The Wyoming Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement

Volume 2: Chapter 3 and Figures

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BLM

FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

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

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

The mission of the USDA Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

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CHAPTER 3—AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes existing conditions for U.S. Department of the Interior, Bureau of Land Management (BLM) and U.S. Department of Agriculture, Forest Service (Forest Service) resource programs, resource uses, special designations, and the socioeconomic environment in the Wyoming Greater Sage-Grouse Resource Management Plan (RMP)/Land and Resource Management Plan (LRMP) (hereafter, land use plan [LUP]) Amendments Planning Area. As summarized in Chapter 1, various laws, regulations, policies, and other requirements direct management of resources and resource uses on BLM-administered and National Forest System lands. The BLM Field Offices and National Forest Service Units, which comprise the planning area, operate under these requirements and guidance. Because this chapter describes existing conditions in the planning area, the chapter serves as the baseline against which the BLM and Forest Service analyze and compare impacts of the Chapter 2 Alternatives in Chapter 4 Impact Analysis.

No new environmental data collection efforts were conducted on BLM-administered and National Forest System lands specifically for the LUP Amendments. The BLM and Forest Service use the best data available at the time the document is prepared. Environmental components that would not be affected or that are not essential to the resolution of planning issues are not covered in detail. Certain information was unavailable for use in developing this plan, because inventories either have not been conducted or were not complete. However, conducting surveys and studies to obtain all unavailable information for inclusion in this Environmental Impact Statement (EIS) would require additional time frames and incur exorbitant costs.

Chapter sections are organized by (1) resource area, (2) BLM field offices, and (3) Forest Service units with the exception of sections on air quality and socioeconomics. Figures for this chapter are located in the Figures section of the document following the Map section. For ease of reference, the sections below are arranged alphabetically by resource.

3.2 AIR QUALITY

This section describes air quality conditions for the entire planning area within both BLM and National Forest System lands. Figures for this resource area are contained within the Figures section following the main portion of the document. A separate General Conformity Determination will be conducted for project areas that are in nonattainment of the National Ambient Air Quality Standards.

3.2.1 Climate

The climate in the planning area is designated as Southern Rocky Mountain Steppe, a temperate semiarid steppe regime with average annual temperatures ranging from 35 to 45 degrees Fahrenheit (°F) (2 to 7 degrees centigrade [°C]) in most of the region, but reaching 50°F (10°C) in the lower valleys (Bailey 1995). The prevailing west winds and the general north-south orientation of the mountain ranges influence the climate. East slopes are much drier than west slopes are in this region; mountain ranges have similar east-west slope differences region-wide. Winter precipitation varies considerably with elevation.

Total precipitation is moderate, but it is greater than on the plains to the east and west. In the highest mountains, a considerable part of annual precipitation is snow, although permanent snowfields and glaciers cover only relatively small areas. Bases of these mountains receive only ten to 20 inches (260 to 510 millimeters [mm]) of rainfall per year. At higher elevations, annual precipitation increases to 40 inches

(1,020 mm), and average temperatures fall (Bailey 1995). Weather stations are located throughout the planning area.

Bureau of Land Management Casper Field Office, Medicine Bow National Forest, and Thunder Basin National Grassland

Meteorological data are available from the Casper Weather Service Office (WSO) Airport station from 1948 through 2012 (Table 3-1). Average temperatures range from 13°F in winter to 88°F in summer. Average precipitation is 12 inches per year, with an average snowfall of 76 inches per year. Wind direction is mainly from the south-west, with speeds up to 39 miles per hour (Figure 3-1).

Table 3-1. Casper Field Office, Medicine Bow National Forest, and Thunder Basin National Grassland

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
January	33.8	13.1	0.51	10.1	1
February	33.7	16.3	0.56	10	1
March	46.1	21.8	0.88	12.6	1
April	56.2	29.3	1.39	11.8	0
May	66.7	38.3	2.09	3.8	0
June	78.7	46.9	1.4	0.2	0
July	87.8	54.2	1.22	0	0
August	85.9	52.5	0.7	0	0
September	74.5	42.4	0.94	1.3	0
October	60.5	32.5	1.02	6.2	0
November	44.6	22.2	0.7	9.9	1
December	35.1	15	0.56	10.4	1
Annual	59	32	11.97	76.4	0

Western Regional Climate Center 2012

Bureau of Land Management Kemmerer Field Office and Bridger-Teton National Forest

Meteorological data are available from the Kemmerer Water Treatment station from 1902 through 2012 (Table 3-2). Average temperatures range from 4°F in winter to 81°F in summer. Average precipitation is nine inches per year, with an average snowfall of 51 inches per year. Wind direction is mainly from the south-west, with speeds up to 25 miles per hour (Figure 3-2).

Table 3-2. Kemmerer Field Office and Bridger-Teton National Forest

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
January	29.1	4.3	0.7	9.3	8
February	32	5.9	0.59	8.2	8
March	39.5	13.5	0.61	6.9	3
April	51.3	23	0.78	4.1	0
May	62.8	31.9	1.11	1.7	0
June	72.5	38.2	0.99	0.2	0
July	81.3	44.2	0.82	0	0
August	79.5	42.2	0.82	0	0
September	69.6	34	0.89	0.5	0
October	57	24.9	0.75	1.9	0
November	40.6	14.8	0.74	7.9	1
December	30.9	6.4	0.68	9.8	5
Annual	53.8	23.6	9.39	50.5	2

Western Regional Climate Center 2012

Bureau of Land Management Newcastle Field Office and Thunder Basin National Grassland

Meteorological data are available from the National Weather Service station at Newcastle, Wyoming, from 1906 through 2012 (Table 3-3). Average temperatures range from 11°F in winter to 88°F in summer. Average precipitation is 15 inches per year, with an average snowfall of 37 inches per year. Wind direction is mainly from the west, with speeds up to 19 miles per hour (Figure 3-3).

Table 3-3. Newcastle Field Office and Thunder Basin National Grassland

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
January	34.1	11.4	0.45	6.4	2
February	37.9	14.5	0.51	5.9	2
March	46.4	22.4	0.73	6.6	1
April	57.5	32.2	1.5	3.9	0
May	68	42.2	2.51	0.5	0
June	78.4	51.6	2.52	0	0
July	87.8	59	2	0	0
August	85.7	56.9	1.63	0	0
September	74.4	46.5	1.17	0.2	0

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
October	60.8	35.1	1.03	1.9	0
November	45.2	22.8	0.6	5	1
December	35.9	14.2	0.5	6.3	2
Annual	59.3	34.1	15.14	36.7	1

Western Regional Climate Center 2012

Bureau of Land Management Pinedale Field Office and Bridger-Teton National Forest

Meteorological data are available from the National Weather Service station at Pinedale, Wyoming, from 1948 through 2012 (Table 3-4). Average temperatures range from -1°F in winter to 79°F in summer. Average precipitation is 11 inches per year, with an average snowfall of 63 inches per year. Wind direction is mainly from the west-northwest, with speeds up to 25 miles per hour (Figure 3-4).

Table 3-4. Pinedale Field Office and Bridger Teton National Forest

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
Pinedale Station					
January	26.5	-0.9	0.68	12.4	8
February	29.8	1.1	0.54	9.7	10
March	38.1	9.9	0.63	8.4	7
April	49.4	20.8	0.89	6.5	1
May	60.6	28.5	1.61	2.3	0
June	70.4	36.6	1.25	0.3	0
July	78.7	41.4	0.97	0	0
August	77	38	1.03	0	0
September	68.1	30.4	1.08	0.7	0
October	55.8	22.2	0.81	2.9	0
November	38.4	11.8	0.67	8.4	1
December	28.2	1.7	0.68	11.3	5
Annual	51.7	20.1	10.82	62.8	3
La Barge					
January	30.1	-2.4	0.31	5.4	3
February	33.8	0.2	0.36	4.7	3
March	43.1	13.7	0.41	4.1	2
April	53.7	23.5	0.79	3.6	0

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
May	64.3	31.9	1.28	1.6	0
June	73.4	39.1	1.03	0	0
July	88.3	44.4	0.62	0	0
August	81.5	42.5	0.89	0	0
September	71	33.1	0.75	0.4	0
October	59	22.8	0.63	2.1	0
November	41.5	10.5	0.42	3.6	1
December	30.8	-0.9	0.47	6.3	2
Annual	55.5	21.5	7.96	31.9	1

Western Regional Climate Center 2012

Bureau of Land Management Rawlins Field Office and Medicine Bow National Forest

Meteorological data are available from the Rawlins Federal Aviation Administration (FAA) Airport station from 1948 through 2012 (Table 3-5). Average temperatures range from 13°F in winter to 84°F in summer. Average precipitation is nine inches per year, with an average snowfall of 52 inches per year. Wind direction is mainly from the south, with speeds up to 32 miles per hour (Figure 3-5).

Table 3-5. Rawlins Field Office and Medicine Bow National Forest

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
January	30.8	12.7	0.45	7.9	2
February	33.7	14.5	0.51	7.5	2
March	41.5	20.5	0.68	7.8	1
April	52.7	27.7	1.02	7.1	0
May	63.9	36.2	1.28	1.6	0
June	75.5	44.5	0.87	0.2	0
July	84	51.6	0.77	0	0
August	81.3	50	0.74	0	0
September	70.5	40.8	0.84	1.2	0
October	57	31.3	0.81	3.4	0
November	40.8	20.5	0.56	7.7	1
December	32	13.8	0.47	7.5	1
Annual	55.3	30.3	9	51.9	1

Western Regional Climate Center 2012

Bureau of Land Management Rock Springs Field Office and Bridger-Teton National Forest

Meteorological data are available from the Rock Springs FAA Airport station from 1948 through 2012 (Table 3-6). Average temperatures range from 11°F in winter to 84°F in summer. Average precipitation is nine inches per year, with an average snowfall of 44 inches per year. Wind direction is mainly from the west to the southwest, with speeds up to 47 miles per hour (Figure 3-6).

Table 3-6. Rock Springs Field Office and Bridger Teton National Forest

	Average Maximum Temperature (F)	Average Minimum. Temperature (F)	Average Total Precipitation (in.)	Average Total Snowfall (in.)	Average Snow Depth (in.)
January	29.3	11.4	0.5	6.9	3
February	33.4	14.4	0.5	5.7	2
March	42	21.2	0.66	6.8	1
April	52.9	28.8	0.95	5.8	0
May	63.6	37.4	1.2	2	0
June	74.6	46	0.86	0.1	0
July	83.5	53.4	0.67	0	0
August	81.1	51.5	0.62	0	0
September	70.7	42.1	0.78	0.7	0
October	57.2	32	0.83	4	0
November	40.5	20.5	0.55	5.6	1
December	30.8	12.8	0.51	6.1	2
Annual	55	31	8.63	43.6	1

Western Regional Climate Center 2012

Precipitation

High elevations generally experience greater amounts of precipitation than lower elevations. Mean annual precipitation in the planning area has decreased by 0.3 to 0.6 inches since 1976 (NOAA 2005).

3.2.2 Temperature

Diurnal (morning to night) and seasonal (summer to winter) ranges in temperature are greater in valleys than on slopes (Martner 1986). Mean annual temperatures in the planning area have warmed 0.1 to 0.25 F° since 1976 (National Oceanic and Atmospheric Administration [NOAA] 2005).

