5.93	17.29
Wyoming ($)	91,714	96,906	101,517	111,437	116,469	121,140	132,708	147,588
% Change		5.66	4.76	9.77	4.52	4.01	9.55	11.21

The fiscal year 2005 Housing Needs Assessment Survey discussed in the above referenced report had 777 respondents in Sweetwater County (Wyoming Housing Database Partnership 2005a). Of the incoming population who were unsatisfied with their current housing, 83.8 percent said they were seeking to own a home and 16.2 percent wished to rent. Of those who expressed an interest in owning a home, 65.0 percent indicated a desire to buy existing units. The percentage breakout of those indicating a desire to purchase homes are as follows: 9.0 percent wanted to purchase homes for less than $50,000, 37.3 percent indicated they would be interested in purchasing homes in the range of $50,000 to $99,999, and 53.7 percent were willing to pay more than $100,000. The 35.0 percent remainder of those seeking to own a home indicated a desire to build, of which 8.3 percent expected to build for less than $50,000, another 33.3 percent for less than $100,000 and 58.3 percent for more than $100,000. Given the current home prices in Sweetwater county, a significant portion of those that wish to own a home do not appear to have expectations in line with market realities.

Table 3.28 Semi-Annual Rental Vacancy Survey, Sweetwater County, 2001 Through 2005

Year	Sample	Total Units	Vacant Units	Vacancy Rates (%)
2001a	16	821	67	8.16
2001b	19	1,083	49	4.52
2002a	20	1,060	65	6.13
2002b	21	1,439	65	4.52
2003a	24	1,620	34	2.10
2003b	33	1,942	18	0.93
2004a	29	1,369	12	0.88
2004b	28	1,264	20	1.58
2005a	24	1,440	34	2.36

Of those currently renting or seeking to rent, 20.0 percent hoped to spend less than $365 per month, 45.0 percent anticipated spending $366 to $474, about 30.0 percent were willing to spend $475 to $599, and 5.0 percent over $600.

Housing costs for Sweetwater County were fairly constant until 2002, with the average cost of a single family home from $106,000 in 1997, increasing to $114,838 in 2002 (Allen 2005) when the growing economy contributed to a sharp rise in housing costs (9.3 percent increase from 2002 to 2003, and 11.6 percent increase in 2004 over 2003 prices). The average sales price for houses sold in the Rock

Springs/Green River area in June 2006 was $186,796 (Sweetwater County Assessor). Most of the growth is being realized in Rock Springs, as illustrated in the number of building permits issued over the past several years. So far, in 2005, less than 10 were issued in Green River compared to over 40 in Rock Springs. In 2004, there were almost three times as many building permits issued in Rock Springs as there were in Green River (SWEDA 2005). More than twice as many building permits were issued in 2004 (approximately 75) than in 2002 (approximately 30) in Rock Springs (SWEDA 2005).

Most individuals working in the mining industry where they have year-round employment tend to buy homes in the community. Due the increase of work outside the mining industry, temporary workers must rent. The latest data available shows that as of 2000, there were approximately 3,600 units available for rent (Sonoran Institute 2006) with a vacancy rate of 16.2 percent. Vacancy rates in 2005 have fallen to 2.36 percent. Average rental rates between 1998 and 2004 are shown in **Table 3.29**.

Table 3.29 Average Rental Rates

Monthly Rental Rates	1998	1999	2000	2001	2002	2003	2004
Sweetwater							
House	$470	$474	$497	$533	$516	$595	$635
Apartment	$358	$363	$333	$390	$392	$412	$427
Mobile Home	$406	$360	$402	$422	$422	$457	$566
Mobile Home Lot	$188	$195	$196	$201	$197	$219	$212

In addition to the homes or rental units in the area, there are 31 hotels/motels and 11 private campgrounds/mobile home parks in Rock Springs and Green River. The occupancy rate for hotels and motels in Sweetwater County has been between 82 percent and 100 percent for the period beginning June 2004 and ending in September 2005. Another hotel with 90 rooms will be opening in 2005; however the rate would probably stay the same once this opens. This rate is high right now because there is a large in-migration in Green River and Rock Springs due to the many oil and gas development projects in the area.

3.12.7 Government and Public Finance

The major governing bodies in Sweetwater County include the city governments of Rock Springs and Green River, the school districts, and the Sweetwater County Commissioners.