Dispersion

Atmospheric stability is a measure of the atmosphere's capacity to disperse pollutants. Comprehensive wind measurements made within the planning area were collected in the Jonah Field Project Area at a meteorological station operated by British Petroleum (BP) from 1999 through 2003. Atmospheric stability class (Table 3-7 and Figure 3-7) is a measure of atmospheric turbulence, which directly affects pollutant dispersion. The stability classes are divided into six categories designated "A" (unstable) through "F" (very stable). The "D" (neutral) stability class occurs more than half of the time. The frequency and strength of winds greatly affect the transport and dispersion of air pollutants. Because of the strong winds in the region, the potential for atmospheric dispersion is relatively high, although nighttime cooling enhances stable air and inhibits air pollutant mixing and transport.

Table 3-7. Atmospheric Stability Class Distribution Averaged from 1999 through 2003

Stability Class*	Frequency (%)
A	2.4
B	6.1
C	12.2
D	60.2
E	15.4
F	3.7

Source: BP 2004.
* A = unstable; D = neutral; F = very stable

Wind Speed and Direction

Wind speed and direction are highly variable as a result of the effect of local topography in the planning area.

3.2.3 Air Quality Characterization

Elements of air quality addressed in the air quality analysis include concentrations of air pollutants, visibility, and atmospheric deposition.

3.2.4 Ambient Air Quality Concentrations

Ambient air concentration refers to the amount of pollutants present in a volume of air and can be reported in units of micrograms per cubic meter ($\mu g/m^3$). Concentration can also be reported as parts per billion (ppb) or parts per million (ppm). The Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD) determines background air quality levels.

Criteria Pollutants

Criteria air pollutants are those for which national health-based concentration standards have been established. Measured pollutant concentrations with concentrations greater than these standards present a risk to human health. Criteria air pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$) and lead (Pb). Criteria air pollutant concentrations are compared to National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS).

Some criteria air pollutant modeled concentrations are compared to the Prevention of Significant Deterioration (PSD) increments. The goal of the PSD program is "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}.

Specific monitoring protocols, known as reference (or equivalent) methods, must be followed to determine compliance with WAAQS and NAAQS. The WDEQ performs regulatory monitoring throughout the State of Wyoming for CO, NO_2, O_3, PM_{10} and $PM_{2.5}$.

Carbon Monoxide

Because carbon monoxide (CO) data are collected mostly in urban areas where automobile traffic levels are high, recent data are often unavailable for rural areas. CO is essentially inert to plants and materials but can have significant effects on human health because it combines readily with hemoglobin and, thus, reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea or death.

Motor vehicles and other internal combustion engines are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. CO is also created during refuse, agricultural, and wood stove burning, and by some industrial processes.

Nitrogen Dioxide

Oxides of nitrogen (N), including nitric oxide (NO) and NO_2, are formed when naturally occurring atmospheric N and oxygen are combusted with fuels in automobiles, power plants, industrial processes, as well as in home and office heating. At high exposures, NO_2 causes respiratory system damage of various types, including bronchial damage. Its effects are displayed by increased susceptibility to respiratory infection and lung function changes. Within the atmosphere, NO_2 may be seen as reddish-brown haze. It also contributes to visibility impacts in distant sensitive areas. NO_2 (and other nitrogen oxides [NOx] compounds) also form nitric acid, a component of atmospheric deposition (e.g., acid rain.).

Ozone

Ozone (O_3) is not emitted directly, but it is formed by a photochemical reaction of precursor air pollutants emitted into the atmosphere. Ozone precursors, which include volatile organic compounds (VOC) and NOx, react in the atmosphere in the presence of sunlight to form ozone. The ozone precursors VOC and NOx are emitted by mobile sources and by stationary combustion equipment. Ozone is produced year-round, but because photochemical reaction rates depend on the concentrations of NOx and VOC and the intensity of ultraviolet light and air temperature, ozone concentrations are generally greatest during the summer in urban areas. Ozone concentrations can be elevated in winter snow-covered rural areas. Ozone is a severe eye, nose, and throat irritant. Ozone is a potent oxidant that increases susceptibility to respiratory infections and may cause substantial damage to vegetation (leaf discoloration and cell damage) and other materials (attacking synthetic rubber, textiles, paints, etc.). There is a non-attainment area that encompasses parts of four planning units: Rock Springs, Kemmerer, Pinedale and Bridger-Teton National Forest (BTNF).

Particulate Matter

Particulate matter includes PM_{10} (inhalable particles and aerosols less than 10 microns in diameter) and $PM_{2.5}$ (fine particles and aerosols less than 2.5 microns in diameter).

PM_{10}

Particulate matter (PM_{10}) impacts include deposition (soiling), localized visibility reduction, potential corrosion, and negative health effects from particulate matter that is small enough to reach the lungs when inhaled. PM_{10} emissions are generated by a variety of sources, including agricultural activities, industrial emissions, and road dust suspended by vehicle traffic. Within the planning area, primary sources of PM_{10}

include smoke from wildland fire, residential wood burning, street sand, physically disturbed soils, and unpaved road dust.

$PM_{2.5}$

Fine particulate matter (smaller-sized $PM_{2.5}$) poses the greatest health concern because it can pass through the nose and throat and get deep into the lungs. $PM_{2.5}$ emissions are primarily generated by internal combustion and diesel engines, high slit/clay content soils, and secondary aerosols formed by chemical reactions in the atmosphere. $PM_{2.5}$ also contributes to visibility impacts in distant areas.

Sulfur Dioxide

Sulfur dioxide is a colorless gas that has a pungent odor. Prolonged exposure to high levels of SO_2 can lead to respiratory failure and can play a large role in the aggravation of chronic respiratory illnesses such as asthma. SO_2 is emitted primarily from stationary sources that burn fossil fuels (i.e., coal and oil) containing trace amounts of elemental sulfur. Other sources of SO_2 include metal smelters and petroleum refineries. SO_2 is also emitted on occasion from natural sources such as volcanoes. In the atmosphere, SO_2 converts to sulfuric acid, a component of atmospheric deposition (acid rain), and also forms secondary aerosols (thus, contributing to visibility impacts in distant sensitive areas).

Hazardous Air Pollutants

Hazardous air pollutants (HAP) ambient concentration data do not exist for the planning area. There are no ambient air quality standards for HAPs. WDEQ-AQD regulates HAP emissions through the New Source Review permitting process and applicable national emissions standards for hazardous air pollutants (NESHAP) maximum achievable control technology (MACT) standards. However, the impact analysis in Chapter 4 addresses HAP emissions.

Bureau of Land Management Casper Field Office, Medicine Bow National Forest, and Thunder Basin National Grassland

Criteria pollutants monitored in the Casper Field Office, MBNG, and TBNG area include NO_2, O_3, $PM_{2.5}$, PM_{10} and SO_2. Figure 3-8 shows that all monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. No areas in the Casper Field Office, MBNF, and TBNG area were designated non-attainment for any criteria pollutant. Particulate concentrations associated with Powder River Basin coal mines in Converse County have been in compliance with the NAAQS since 2008. There were three exceedences of the 24 hour PM10 NAAQS in northern Converse County in 2012 due to high winds (Environmental Protection Agency [EPA] 2013). In Campbell County, there were two violations of the 24 hour PM_{10} NAAQS near Powder River Basin coal mines in 2008 (BLM 2010). There was one exceedance of the 24 hour PM_{10} NAAQS near Powder River Basin coal mines in Campbell County in 2011 and one in 2012 (EPA 2013). These exceedences may constitute a violation of the 24 hour PM_{10} NAAQS if WDEQ determines that the average of the second highest PM_{10}concentrations for 2010, 2011 and 2012 are greater than 150 $\mu g/m^3$. Concentrations of $PM_{2.5}$ in Campbell County have been in compliance with the NAAQS since 2008.

Bureau of Land Management Kemmerer Field Office and Bridger-Teton National Forest

Criteria pollutants monitored in the Kemmerer Field Office and BTNF area include NO_2, O_3, PM_{10} and SO_2. Figure 3-9 shows that all monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. However, elevated ozone concentrations in the Pinedale area led to the designation of the north-eastern part of Lincoln County (as well as Sublette and part of Sweetwater Counties) as non-attainment for ozone in July 2012. No areas in the Kemmerer Field Office and BTNF area have been designated non-attainment for any other criteria pollutant.

Bureau of Land Management Newcastle Field Office and Thunder Basin National Grassland

Criteria pollutants monitored in the Newcastle Field Office and TBNG area include O_3 and SO_2. Figure 3-10 shows all monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. No areas in the Newcastle Field Office and TBNG area have been designated non-attainment for any criteria pollutant.

Bureau of Land Management Pinedale Field Office and Bridger-Teton National Forest

Criteria pollutants monitored in the Pinedale Field Office and BTNF area include CO, NO_2, O_3, $PM_{2.5}$ and PM_{10}. Figure 3-11 shows O_3 concentrations averaged over three years (from 2009 through 20011) exceeded the NAAQS. All other monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. Ozone concentrations in Pinedale for 2011 exceeded the applicable NAAQS. Elevated O_3 concentrations led to the designation of Sublette and part of Lincoln Counties (as well as part of Sweetwater County) as non-attainment for ozone. The Upper Green River Basin within the Pinedale (and Rock Springs) Field Office area was designated non-attainment for O_3 in 2012.

Ozone data have been collected at three monitoring sites in the Jonah area since 2005 (Figure 3-12). These stations have recorded elevated O_3 levels since 2005. The elevated ozone levels have been recorded during the winter months, primarily in February. Ozone was once thought to be primarily a summertime problem in urban areas. In recent years, however, elevated O_3 concentrations have occurred during winter in rural areas. Elevated O_3 concentrations in western Wyoming are most likely associated with increased emissions of NO_2 and VOC during stable conditions and adequate accumulation of snow. There are several hypotheses regarding the cause(s) of elevated O_3 events during winter in rural areas, including a combination of unique meteorological, land surface, and topographical conditions acting upon local large scale emissions. Stratospheric O_3 intrusion and ozone transport from other areas have been dismissed as a cause of elevated O_3 concentrations in the Pinedale area.

Bureau of Land Management Rawlins Field Office and Medicine Bow National Forest

Criteria pollutants monitored in the Rawlins Field Office and MBNF area include CO, NO_2, O_3, $PM_{2.5}$, PM_{10} and SO_2. Figure 3-13 shows that all monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. No areas in the Rawlins Field Office and MBNF area have been designated non-attainment for any other criteria pollutant.

Bureau of Land Management Rock Springs Field Office and Bridger-Teton National Forest

Criteria pollutants monitored in the Rock Springs Field Office and BTNF area include CO, NO_2, O_3, $PM_{2.5}$, PM_{10} and SO_2. Figure 3-14 shows all monitored criteria pollutants were in compliance with NAAQS and WAAQS in 2011. However, elevated ozone concentrations in the Pinedale area led to the designation of the north-western part of Sweetwater County (as well as Sublette and part of Lincoln Counties) as non-attainment for ozone in July 2012.

3.2.5 Air Quality Related Values

Air quality related values (AQRV) (such as flora, fauna, soil, water, cultural resources, odor and visibility) can be impacted by air pollution. AQRVs are related to the Clean Air Act. Federal Land Managers are required to protect these in Class I areas and under the Wilderness Act, these same values are to be protected in all wilderness areas (Class I and II). For the purpose of this analysis, the discussions will focus on visibility, deposition of N and sulfur, and lake chemistry.

Visibility

Interagency monitoring of protected visual environments (IMPROVE) has measured visibility in national parks and wilderness areas in the United States since the 1980s. There are seven IMPROVE aerosol monitoring stations in Wyoming: Bridger Wilderness (near Pinedale), Yellowstone National Park, North Absaroka Wilderness (near Dead Indian Pass), Cloud Peak, Brooklyn Lake, Boulder Lake and Thunder Basin. Some of the best visibility monitored in the contiguous United States is at the Bridger Wilderness station in western Wyoming.

Visibility can be expressed in various units, including SVR (standard visual range) and dv (deciview). SVR is the distance wherein one can see the color, contrast and texture of an object. Figure 3-15 shows daily visibility in the Bridger Wilderness as standard visual range. From 1988 through 2010, visibility in the Bridger Wilderness stayed about the same, ranging from ten miles on the haziest days to 230 miles on the clearest days. Visibility is similar at Yellowstone National Park (Figure 3-16), North Absaroka (Figure 3-17), Cloud Peak (Figure 3-18), Brooklyn Lake (Figure 3-19), and Rocky Mountain National Park (Figure 3-20). SVR is less on the clearest days in Thunder Basin (Figure 3-21) and Boulder Lake (Figure 3-22).

Visibility can also be expressed in dv, a measure of perceived changes in visibility. One dv is defined as a change in visibility that is just barely perceptible to an average person, about a 10% change in light extinction.

Monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored, ranked from clearest to haziest; conditions are reported in three categories:

- 20% clearest—Mean visibility for the 20% of days with the best visibility
- Average—Annual mean visibility
- 20% haziest—Mean visibility for the 20% of days with the poorest visibility

Figure 3-23 shows annual visibility in Bridger Wilderness from 1989 through 2010 (using the most current data available from IMPROVE). Visibility on the 20%clearest days varies from 160 to 200 miles. Average visibility varies from 110 to 150 miles. Visibility for the 20% haziest days varies from 70 to 100 miles. Visibility on the clearest days has improved since 1989. The Bridger IMPROVE station was sited to monitor general air quality representative of the Bridger area, rather than the maximum impact from gas development.

Figure 3-24 shows annual visibility in Yellowstone National Park from 1991 through 2010. Visibility on the 20% clearest days varies from 135 to 200 miles, average visibility varies from 95 to 145 miles, and visibility on the 20% haziest days varies from 60 to 95 miles. Visibility has improved since 1991.

Figure 3-25 shows annual visibility in North Absaroka from 2002 through 2008. Visibility on the 20% clearest days varies from 180 to 200 miles, average visibility varies from 120 to 135 miles, and visibility on the 20% haziest days varies from 60 to 90 miles. Visibility has stayed about the same over this period.

Figure 3-26 shows annual visibility in Cloud Peak from 2003 through 2010. Visibility on the 20% clearest days varies from 190 to 200 miles, average visibility varies from 130 to 150 miles, and visibility on the 20% haziest days varies from 60 to 95 miles. Visibility on hazy days has improved, although visibility on average and clear days has stayed about the same during this period.

Figure 3-27 shows annual visibility in Rocky Mountain National Park from 1991 through 2010. Visibility on the 20% clearest days varies from 150 to 200 miles, average visibility varies from 100 to 130 miles, and visibility on the 20% haziest days varies from 50 to 80 miles. Visibility has improved since 1991.

Atmospheric Deposition

Atmospheric deposition, which refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, is reported in the document as the mass of material deposited on an area in one year (kilogram per hectare per year [kg/ha/yr]). 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). The following substances are deposited:

- Acids—Such as sulfuric acid (H_2SO_4) and nitric acid (HNO_3). This acid deposition is sometimes referred to as acid rain.
- Air toxics—Such as pesticides, herbicides, and volatile organic compounds (VOC).
- Nutrients—Such as nitrate (NO_3^-) and ammonium (NH_4^+).

The estimation of atmospheric deposition is complicated by contributions to deposition by rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation, which, in turn, varies with elevation and time.

Wet Deposition

The National Atmospheric Deposition Program (NADP) assesses wet deposition by measuring the chemical composition of precipitation (rain and snow). The natural acidity of rainwater is represented by a range of pH values from 5.0 to 5.6 (Seinfeld 1986). There are nine NADP stations in Wyoming: Snowy Range, Sinks Canyon, Pinedale, Yellowstone National Park, Grand Tetons, Brooklyn Lake, South Pass, Gypsum Creek and Newcastle.

The mean annual precipitation pH in Pinedale from 1982 through 2011 ranged from 4.9 to 5.5, indicating some acidification of precipitation during that period (Figure 3-28). Data for Sinks Canyon and South Pass show similar values of precipitation pH (Figure 3-29).

Dry Deposition

Dry deposition refers to the transfer of airborne gaseous and particulate material from the atmosphere to the Earth's surface by gravitational settling. The Clean Air Status and Trends Network (CASTNet) measures dry deposition and concentrations of SO_2, HNO_3, sulfate (SO_4^{2-}), NO_3^-, and NH_4^+. There are three CASTNet stations in Wyoming: Pinedale, Yellowstone National Park and Centennial with data available from the 1990's through the present. These data for Pinedale, Centennial, and Yellowstone National Park show dry deposition values in Pinedale to be low and steady for all pollutants, although HNO_3 deposition ranged from 0.75 to 2.5 kg/ha/yr in Pinedale.

Mean annual CASTNet concentrations of HNO_3 are less than 0.2 ppb in Pinedale (Figure 3-30). Typically, HNO_3 concentrations range from 0.02 to 0.3 ppb in remote areas and from 3 to 50 ppb in urban areas (Seinfeld 1986). Although HNO_3 concentrations in Pinedale are well below urban levels, concentrations are in the high range of those typical in remote areas. Mean annual concentrations of NO_3^- are less than 0.1

ppb at Pinedale. Typically, NO_3^- concentrations are about 0.2 ppb in remote areas and one ppb in urban areas (Stern 1973). Mean annual concentrations of NH_4^+ are less than 0.4 ppb in Pinedale. Typically, NH_4^+ concentrations are 0.3 ppb in remote areas and 1.4 ppb in urban areas (Stern 1973). The concentrations of N compounds are about the same in Centennial (Figure 3-31) and in Yellowstone National Park (Figure 3-32). N compound measurements at the Pinedale site are not reflective of the higher elevation forested areas that have N deposition exceeding 3 kg/ha/yr.

More recent SO_2 data, as well as SO_4^- data, were collected by CASTNet in Pinedale through 2011 (Figure 3-34). Concentrations of SO_2 are less than 0.3 ppb in Pinedale. Typically, SO_2 concentrations range from 1 to 10 ppb in remote areas and from 20 to 200 ppb in urban areas (Seinfeld 1986). Thus, SO_2 concentrations in the planning region are less than concentrations typical of remote areas. Mean annual concentrations of SO_4^- are below 0.1 ppb in Pinedale. Typically, SO_4^- concentrations are about 0.6 ppb in remote areas and about 2.5 ppb in urban areas (Stern 1973). The SO_4^- concentrations in the region are well below urban levels and equal to levels typical in remote areas. Concentrations of sulfur compounds are similar in Centennial (Figure 3-35) and Yellowstone National Park (Figure 3-36).

Figure 3-37 shows that mean annual WARMS concentrations of SO_2 and SO_4^- in Pinedale were less than 1.0 $\mu g/m^3$ from 2002 through 2010. These concentrations indicate sulphur compound concentrations typical for remote areas.

Total Deposition

Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition. Total deposition level of concern (LOC) has been estimated by the National Park Service (NPS) to be 1.5 kg/ha-year for N and 3 kg/ha-year for sulfur (NPS 2011).

Figures 3-38 to 3-43 compare total deposition near Pinedale, Yellowstone National Park and Centennial with the total deposition LOCs set by the NPS. Total N deposition near Pinedale ranged from 1.2 to 1.9 kg/ha-year from 1982 to 2010, and was greater than the N LOC in 1995, 2002, 2005, and 2007. Total sulfur deposition was well below the LOC for the same period. Total N deposition in Yellowstone National Park has ranged from 1.39 to 2.18 kg/ha-year, and total sulphur deposition has been about 1 kg/ha-year. Total N deposition at Centennial has ranged from 2-4 kg/ha-year, and total sulphur deposition has been below 3 kg/ha-year.

Lake Chemistry

Long-Term Lake Monitoring for the Bridger-Teton National Forest

The lake monitoring program on the BTNF began in 1984 to monitor AQRVs in a Class I wilderness area. The four lakes (Black Joe, Hobbs, Upper Frozen, and Deep Lakes) that are currently monitored were chosen based on elevation (above 2,900 meters), size (greater than 15 acres), and low acid neutralization capacity (ANC) (Table 3-8). Lake data for the BTNF can be obtained from the Forest Service Natural Resource Information System (NRIS)-Air database for chemistry of lakes, streams, and bulk deposition on and near the National Forests (http://www.fs.fed.us/waterdata/). The lake sampling followed protocols highlighted in the BTNF Wind River Mountains Air Quality Monitoring Program Methods Manual (Forest Service 2002b). Lakes were typically sampled three times per year at the inlet and outlet. Collecting of the season one sample occurred during the months after ice typically begins to break up (May to July 21). Season two sampling occurred mid- to late summer when the lakes typically are stratified (July 22 to August 31). Lastly, season three sampling occurred closest to typical lake freezing after fall overturn (September 1 to mid-November). In addition, epilimnion and hypolimnion samples were collected during season two.

Table 3-8. Physical Features of Sampled Lakes

Lake Name	Elevation (m)	Depth (m)	Area of Lake (acres)
Black Joe	3,120	29	80
Deep	3,220	27	61
Hobbs	3,080	18	17
Upper Frozen	3,490	43	24

Data from Black Joe, Hobbs, Deep and Upper Frozen Lakes were analyzed for trends in concentrations of lab specific conductance (Lcond), ANC (µeq/L), calcium (Ca^{2+}), chlorine (Cl^{-}), potassium (K^{+}), magnesium (Mg^{2+}), sodium (Na^{+}), NH_4^+, NO^-, lab pH, and SO_2^- (all in µeq/L). Data from each lake was analyzed for annual trends in chemistry at the lake inlet, outlet, epilimnion, and hypolimnion (hypo) in the General Technical Report (RMRS-GTR-248WWW) from Rocky Mountain Experiment Station in November 2010. Upper Frozen Lake was first sampled in 2000 and was later added as a very sensitive (low ANC) lake. Due to a short sampling period, statistical analysis could not be completed. Due to its remote location, Upper Frozen Lake was sampled once a year at the outlet during season two. General Trend Information for the long-term lakes is displayed in Table 3-9.