According to the Wyoming Mining Association (2004), coal mining contributed $535 million to state and local governments in 2003. This amount includes federal mineral royalties (30 percent), ad valorem property taxes levied by the county at six percent (two percent), ad valorem production taxes levied by the county at six percent (19.7 percent), abandoned mine land distributions (5.5 percent), severance taxes (23 percent), state rents and royalties (0.4 percent), lease bonus payments (13.8 percent), and sales and use taxes (5.6 percent). Mining sector sales and use tax collections in Sweetwater County totaled over $10.4 million in Fiscal Year 2003 (Wyoming Department of Administration and Information 2004). BBCC paid approximately $11.1 million in state and federal taxes and royalties in 2004 (McCarthy 2005).

Recipients of state severance tax and federal mineral royalty revenue distributions include cities and towns in the state, the state school foundation, University of Wyoming, state and federal highway funds, county government, community colleges, city/town/special district capital construction programs, state aid for county roads, and municipal water projects, among others (Wyoming Department of Administration and Information 2004).

3.12.8 Environmental Justice

Executive Order 12898 (*Federal Register* 1994) directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects that their programs might impose on minority and low-income populations. The data presented herein are drawn from the 2000 federal census. The EPA (EPA 1998) and CEQ (CEQ 1997) guidelines for conducting environmental justice assessments were followed when preparing this analysis. Census data were reviewed for census tracts and/or the region of influence encompassing the project area.

Minority populations in the census include black, American Indian, Eskimo or Aleut, Asian or Pacific Islander, Hispanic, and other persons. A census tract will be defined as having a disadvantaged population if the proportion within any category equals or exceeds 1.5 times the percentage for the county as a whole. For example, if a countywide black population is nine percent, than any census tract or block in which the black population is 13.5 percent or higher will be considered as having a disadvantaged population. This method is considered to be a conservative approach for a screening level assessment such as this FEIS.

The low-income level is defined in this analysis as the percentage of individuals reported in the 2000 U.S. census as living below the 1999 poverty level. In that year, the average poverty threshold for a family of four in the 48 contiguous states was $16,700 (*Federal Register* 1999).

3.12.8.1 Minority Composition

The project area is located in Census Tract 9716, which encompasses nearly two-thirds of the land area in the county. Information regarding the ethnic composition of populations located within the census tract is provided in **Table 3.30**. Comparative information is also provided for Sweetwater County and the State of Wyoming. As noted above, a census tract will be defined as having a disadvantaged population if the proportion of it population within the category equals or exceeds 1.5 multiplied by the percentage for Sweetwater County as a whole.

Census Tract 9716 and the county exhibit populations that are not diverse ethnically. Whites are predominant (89 percent within the tract, compared to 87 percent for Sweetwater County). The results show that none of the minority populations exceeds 1.5 times the percentage for the county as a whole; therefore, there are no environmental justice populations directly affected by the proposed project, and this section will not be carried forward into Chapter 4.0.

Table 3.30 Ethnic Composition of the Project Area and State of Wyoming Populations

Location	Percent of Total Population					
	White	Black	American Indian, Eskimo, or Aleut	Asian or Pacific Islander	Hispanic	Other/Two or More Races
Wyoming	88.9	0.8	2.3	0.7	6.4	4.3
Sweetwater County	87	0.7	0.8	0.7	9.4	6.0
Tract 9716	89	0.1	0.8	0.4	7.5	2.2
Sources: Quick Facts for Wyoming and Sweetwater County. U.S. Census Bureau 2000b.						

3.12.8.2 Economic Data

The second element of environmental justice is the potential for disproportionate impacts on populations living below the poverty level. Poverty data provided by the Census Bureau characterize only a portion of the overall population. Groups not included in the poverty data are unrelated individuals under the age of 15; individuals living in group quarters such as correctional centers, institutions, college dorms, or

military barracks; or individuals in living institutions without conventional housing. Data on persons living below poverty level in and adjacent to the assessment area are presented in **Table 3.31**.

Table 3.31 Number of People in Assessment Area Living Below the Poverty Level (by Race) in 1999, Compared with State of Wyoming

	White	Black	American Indian, Eskimo, or Aleut	Asian or Pacific Islander	Hispanic	Other Race or Mixed Race	Total Population
Below Poverty Level in Wyoming	45,732	448	3,956	314	5,772	4,327	60,549
Below Poverty Level in Sweetwater County	2,520	69	17	9	353	256	3,224
Below Poverty Level in Tract 9716	133	0	0	9	4	8	154

Source: U.S. Census Bureau 2000b. Census 2000 Summary File three (SF-3)-Sample Data, Detailed Tables P159A-H, Poverty Status in 1999 by Age and Race. Numbers were obtained from Detailed Tables P159A-H as follows for each geographic unit. Quantity below Poverty Level: Taken directly from "Income in 1999 below poverty level" line on each table by race.