Table 3-9. Significant Trends for Long-Term Lakes (1984-Present)

	Black Joe			Hobbs			Deep			Upper Frozen		
	Inlet	Outlet	Hypo	Inlet	Outlet	Hypo	Inlet	Outlet	Hypo	Inlet	Outlet	Hypo
ANC	—	—	—	—	▼	—	—	—	—	ND	ND	ND
NH4	—	▲	▲	▲	▲	▲	—	—	▲	ND	ND	ND
NO3	▲	—	—	—	—	▼	—	—	▲	ND	ND	ND
SO4	▲	—	—	—	—	—	—	—	—	ND	ND	ND

ND = Not Determined
▲ = Increasing trend
— = No change
▼ = Decreasing trend

Lake Trend Discussion

Black Joe Lake has increases of NO_3^- and SO_4 at the inlet. This indicates that the lake is getting additions of these nutrients due to atmospheric deposition and subsequent runoff entering the lake. This lake also shows increases in NH_4^+at the outlet and hypolimnion, which is likely a byproduct of dying algae and enrichment due to additions of NO_3^- and SO_4. This lake is showing signs of nutrient enrichment tending towards eutrophication. In addition to atmospheric deposition as a source for enrichment, the melting of adjacent snowfields could be a stored source of nutrients that are being released as the snow melts. Snowfields have all but disappeared over the last 15 years.

Hobbs Lake is truly showing signs of eutrophication with NH_4^+ increasing at the outlet, inlet and hypolimnion. This lake is also showing decreases in NO_3 at the hypolimnion, which indicates NO_3^- is probably being taken up by biota in the lake system. This lake also shows a decrease in ANC or less ability to buffer the addition of acids to the lake. Low ANCs may contribute to changes in biota within the lake system and can be harmful to fish. These nutrient increases are due to increased atmospheric deposition as shown by co-located deposition monitors.

Deep Lake is showing enrichment in the form of NO_3^- and NH_4^+ in the hypolimnion. The source is likely atmospheric deposition. This lake (like Black Joe Lake) is showing signs of nutrient enrichment trending towards eutrophication.

Upper Frozen Lake has a limited number of samples, and not enough data is available for statistical analysis.

More significant trends appeared in the inlet samples rather than in the outlet samples, most likely due to lake watershed processes such as biological activity and mixing. Black Joe and Deep lakes may be particularly influenced by melting snowfields and atmospheric deposition. Chemical concentrations in lakes may be influenced by weather and the time of year samples were collected since lake chemistry is increasingly influenced by groundwater after the snowmelt surge is over (Guerri 2010, personal communication).

An increasing trend in NO_3^- concentration was also found in lakes that were sampled in the Shoshone National Forest (Bevenger 2008). In the Rocky Mountains, many lakes may be at or near N saturation levels (Burns 2003, Campbell 2004) where lake N supply exceeds uptake. Increasing trends in NO_3^- concentrations have occurred in at least two water catchments in the Colorado Front Range (Williams et al. 1996). In these two catchments, NO_3^- levels have increased from below detection limits to about 10 μeq/L (0.62 mg/L). NH_4^+ concentrations have also been increasing at Black Joe, Hobbs, and Deep lakes. Significant increasing trends were present in the hypolimnion at Black Joe and Deep lakes, the inlet and outlet at Hobbs Lake, and the outlet at Black Joe Lake. The major concern associated with increasing inorganic N in aquatic ecosystems is the potential to cause acidification (via increasing hydrogen ions) and/or eutrophication through increased primary producers (Camargo and Alonso 2007).

The data suggest an increasing trend in SO_4^{2-} at Upper Frozen and Black Joe lakes. This is opposite the pattern of decreasing trends in SO_4^{2-} concentrations observed in precipitation across the United States, including the trends found in the NADP data discussed above and in Hobbs Lake. SO_4^{2-} concentrations in lake water may be influenced by melting snowfields (with the exception of Hobbs Lake) or local and/or regional emissions. In the neighboring Shoshone National Forest, Bevenger (2008) found no significant trends in SO_4^{2-} at Saddlebag Lake and significant decreasing trends at Ross Lake for the outlet and hypolimnion. On the other hand, some lakes in Colorado are exhibiting increases or no trend in SO_4^{2-} concentrations when analyzed (Mast 2009, personal communication). The cause of the increased trend in SO_4^{2-} in the Bridger-Teton lakes is not readily understood. Overall, cations (Na^+, Ca^{2+}, Mg^{2+}, and K^+) showed significant increases in concentrations over time in some portions of the lakes possibly due to drought, melting snowfields, or both.

General observations from the data:

- SO_4^{2-} has been increasing (hypolimnion) since the late 90's
- Increase in NH_4^+ in lakes (agrees with the general increase in NH_4^+ deposition occurring across the western US)
- Increase in NO_3^- during season three lake sampling for Black Joe and Deep inlets
- Hobbs Lake appears to be the lake most impacted by additions of N
- Deep Lake appears to be using additions of N (increasing in the hypolimnion)
- Both Black Joe and Hobbs Lakes are showing increases in NH_4^+ at the outlets, which may contribute to changes downstream
- SO_4^{2-} and N loading are higher in lakes on the south end of the Wind River Range.

These observations lead us to conclude that the chemistry and function our long-term lakes are changing due to increased deposition of N and SO_4^{2-}. Increases in hypolimnion and outlet NH_4^+means there is some eutrophication occurring (Black Joe, Hobbs and Deep Lakes). Nitrogen and sulphur concentrations are much higher in inlets than in outlets (indicating nutrient uptake in the lakes). A N spike in the inlet compared to the outlet meets the definition of eutrophication and represents a build-up in N entering the lakes. All of these are of concern since minor changes in lake chemistry can change the function and survival of biotic communities within the lake ecosystem and even downstream. Biota within the lake ecosystem that can be affected include algae, diatoms, macroinvertebrates, and fish. Future deposition of N and sulphur compounds must be reduced to avoid even more drastic changes from occurring, so Federal Land Managers can fulfill their obligations under the Clean Air Act (CAA) and Wilderness Act (WA) to protect AQRVs in Class I and Class II Wilderness areas.

3.2.6 Summary of Existing Air Quality

Air quality monitoring data provided by the State of Wyoming show that air quality in the planning area is not entirely in compliance with state and federal ambient air quality standards (Table 3-10).

Table 3-10. Summary of Air Quality Values for the Planning Area

Air Quality Component	Comment
Air Pollutant Concentrations	
Criteria air pollutants	• Concentrations of CO, NO2, PM and SO2 are in compliance with NAAQS and WAAQS. • All of Sublette and parts of Lincoln and Sweetwater counties have been designated non-attainment for O3. • Sheridan County has been designated non-attainment for PM, but monitored concentrations have been in compliance with the NAAQS for many years.
Nitrogen compounds	• Concentrations of HNO_3, NO_3^- and NH_4^+ in the planning area are consistent with other remote areas.
Sulfur compounds	• SO_2 concentrations in the planning area are below concentrations typical in remote areas. • SO_4^- concentrations in the planning area are below concentrations typical in remote areas.
Visibility	
Annual Visibility	• Visibility in Bridger Wilderness, Yellowstone National Park and Rocky Mountain National Park has improved slightly over the last two decades. • Visibility in North Absaroka has stayed about the same. • Visibility in Cloud Peak on hazy days has improved slightly, while visibility on average and clean days has stayed about the same.
Atmospheric Deposition	
Precipitation pH	• There was a slight precipitation acidification in Pinedale from 1994 through 1998 (pH as low as 4.9).
Total deposition	• Pinedale: Total N deposition above LOC (1.5 kg/ha-year) for some years. Total sulphur deposition below LOC. • Yellowstone National Park: Total N deposition above LOC for most years. Total sulphur deposition below LOC. • Centennial: Total N deposition above LOC for most years. Total sulphur deposition below LOC.

Air Quality Component	Comment
Lake Chemistry: Acid Neutralizing Capacity (Forest Service 2010)	• Black Joe: Current ANC 69.7 µeq/l, flat trend from 1984 through 2010. • Hobbs: Current ANC 70.1 µeq/l, decreasing trend from 1984 through 2010. • Deep: Current ANC 60.4 µeq/l, flat trend from 1984 through 2010. • Ross: Current ANC 54.1 µeq/l, decreasing trend from 1984 through 2010. • Lower Saddlebag: Current ANC 55.6 µeq/l, decreasing trend from 1984 through 2010. • Upper Frozen: Current ANC 7.4 µeq/l (extremely sensitive to atmospheric deposition). • Lazy Boy: Current ANC 12.4 µeq/l (extremely sensitive to atmospheric deposition).

3.2.7 Global Climate Change

Ongoing scientific research has identified the potential impacts of greenhouse gas (GHG) emissions (including carbon dioxide [CO_2], methane [CH_4], nitrous oxide [N_2O], water vapor, and several trace gases) on global climate. Through complex interactions at regional and global scales, these GHG emissions cause a net warming effect of the atmosphere (which makes surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase dramatically and are likely to contribute to overall climatic changes. These overall climate changes are typically referred to as global warming or global climate change. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.

Several activities occur within the planning area that may generate GHG emissions. Oil and gas development, large fires, and recreation using combustion engines can potentially generate CO_2 and CH_4. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHG are likely to accelerate the rate of climate change.

Global mean surface temperatures increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2009). Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Figure 3-44 shows data indicating that northern latitudes (above 24° N) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. Figure 3-45 shows average temperature (AT) and precipitation (PPT) trends for the conterminous United States. For both parameters, varying rates of change have occurred, but overall, there have been increases in both AT and PPT. Temperatures in southwestern Wyoming have increased by 0.25 to 0.4°F per decade since 1976 and precipitation has decreased by 0.3 to 0.6 inches per decade since 1976.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) pointed out that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels (IPCC 2007). The National Academy of Sciences (2008) confirmed these findings but also indicated that there are uncertainties regarding how climate change may affect different regions. Computer model forecasts indicate that increases in temperature will not be evenly or equally distributed but rather are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures.

3.2.8 Cooperative Air Quality Management

The State of Wyoming has primacy with regard to air quality regulation within Wyoming. Adhering to WDEQ standards is required by law. Air quality standards are maintained by the State of Wyoming, which determines the necessity of regulating emissions. When necessary, the state regulates emissions through its State Implementation Plan (SIP) for air quality by promulgating the appropriate rule. Federal Land Managers such as the BLM and Forest Service strive to minimize, within the scope of their authority, any emissions that may add to atmospheric deposition, cause violations of air quality standards, or degrade visibility. The EPA provides oversight responsibility during this process and has approval authority over the State of Wyoming SIP. State standards enforced in the planning area must be as strict as or stricter than federal standards.

The BLM and the Forest Service help support interagency efforts, such as IMPROVE stations and remote automated weather stations (RAWS) and the National Atmospheric Deposition Program (NADP), and directly fund the WARMS network.

3.3 Cultural Resources

3.3.1 Bureau of Land Management

General Planning Area Description

Cultural resources include any prehistoric or historic district, site, structure, building and object considered important to a culture, subculture, or community for traditional, religious, scientific, or other purposes. Cultural resources include archaeological resources, historic architectural and engineering resources, and traditional resources. Archaeological resources are areas where prehistoric or historic activity measurably altered the Earth or where deposits of physical remains (e.g., arrowheads, pottery, bottles) are discovered. Architectural and engineering resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Traditional resources can include archaeological resources, structures, topographic features, landscapes, habitats, plants, wildlife, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

A cultural resource identified as significant by Native American groups may be protected under the American Indian Religious Freedom Act (AIRFA), Native American Graves Protection and Repatriation Act (NAGPRA), the National Historic Preservation Act (NHPA), and Executive Order 13007. The BLM is mandated to consult Native American tribes with aboriginal territories within the planning area as part of the Sections 106 and 110 processes to determine the presence of archaeological and/or nonarchaeological site types (i.e., Traditional Cultural Properties (TCP), sensitive sites, sacred areas, and other areas and sites considered special or of concern to Native Americans). Places that may be of traditional cultural importance to Native American people include locations associated with traditional beliefs concerning tribal origins, cultural history, or the nature of the world; locations where religious practitioners have gone or go to perform ceremonial activities based on traditional cultural rules of practice; ancestral habitation sites; trails; burial sites; and places where plants, animals, and minerals important to tribes are found. Frequently, tribes are not comfortable providing detailed information about these types of sites or their exact locations, which can cause difficulties for the Federal Agency trying to protect them. The federal government will not be able to protect these sites if locational information is unknown to the Federal Agency. These site types can be further protected if a tribe is willing to provide traditional use information that can be used to determine the significance to tribal individuals.

The majority of cultural resources in the planning area are identified, evaluated, and managed as a result of compliance with Section 106 of the NHPA. The purpose of the process required by Section 106 of the NHPA is to identify historic properties potentially affected by undertakings and assess effects. The purpose is also to seek ways to avoid, minimize, or mitigate any adverse effects on historic properties through consultation among the agencies and other parties that may have interests in the affected properties. A historic property is any prehistoric or historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential adverse effects on historic properties require consultation with the State Historic Preservation Officer (SHPO); Native Americans in tribally sensitive sites; and affected interests such as the Oregon-California Trails Association (OCTA), the Alliance for Historic Wyoming, and Wyoming Archeological Society. Map 3-1 (Historic Sites and National Historic Trails) displays these for the entire planning area.

All of the above subcategories of cultural resources are evaluated and managed according to whether or not they meet Federal standards of eligibility as established by the (NRHP [36 Code of Federal Regulation (CFR) 60]). During the Section 106 process (36 CFR 800.4.c.2.), the BLM is required to examine the effects of any federal undertaking on any cultural resource eligible for listing in the NRHP as a “historic property.” The BLM evaluates the significance of historic properties in consultation with the Wyoming SHPO to determine if the resources are eligible for inclusion in the NRHP. The NRHP specifies that a historic property must meet at least one of four criteria and some of the seven aspects of integrity to be deemed 'eligible' for listing in the NRHP (36 CFR 60.4).

- A) Event: They are associated with events that made important contributions to broad patterns of history.
- B) Person: They are associated with the lives of individuals important to our past.
- C) Design: They embody distinctive characteristics of a type, period, or method of construction. They can also represent the work of a master, possess high artistic vales, or represent a significant and distinguishable entity whose components lack individual distinction.
- D) Information: They have yielded, or may be likely to yield, information important in prehistory or history.

The seven aspects of integrity are: location, design, setting, materials, workmanship, feeling and association. One of the seven NRHP aspects of integrity, setting, is commonly a characteristic that must be addressed in BLM land management decisions. Setting is the physical environment of a historic property that refers to the character of the place in which the property played its historical role. For many historic properties, the setting is an important aspect of integrity that contributes to properties' NRHP eligibility. For those properties where the setting is an important aspect of integrity, the BLM must manage the area surrounding the apparent boundary of the property to make sure that the overall setting of the resource is addressed.

For any given portion of the planning area, the BLM classifies historic properties into management categories. BLM Manual 8110, *Identifying Cultural Resources,* defines six use categories for cultural resources:

- Scientific Use - preserved until research potential is realized
- Conservation for Future Use - preserved until conditions for use are met
- Traditional Use - long-term preservation
- Public Use - long-term preservation and on-site interpretation
- Experimental Use - protected until used
- Discharged from Management - no use after recordation and not preserved

Prehistoric sites may be sorted into time periods based on relative and absolute dating techniques. The time period often correlates to culture and lifestyle practices typical for the available technology and societal structure. The Paleoindian period, the oldest time period, covers the time range from roughly 12,500 to 8,000 years before present (B.P.). Hunting big game was a critical component of survival during this time period.

The Early Archaic period (8,000 to 5,000 years B.P.) likely had a broad range of subsistence practices based on a variety of plant and animal food use, as opposed to a focus on big game typical of the Paleoindian period. The large finely made projectile points of the Paleoindian were replaced with considerably smaller spear and atlatl dart points, which usually had either corner or side notched bases to facilitate hafting into a foreshaft.

The Middle Archaic period (5,000 to 2,500 years B.P.) components indicate an increased population and an ecologically stable period. Housepit features were found in Middle Archaic-aged deposits at the Maxon Ranch and Sweetwater Creek sites. When reviewing artifacts from the Middle Archaic, it is possible to differentiate between artifact assemblages that seem to be associated with Great Plains cultures and those from the Great Basin.

The Late Archaic period (2,500 – 1,500 years B.P.) is characterized by the arrival of two distinctive atlatl dart point styles known as Pelican Lake and Besant. None seem to have been a pure cultural component from that period.

At the Deadman Wash site, for instance, artifacts have produced Late Archaic dates as well as dates and diagnostic projectile points from both the Middle Archaic and Late Prehistoric time periods (Armitage et al. 1982). This situation is likely the result of periodic occupation of sites over great spans of time (Armitage et al. 1982).

The Late Prehistoric period began about 1,500 years ago and ended in about 1650 A.D. Two important innovations in the Late Prehistoric period were the introduction of the bow and arrow and pottery into the intermountain West. Atlatl dart technology continued to be used, but the bow and arrow expanded the range of hunting techniques available to hunters at this time. Pottery allowed more effective storage of foods and a broader range of food preparation options. Pottery also was occasionally decorated and, thus, may have been related to culture group recognition.

Broadly, Native American cultural resources include things from discrete archaeological sites to broad landscapes and vistas. More specific types of locations can include petroglyphs and pictographs; burials; rock and stone alignments, circles and cairns; plant, animal and lithic collection areas; sacred and spiritual sites; drive lines and animal traps; and the locations of important places and events in Tribal oral histories.

Casper Field Office

Prehistoric Sites

The Casper Field Office contains approximately 4,029 cultural resource investigation sites or other cultural resource locations within the field office (BLM 2004a). Surveys to date have occurred on approximately 192,000 acres (roughly, 5% of the field office). Most recently, the BLM completed a regional overview of the field office that reviewed and summarized past cultural resource investigations, the numbers and kinds of recorded resources, and cultural resource management directions (BLM 2004a).

The field office is divided into 16 subregions based on convenient geographic locales: Bates Hole, Cedar Ridge-Badwater Creek, Chugwater, Chugwater Flats, Crescent Basin, East Wind-West Powder River, Goshen Hole, Hartville Uplift/Spanish Diggings, Laramie Range, Pine Ridge, Powder River Basin, Rattlesnake Hills, Saltbush Badlands, South Bighorns, Sweetwater Rocks, and Wheatland Heights. Cultural resource inventory coverage throughout the subregions is not evenly distributed and concentrates more on project locations. Particularly, there is a focus on projects related to energy development. A purely scientific archaeological approach entails formal sampling techniques or focuses on areas of particular interest. Although a complete picture of site density and distribution is problematic given the inconsistent nature of inventory coverage, current inventory shows a higher percentage of historic materials on the east side of the field office and a higher percentage of Native American materials on the west, suggesting the influence of environmental factors or differing homestead success rates. Investigations to date have recorded 7,844 cultural resource sites within the field office, including archaeological resources, historic architectural and engineering resources, and traditional cultural resources (BLM 2004a). Approximately 4% of the total number of cultural resources possesses both a prehistoric and historic component of some type. A multicomponent cultural resource can be counted as two or more separate cultural resources, even though they occupy the same location.

Native American site types found within the field office generally are prehistoric and include open and sheltered camps, hearths, lithic scatters, stone tool quarry, lithic workshops, ritual localities, stone circles, stone alignments, and rock cairns. Most stratified archaeological resources demonstrate a full scope of human presence in the field office, from the Paleoindian period through the Historic periods. Most prehistoric archaeological resources to date have been identified as being from the Late Archaic and Late Prehistoric periods (roughly, from the last 5,000 years) (BLM 2004a).

Historic Sites

Historic era resources include trails, wagon roads, stage roads, transmission lines, irrigation canals, urban buildings, homesteads and ranches, stock-herding camps, cairns, oilfields, bridges, mines, Civilian Conservation Corps camps, and World War II bombing ranges (BLM 1986a; BLM 2004a; BLM 2004b; NPS 1981).

Historic Trails

Four National Historic Trails (NHT) and Other Historic Trails of regional and national significance cross the Casper Field Office planning area. The four NHTs are formally known as the “Oregon-California-Mormon Pioneer-Pony Express Trail,” but generically as the Oregon Trail because the routes overlap in many areas. The NHT area is associated with sites such as Fort Caspar and Fort Laramie. Child’s Route was used as an alternate river corridor that coursed along the north side of the North Platte River; contrastingly, the other NHTs routes predominately followed the south side. Child’s Route is currently being analyzed and considered for inclusion in the NHT system. These routes, along with others (Bozeman and Bridger trails), were major thoroughfares for westward expansion, military campaigns, and the gold fields of California, Idaho, and Montana. John Bozeman’s shorter route to the Montana mining areas was one of the catalysts of the Plains Indian wars in the latter half of the nineteenth century. Additionally, the Texas Trail, the Cheyenne Deadwood Stage Road, and other historic roads were routes important at a regional level, opening central Wyoming to settlement, commerce, agriculture, industry, and travel.

NHTs and Other Historic Trail segments can be found on public and private land within the Casper Field Office planning area. The Oregon Trail complex stretches 197 miles, but it is more than 550 miles long when all routes and variants are included. Altogether, 22.5 miles of trail cross public surfaces. The Bozeman Tails crosses 60.5 miles of public surface, with 87 miles lying on private and state lands. The Bridger Trail has 18.3 miles of public surface and 45.9 miles on private and state lands.

Native American Sites

One Native American TCP has been documented in the Casper Field Office (BLM 2004a). The Cedar Ridge complex is culturally important to the Eastern Shoshone and Northern Arapaho Tribes and possibly to other Native American tribes. Cedar Ridge was established as a TCP in 1997 after extensive consultation with the Eastern Shoshone Tribe and the Wyoming State Historic Preservation Office. However, the Northern Arapaho also consult on, refer to, and claim Cedar Ridge as their TCP. This locality was used for more than 5,500 years as a ceremonial site for prayers and rituals and continues to be a sacred place for the Eastern Shoshone Tribe to conduct similar religious observances. The Cedar Ridge site is considered integral to the proper functioning of the contemporary Shoshone ways of life. EO 13007, AIRFA, and elements of the NHPA enjoin federal agencies to prevent disturbances and provide access to the Cedar Ridge TCP site. No other TCPs have been identified in the Casper Field Office to date (BLM 2004a); however, others are likely to be discovered in the future as the tribal consultation process continues.

Kemmerer Field Office

Approximately 4,400 cultural resource investigations were conducted within the Kemmerer Field Office between 1967 and 2003. More than 192,000 acres of the field office were investigated (BLM 2004c). Approximately 84% of the 8,400 cultural resources recorded in the Kemmerer cultural resources are prehistoric sites that represent human activities in the area for about 12,000 years prior to the beginning of the historic period in the 19th century. The remaining 16% of recorded cultural resources are historic sites related to the fur trade, emigration, early settlement and ranching, communications and transportation networks, and natural resource extraction industries.

Prehistoric Sites

Within the Kemmerer Field Office, there are approximately 6,766 recorded prehistoric sites. Many of these sites are interpreted as early Native American campsites or habitations, lithic scatters, or secondary lithic procurement sites. Other site types include burials, ceremonial stone alignments, rock art, rock shelters, ceramic-bearing sites, quarries/primary lithic procurement sites, hunting blinds, house pit features, and bison kill and butchering sites (BLM 2004c).

The Bear River Divide Subregion contains 24 prehistoric Native American sites. The majority of the Native American sites are classified as lithic scatters and campsites. One site with stone circles has been identified. The Hams Fork Conglomerate Archaeological Landscape is located in this subregion.

The Bear River Valley Subregion contains 95 prehistoric Native American sites. The majority of the Native American sites are classified as lithic scatters, along with campsites, quarries, and one rock shelter. Notable archaeological sites include the Weston and Bessie Bottom sites.

The Bridger Valley Subregion contains 536 prehistoric Native American sites. The majority of Native American sites are Archaic campsites and lithic scatters. The Eakin site is a notable archaeological property.

The Green River Basin Subregion contains 4,837 prehistoric Native American sites. The high density of Native American camps, lithic scatters, and archaeological landscapes reflect concentrated land use, in which occupants utilized a variety of critical resources throughout the basin for thousands of years (BLM 2004c). Notable prehistoric sites include Austin Wash, Church Butte Four, Cow Hollow Creek, Dixie Cup, Disney, Fontenelle Twelve, Gateway Petroglyphs, Gemma, Hams Fork, MAK, Moxa Twenty-eight, Moxa Housepit, Old-and-in-the-way, Pescadero, Porter Hollow, Sevenmile Wash, Shute Creek Plant, Taliaferro, and the Vegan sites.

The Overthrust Belt Subregion contains 459 prehistoric Native American sites. The majority of the Native American sites are classified as lithic scatters and campsites.

The Uinta Foothills Subregion contains 35 prehistoric Native American sites. The majority of the Native American sites are classified as lithic scatters.

The Wyoming Range Subregion contains 75 prehistoric Native American sites. The majority of the Native American sites are classified as campsites and lithic scatters.

The Overthrust Foothills Subregion contains 705 prehistoric Native American sites. Notable archaeological sites include Broken Home, Deep Hearth, Meadow Draw Ten, Meadow Draw Thirteen, Oyster Ridge, Skull Point, South Slate Creek, and Wishful sites. The Bridger Antelope Trap, an NRHP-listed game drive and trap, is also located in this subregion.

Historic Sites

A total of 1,656 historic sites have been recorded within the Kemmerer Field Office. Historic sites include emigrant trails, freight wagon and stagecoach trails, military camp and fort sites, an early highway, early ranches and farms, stock-herding camps, irrigation systems, coal mines, early oil fields, railroads, bridges, historic landscapes, and urban buildings (BLM 2004c).

The Bear River Divide Subregion contains 15 historic sites. Among the sites, stock herding is the dominant theme. Several variants of the Oregon-California NHT cross this subregion (BLM 2004c).

The Bear River Valley Subregion contains 135 historic sites. Among the historic sites, transportation sites dominate, including the original routes of the Union Pacific Transcontinental Railroad and the Union Pacific Oregon Short Line Railroad. Other site types include irrigation features and reservoirs, homesteads/ranches, urban buildings, and stock-herding sites. The Oregon-California NHT and the Mormon Pioneer-California NHT cross this subregion (BLM 2004c).

The Bridger Valley Subregion contains 145 historic sites. Several of the historic sites are significant in national and regional history, including portions of the Oregon, California, Mormon Pioneer, and Pony Express NHTs; the Fort Bridger State Historic Site; the Fort Supply; features of Mormon agrarian development, such as homesteads, ranches and irrigation districts; and the Union Pacific Transcontinental Railroad and the Lincoln Highway (BLM 2004c).

The Green River Basin Subregion contains 502 historic sites. Significant historic roads and trails passing through this area include the Oregon, California, Mormon Pioneer, and Pony Express NHTs, the Union Pacific Transcontinental Railroad, the Oregon Short Line Railroad, the Lincoln Highway, the Opal Wagon Road, and the Bryan to South Pass City Road (BLM 2004c).

The Overthrust Belt Subregion contains 290 historic sites. Among the historic sites, stock herding is the dominant theme. The Sublette and Dempsey-Hockaday Cutoffs of the Oregon-California NHT cross this subregion, as do the major variants of the Oregon, California, Mormon Pioneer, and Pony Express NHTs. The Union Pacific Transcontinental and Oregon Short Line Railroads as well as the Lincoln Highway also cross the subregion (BLM 2004c).

The Overthrust Foothills Subregion contains 460 historic sites. All but one of the NHTs passes through this subregion, as do the Union Pacific Transcontinental Railroad, the Oregon Short Line Railroad, and the Lincoln Highway. Most of the numerous historic coal mines in the field office are also located in this subregion, as are the historic Piedmont charcoal kilns and town site (BLM 2004c).

The Star Valley subregion contains 22 documented historic sites. One significant cultural property in the subregion is where Lander's Cutoff of the Oregon Trail crosses private land in Star Valley (BLM 2004d).

The Uinta Foothills subregion contains 25 historic sites. Among the historic sites, homesteading and ranching are the dominant themes (BLM 2004c).

The Wyoming Range subregion contains 62 historic sites. Among the historic sites, homesteading and ranching are the dominant themes. The Sublette and Dempsey-Hockaday Cutoffs of the Oregon- California NHT pass through the southern tip of the subregion on BLM and private lands (BLM 2004c).

Historic Trails

More than 400 miles of designated NHTs pass through the Kemmerer Field Office. The NHTs provided significant travel routes and include the primary routes of the Oregon-California Trail, the Mormon Trail, the Pony Express Route, the Slate Creek Cutoff, the Dempsey-Hockaday Trail, the Sublette Cutoff, and the Lander Road. The four NHTs are sometimes referred to collectively as the "Oregon-California-Mormon Pioneer-Pony Express Trail" because their routes overlap in many areas.

Conditions of the trails range from highly visible, well-developed ruts, to areas where the trail is non-locatable. The trail settings have varying degrees of historic integrity. Some trail segments have been covered by modern roadways. NHTs in the field office are visited by both intentional and incidental tourists. Portions of the trails can be explored from the comfort of cars and paved surfaces, by hiking, and by horseback. Where trail traces are destroyed and no sites are documented, no special management actions are planned for such trail segments.

Management actions for NHTs generally address management of trails for maintenance of long-term heritage and educational values, reduction of imminent threats from natural or human-caused deterioration, and reduction of conflicts with other resource uses. In 1986, the Oregon/Mormon Pioneer National Historic Trails Management Plan (updated in 2004) was prepared to guide management of the NHTs (BLM 2004b). Since implementing the plan, protective measures have been in place within individual BLM districts for sites and segments of the NHTs contained on public lands (BLM 2004e).

Native American Sites

The lands managed by the Kemmerer Field Office fall within the judicially established Native American land areas of the Shoshone Tribe (U.S. Army Corps of Engineers 1999). Native Americans inhabited the Kemmerer Field Office for thousands of years prior to European contact. Native Americans used the region for hunting, fishing, collecting plants, religious ceremonies, and burial of the dead. In the late nineteenth and early twentieth centuries, the field office was used by Eastern Shoshone, Shoshone-Bannock, and Ute tribes in the vicinity of Fort Bridger. Ute bands occupied territory directly south of the field office (BLM 2004c). The Kemmerer Field Office currently consults with the following tribes regarding Native American issues and concerns:

- Northern Arapaho
- Eastern Shoshone
- Shoshone-Bannock
- Northern Ute.

Native American tribes have not specifically identified culturally sensitive sites within the field office; however, this does not mean no such sites exist. Sites which may fall into the culturally sensitive category could include burials and stone cairns; rock art sites; rock alignments, including drive lines and stone circles; brush corrals and animal traps; natural formations or plant collection areas; view sheds; landscapes; the former location of historically recognized villages; or other locales. Of these types of sites, burials are not commonly located, but some are known within the Kemmerer Field Office (BLM 2004c).

Native American treaty rights in the Kemmerer Field Office are defined in Article 4 of the 1868 Fort Bridger Treaty, in which the Shoshone people are provided "the right to hunt on the unoccupied lands of the United States so long as game may be found thereon." This right applies to all public domain lands. The Kemmerer Field Office consults with Shoshone tribes to develop specific measures to ensure land areas important to Native American communities are not transferred from federal ownership, physically modified, or impacted by decisions in ways that would restrict or deny access to Native Americans for traditional uses protected by the Fort Bridger Treaty. No tribal trust lands, tribal reservation lands, or tribal properties are known to occur within the Kemmerer Field Office.

Newcastle Field Office

Prehistoric Sites

The Newcastle Field Office contains eight archaeological sites from the Paleoindian period. These sites are distinguished by the distinctive fluted points dated to the time period. Clovis remains have been documented at the Sheaman site. The Betty Greene site has large numbers of grinding stones, which suggest plant food processing. Seven Early Archaic sites have been recorded in the Newcastle Field Office. Only the Hawken site has been extensively investigated. At the Hawken site, prehistoric hunters trapped bison in an arroyo similar to many Paleoindian kill sites.

Middle Archaic sites are much more abundant in the field office. A total of 31 sites have been recorded in the field office. Excavations at the McKean site and several other sites near Keyhole Reservoir provide evidence of cooking and food processing in the form of hearths and grinding stones, showing a wide range of plant and animal foods rather than concentration on bison hunting.

Sites in the Newcastle Field Office with artifacts from the Late Archaic show an increased reliance on bison hunting, including the construction of corrals for driving and trapping animals. There have been 69 Late Archaic sites recorded in the field office. Furthermore, two bison kill sites, the Futon site and the Lance Creek site, which have not been extensively investigated, are located in the field office. Extensive excavations performed at the Vore site in Crook County show a series of 25 communal bison drives into a sinkhole trap. Several sites excavated near Keyhole Reservoir provide information on campsites in the field office.

Historic Sites

The Newcastle Field Office contains the Spanish Diggings quarries in the Hartville Uplift, one of the most extensive quarry locations in North America. The quarry covers 360 square miles in the Newcastle Field Office. Extensive workshops and campsites surround the quarries. The Manville and Old Woman Creek Hills quarries are examples of additional quarries known to serve as similar stone quarries by the Spanish. Although they were originally attributed to the Spanish (and therefore called Spanish Diggings), research now indicates they were dug before the Spanish could possibly have been in the area. No quarry site in the field office has ever been excavated.

The initial impetus for historic settlement in the Newcastle Field Office was the Black Hills gold rush. The first oil discoveries in the field office were oil springs near Newcastle. As early as 1878, oil was skimmed off settling ponds and hauled to the Deadwood-Lead area for the purpose of lubricating mining equipment. Oil seeps near Moorcroft were discovered around 1884. The demand from mining towns was sufficient, resulting in 80 wells being drilled by 1887. Pedro, Ant Hills, and Dewey Dome were all post-World War I oil extraction developments. Several of the fields are historically important and may contain features eligible for the NRHP. Coal was discovered at Aladdin between 1875 and 1880 and was mined by early settlers for domestic use. Peak production was between 1898 and 1909 when the coal was used to fuel locomotives. Bentonite was also discovered prior to 1900. In 1897 a pit near Newcastle shipped raw clay.

As soon as the treaty of 1876 opened up the area to Anglo-American settlement, commercial buffalo hunters swarmed the Powder River Basin and killed most of the buffalo by the fall of 1878. Cattlemen then began moving herds into the area. A number of large ranches were established in all three counties in 1878. The large ranches were in open country along major streams, including the Little Missouri River, Belle Fourche River, Cheyenne River, Lance Creek, Old Woman Creek, and Beaver Creek. Smaller ranchers and settlers moved to the streams along the edge of the Black Hills. Homesteads are the most frequent kinds of historic sites found in the field office.

Historic Trails

As soon as the Black Hills were opened for mining in 1876, the Cheyenne to Black Hills Stage Line was developed. This line was soon abandoned and a route up the west side of the Black Hills was established. The Black Hills Wagon Road or the Cheyenne to Deadwood Stage Road was used from 1877 to 1887. The stage route was used long enough to leave traces in areas where subsequent roads have not obliterated them. Although only the Hat Creek Stage Station still has a standing structure, archaeological remains are likely at all of the former station locations. From 1868 to 1897, cattlemen used the Texas Trail to move cattle from Texas to Montana. The trail extended south to north across the Newcastle Field Office. Early exploratory expeditions also left remains in the planning area including the Custer Expedition of 1875.

The first railroad that entered northeastern Wyoming was a line of the Burlington and Missouri River Railroad. The line was extended to Newcastle from Grand Island, Nebraska, in 1889, only after sufficient coal was discovered at Cambria to run the steam engines. By 1891, the rail line reached Moorcroft and continued west across the Powder River Basin. Rail service to Aladdin was also associated with coal mining, and a narrow gauge spur line connected Aladdin to the Chicago and Northwestern Railway at Belle Fourche, South Dakota.

Native American Culturally Sensitive Sites

Significant rock art sites span much of the Paleoindian, Archaic, and Late Prehistoric periods. Fourteen rock art sites have been minimally recorded in the Newcastle Field Office. In addition, Medicine Creek Cave has been more fully investigated, and fieldwork is ongoing at Whoopup Canyon. The Whoopup Canyon petroglyph area was designated an Area of Critical Environmental Concern (ACEC) in 1981. The site is an extensive complex of rock art panels and associated archaeological deposits. It is one of the oldest rock art sites in North America. National Register nomination forms were prepared and submitted in 1976 but returned for necessary boundary information. Surveys to determine the site boundaries and gather data for a management plan began in 1990 and will take several years to complete.

Cultural Resource Concerns

The Whoopup Canyon petroglyph site is in danger of continued natural erosion and damage by public visitors. An unusually high percentage of the panels, 98% of those on public surface, have been damaged by visitors. Limited legal access to the public lands within the site complex is provided to visitors. Additionally, only nine sites have been recorded from the protohistoric period. This low number of sites is not consistent with known protohistoric activity in the Newcastle Field Office. Some protohistoric sites may be identified as Late Prehistoric, because no trade goods happen to be found on the site surface and a similar lifeway continued for a while into the protohistoric period. Further investigations of protohistoric sites could be beneficial for identifying areas containing higher densities of artifacts (BLM 1992a).

Pinedale Field Office

Prehistoric Sites

Archaeological remains represented in the Pinedale Field Office include a variety of fire pits, discarded cooking rock, flaked stone tools and waste flakes, and animal bone fragments. Open campsites and lithic scatters compose the majority of prehistoric archaeological sites in the field office and the western Wyoming Basin in general. Both site types occur in a wide variety of topographic, ecological, and depositional contexts, and the general site types mask a wide range of functional and temporal variability. A large proportion of the open camps are limited to one or a few fire pits with only a few associated waste flakes and/or scraps of animal bone; this reflects brief occupations or an accumulation of remains as a result of the reuse of the same location over a period of decades, centuries, or even millennia. Particularly desirable locations can contain very extensive, very dense concentrations of remains resulting from longer occupations and/or particularly heavy reuse over extended periods of time. The latter sites are especially common in sand dune complexes found in the Pinedale planning area. Other campsite types are defined by the presence of distinctive habitation features, most notably house pits and domestic stone circles. Most house pits have only limited artifacts and other remains.

Site types corresponding to more specialized activity include animal kill and butchering sites, plant processing locales, and tool stone source areas. Two particularly prominent animal kill and processing sites have been excavated. The Wardell site was a communal bison trapping site near the Green River. Wardell was used over a period of approximately 500 years beginning roughly 1,580 years B.P. The site includes the remains of a bison trap; a dense bison bone bed; and an adjacent large butchering, processing, and camp area. Smaller bison kill and butchering sites have also been identified in the Pinedale Field Office, but, in general, trapping sites are rare. The Barnes site is a similar communal kill site containing bison remains. However, the Barnes site is a jump site, whereas Wardell is a trap site. The Trappers Point site, part of the

Cora Butte/Trappers Point cultural subregion, is situated along a bottleneck in a major pronghorn migration route between summer and winter ranges; it exhibits evidence of the intensive procurement and processing of pronghorn between approximately 6,000 and 5,300 years B.P. The excavated portion of the site encompasses a bone'bed associated with a processing area. It is estimated to contain bone from more than 100 individual pronghorn. It is possible that other similar pronghorn kill and processing sites are present in the field office, both in the Trappers Point area and at other strategic points along the migration corridor.

The most prominent plant processing locations in the Pinedale Field Office consist of cobble-filled pits interpreted as the remnants of features used to bake roots as food sources. There are dozens of such features along the margins of the Green and New Fork River valleys in the Pinedale field office. Their use apparently spanned a significant part of the total prehistory of the region. Deep slab-lined and unlined pits that occur in sand dune sites, especially in the southwestern part of the field office, are also typically interpreted as having been used to bake root foods.

Sites associated with primary tool stone sources are characterized by a dense scattering of stone waste flakes and broken debris associated with the initial reduction of the tool stone material. Prominent known bedrock tool stone sources with associated prehistoric sites include Site 48SU345 and Site 48SU337. Secondary tool stone source sites tend to be much more extensive and are often categorized as lithic procurement landscapes. Two lithic landscapes, the Mesa and the Yellow Point Ridge Lithic Landscapes, have been identified in the Pinedale Field Office. Material associated with lithic landscapes is usually widely dispersed and of limited complexity; such landscapes are typically considered to possess little significance as archaeological resources (Lubinski 1998).

Known cultural resources are not distributed evenly across the Pinedale Field Office. The site locations vary in densities, types, and sensitivities, representing a variety of ecological and topographic contexts and other factors within the field office. The amount of professional cultural resource management work in the 15 different cultural subregions of the Pinedale Field Office also varies greatly in proportion to the amount of oil and gas development. Subregions containing known high densities of significant prehistoric cultural resources include the LaBarge Uplift, Deer Hills, Jonah, South Anticline, and Cora Butte/Trappers Point subregions.

The LaBarge Uplift and Deer Hills subregions are characterized by dense, diverse prehistoric cultural resources, including major sites associated with sand dune complexes (e.g., Birch Creek site). The LaBarge Uplift and Deer Hills subregions contain primarily cultural resources postdating 6,000 years B.P., including numerous Late Prehistoric period sites. The dune complex sites tend to be rich in data because of the quality of preservation and the intense prehistoric use of the dunes themselves. Development activities in the vicinity of such sites also tend to result in a high proportion of unanticipated discoveries.

The Jonah and Anticline South subregions are regionally and, perhaps even nationally, distinctive because of the abundance of prehistoric resources dating to the Early Archaic period, including some very early houses predating 6,000 years B.P., numerous prehistoric campsites, and ceramic sites (TRC Mariah Associates 2006).

Historic Sites

A number of the recorded historic sites are present in the Pinedale Field Office. Historic-period resources within the Pinedale Field Office range from large and significant linear resources such as the Oregon and California National Historic Trails, to small and insignificant sites such as a scatter of cans left by shepherds or cowboys. The dynamic activities associated with historic sites in the Pinedale Field Office can best be grouped by the various themes or contexts of the sites (e.g., early fur-trapping, ranching, transportation, oil and gas development).

The most common historic archaeological sites identified in the Pinedale Field Office are those associated with ranching activities. All of the historic ranch complexes are located on now private land; however, a number of ancillary site types are frequently encountered on federal lands. The more prominent of such sites include line camps, corrals, irrigation ditches, sheepherder monuments and rock cairns. However, by far, the most common historic archaeological sites encountered in the field office are trash scatters associated with stock herding camps. Typically, the historic ranch sites date from the 1880s to the 1940s.

The Upper Green River/Beaver Ridge and other river-related cultural subregions contain limited historic resources associated with the fur trade era and early exploration of the Green River Valley. The junction of Horse Creek and the Green River was designated as the Green River Rendezvous National Historic Landmark to commemorate early meeting points of fur traders. Other fur trading-related historic sites include the Father DeSmet Monument. The Father DeSmet Monument is listed on the NRHP and placed at the location of the first Catholic Mass in what is now Wyoming. Adjacent to the Father DeSmet Monument lies Pinkney Sublette's grave. Pinkney Sublette was one of the famous Sublette brothers of American Fur Company fame. Fort Bonneville, built and occupied by Captain L.E. Bonneville in 1832, lies four miles upstream on the Green River from the DeSmet Monument. Fort Bonneville is also listed on the NRHP.

Another historic theme identified in the field office is historic oil and coal mining activities, particularly in the LaBarge subregion. These sites associated with resource extraction include historic oil field camps and associated ancillary facilities (i.e., historic coal mine complexes, including the associated residential structures), historic oil well locations and oil field equipment, roads, and a variety of features produced as a result of construction or maintenance of wells.

Historic Trails

Historic trails and roads are another prominent historic feature identified in the Pinedale Field Office. Historic trails, because of their historic prominence and length, are often difficult to avoid in the context of development activities. In addition to the more prominent trails, there are the early Opal and New Fork wagon roads and early 20th century automobile routes (including bridges). Portions of two National Historic Trails traverse the BLM Pinedale Field Office. The Sublette Cutoff is a branch of the Oregon Trail that crosses through the southwest portion of the field office. The Lander Road is a branch of the California National Historic Trail that crosses the central portion of the field office. In addition to the two National Historic Trails, there are the Opal and New Fork wagon roads and a network of early 20th century automobile roads.

Historic Native American trails are known to have been present in the Wyoming Range Front and Wind River Front subregions.

Native American Sites

Cultural resources within the Pinedale Field Office considered sensitive and potentially sacred to modern Native American tribes include burials, rock art, rock features and alignments (such as stone circles, cairns, and medicine wheels). The Pinedale Field Office has as many as five prehistoric/Native American burial sites (most consisting of single individuals), which have been documented within the Upper Green River Basin. The United States Geological Survey (USGS) defines the Upper Green River Basin as everything north of Flaming Gorge Reservoir. Rock niche burials, shallow pit burials, and burials from within aboriginal structures are reported for the area.

Native American prehistoric rock art sites include petroglyphs and pictographs, etched or painted onto a rock surface. The Pinedale Field Office has both types of rock art. To protect rock art sites, their locations are kept confidential. Subregions containing especially high concentrations of potentially sensitive Native

American rock art include the LaBarge Uplift. The LaBarge Uplift contains the greatest concentration of rock art sites in the field office. Rock art is also present in the adjacent South LaBarge subregion.

The relative abundance of stone circle sites distinguishes the Pinedale Field Office from the rest of the Green River Basin. Other aboveground stone features (e.g., cairns and rock alignments) are often associated with stone circle sites. Rock features, including medicine wheels, circular stone alignments of possible ceremonial significance, isolated cairns and lines of cairns, game drive lines, and small stone structures, may represent hunting blinds and vision quest structures. Most features and feature complexes occur on higher ridges and other prominences. During consultations, Tribal members frequently consider stone circles and other alignment sites as sensitive, "respected areas," as well as stone cairns, rock alignments, drive lines, and similar stone features (TRC Mariah Associates 2006).

Cultural Resource Use Allocations

The majority of significant cultural resources in the Pinedale Field Office are allocated to Scientific Use. Cultural resources categorized as Conservation for Future Use include the Trappers Point area and portions of the Johnson Spring Site. Cultural resources in the Pinedale Field Office categorized as Traditional Use include those properties determined to be important to the identity, heritage, or well-being of specific social or cultural groups. In the field office, this use category pertains mainly to Native American sensitive sites. Specific properties allocated for Traditional Use in the field office include the Calpet Rock Shelter, all the rock art sites, and several additional confidential sites (TRC Mariah Associates 2006).

Cultural resources in the field office classified as public use are lands appropriate for interpretive, educational, or recreational uses by the public. In the Pinedale Field Office, these areas would include the Lander Trail and Sublette Cutoff. Public use lands include portions of the Sublette Cutoff and Names Hill.

Within the Pinedale Field Office, archaeological sites are subject to occasional, unauthorized artifact collecting and are susceptible to incidental or accidental damage through activities like off-road vehicle use or camping. Archaeological sites may be threatened by natural causes, such as erosion, or human causes, such as land development or vandalism. Vandalism to rock art and historic inscription sites is common, often in the form of modern dates and initials.

The BLM consults with all Native American tribes within the field office who have expressed an interest in the area on a programmatic level and on a case-by-case basis at the project level for any federal undertakings that have the potential to impact sites known or thought to be sacred, sensitive, or of cultural significance to Tribes. The BLM makes every effort to keep any information concerning these sites confidential to the extent possible.

Rawlins Field Office

The entire Rawlins Field Office is within the larger Northwestern Plains cultural area (Frison 1991). As of December 2005, approximately 15,643 cultural resource sites had been documented in the Rawlins Field Office. Prehistoric sites throughout the Rawlins Field Office exhibit numerous similarities with respect to artifact assemblages, feature types, and function but can also exhibit differences based on ecological setting and cultural influences from surrounding regions. Prehistoric sites in the Rawlins Field Office are known to date from approximately 12,000 years B.P. to the time of European contact (roughly 1650 A.D.).

There are 14 cultural resource subregions within the Rawlins Field Office. All of the subregions contain both prehistoric and historic cultural sites. Bates Hole (48,160 total acres; 29,480 BLM surface) contains the highest number of cultural sites per acre, with one site found in every ten acres, on average. Areas with similar high cultural site density include Eastern Plains, Laramie Basin, Washakie Basin, and Laramie Mountains. Washakie Basin contains the highest total number of cultural sites (3,991) and has the largest area of BLM surface land (82.2%, 667,670 acres) of all the subregions. The other subregions include Great Divide Basin, Separation Flats/Rawlins Peak, Sierra Madre Uplands, Hanna Basin, Upper North Platte, Shirley Basin, Middle Medicine Bow, Sweetwater Arch, and Medicine Bow Mountains.

Site types in the field office include lithic scatters, lithic material quarries, open camps, stone circles, rock shelters, house pits, rock cairns and alignments, game drive lines and kill sites, brush or pole structures, rock art, and human burials. The most significant prehistoric cultural resources are found along major ephemeral drainages and along the lower benches of escarpments found commonly throughout the western half of Rawlins. Certain topographic settings have higher archaeological sensitivity, such as aeolian deposits (sand dunes, sand shadows, and sand sheets), alluvial deposits along major drainages, and colluvial deposits along lower slopes of ridges.

Open camps found in the field office contain evidence of a broad range of activities, including subsistence-related activities. Cultural remains at these site types include formal features, lithic debris, chipped stone tools, and evidence of milling/vegetable processing activities. Remains from animal butchering activities, including bones and lithic tool types, also are often found at open campsites. Open campsites often show evidence that they were occupied for longer periods of time or were used repeatedly. Lithic landscapes are also common in the Rawlins Field Office. These are often manifested as widespread lithic scatters resulting from testing, procurement, and reduction of tool stones (Michaelsen 1983; Miller 1991).

Stone circle sites, interpreted as a type of campsite, are relatively common on ridge tops, upper stream terraces and benches, and mountain foothills throughout the North Platte River subregion and the Eastern Plains subregion. Lithic debris and formal tools (i.e., flaked stone artifacts) are typically discovered in conjunction with stone circles. Stone circles are considerably rarer in the western basins. House pits, though less uncommon, are increasingly being recognized and documented in portions of the Rawlins Field Office. A recent study suggests these house pits were occupied for short seasonal periods over a succession of years (Smith 2003). Archaeological remains of house pits sites usually include a large circular area of charcoal-stained sediment, revealing a generally shallow, basin-shaped living floor containing internal features, such as fire hearths and storage pits. House pits generally provide artifacts of flaked stone, ground stone, and bone tools. House pits have been documented in the intermountain basins of the western and central portions of the Rawlins Field Office, particularly in the Bairoil oil fields in the northeastern Great Divide Basin (Reust et al. 1993).

Less common elements of Prehistoric culture documented in the Rawlins Field Office include rock shelters, rock art, mass kill sites, brush and pole structures (i.e., wickiups or "war lodges"), burials, and certain types of rock features, such as medicine wheels, drive lines, or cairn lines. Some of these elements are sacred to Native American groups and may be designated as TCPs.

Paleoindian sites or components have been identified within the Rawlins Field Office. These sites include the Union Pacific Mammoth site, the James Allen site, the Rattlesnake Pass site, the China Wall site, and the Pine Bluffs site. Paleoindian sites like the China Wall and the Pine Bluffs sites also contain later Archaic components.

Archaic period sites containing house pits include the Medicine House site, the Shoreline site, the Sinclair site, and the Bald Knob site (Miller and McGuire 1997; Reust et al. 1993; Smith and Reust 1992; Walker et al. 1997). Settlement and subsistence patterns of the Late Archaic within the field office are poorly understood (Frison 1991; Smith and McNees 1990; Waitkus and Wimer 2002). Numerous Archaic period sites have been identified, including the Seminole Beach site, the Scoggin site, the Muddy Creek site, the Mill Creek Bison Jump, and Sorenson Shelter (Frison 1991; Lobdell 1973).

An increase in aboriginal populations apparently began toward the end of the Archaic period and continued through the first half of the Late Prehistoric period. Consequently, a large percentage of excavated sites in the Rawlins Field Office either date to the Late Prehistoric period or have a Late Prehistoric period component overlying older components. Aside from the overall increase in site frequency, Late Prehistoric settlement and subsistence patterns do not appear to have diverged markedly from those of the Late Archaic (Creasman et al. 1983). Ash-filled basins and cobble-filled hearths are the dominant feature types (Frison 1991).

Historic Sites

The historic era appears in the Rawlins Field Office as the arrival of well-organized fur trading expeditions in the region dated to the early 1800s. Subsequent themes represented by historic cultural resources identified in the field office include historic ranching, transportation, and mining.

Historic sites documented in the Rawlins Field Office include emigrant trails; stage and freight roads; stage stations; railroads and sidings; early automobile roads; ranches and ranching-related features; cabins; buildings; towns and camps; dams and irrigation ditches; stock herder camps and trash scatters; trash dumps; mines, mining facilities, and mining debris; and oil and gas facilities.

Today, evidence of both cattle and sheep ranching in the field office can be found through homesteads, ranches, stockherder camp, and stockherder cairns.

Historic Trails

Transportation routes (e.g., trails, roads, and railroads) command a great amount of management attention because of their overall historic importance in U.S. expansion and western settlement as well as their presence over long distances within the Rawlins Field Office. The historic Overland Trail transects east-west through the Rawlins Field Office. Blazed in the mid 1800's, the Overland Trail became a primary central overland route by 1862, providing emigrant travel west to the California gold fields, as well as mail and stagecoach services. In 1869, the Union Pacific Railroad was completed across southern Wyoming, providing federal mail and passenger service through the region. Despite the new transportation option, the Overland Trail remained in use as a thoroughfare for emigrant and freight traffic. It even became the trunk line for the late 19th-century road system developed to the south of the rail line that served the towns and outlying ranches. Three of the stations built along the Overland Trail remain on public land: the Midway, Sage Creek, and Washakie Stations. The Washakie Station is listed on the NRHP and still retains some of the original structures. The other two stage stations have been destroyed, although their location is well documented. Evidence of the trail remains in the form of ruts and swales as well as associated artifacts.

The California gold rush was the catalyst for the development of the Cherokee Trail, a southern route that would become the precursor of an overland wagon road across the southern portion of future Wyoming Territory. The Cherokee Trail connected Bent's Old Fort on the Santa Fe Trail to Fort Bridger on the Oregon-California Trail (Hornsher 1965). Today, evidence of the Cherokee Trail is scarce, but it can be found in the form of ruts and swales.

Another trail found in the field office, the Rawlins-to-Baggs Freight Road, dates from 1868 to 1909 and was also referred to as the Rawlins-to-White River Road, the Rawlins and the Snake River Road, and the Baggs-to-Rawlins Road. The origins of the route are attributed to the building of the first transcontinental railroad through southern Wyoming Territory in 1867–1868, leading to the founding of the town of Rawlins. Furthermore, creation of the White River Agency for the Ute Indians in northwestern Colorado in 1868 provided government travel routes. This stage and freight route developed from Rawlins to the Ute Agency and headed southwest from Rawlins, skirting the western base of the Sierra Madre Range. The route was initially used for freight, but mail and passenger service was added as the region became more settled. Stage service ended on the Rawlins-to-Baggs Road in 1909.

The Rawlins-to-Fort Washakie Freight Road was originally laid out and used as a trail by the military after the establishment of Camp Auger (probably in 1868 or 1870). The trail was extended 16 miles northwest to Fort Washakie in 1871, when the Indian Agency was established. The Rawlins-to-Fort Washakie Freight Road appeared on Masi's Black Hills Map in 1875 for stage travel as well as for use as a telegraph line. The Rawlins-to-Fort Washakie Freight Road represented the key transportation link between Wind River Valley and the Union Pacific Railroad through southern Wyoming Territory. The establishment of the road set the pattern of transportation, communication, and settlement for the Wind River Valley from the south via Rawlins.

The Union Pacific Railroad was constructed through southern Wyoming Territory during 1867 and 1868. The original railroad route was abandoned in 1901. The tracks and ties were removed, and the railroad was realigned and rebuilt. Much of the original grade has since been impacted by pipelines, roads, and other developments over time. However, portions of the original Union Pacific grade still remain and have been recorded in the Rawlins Field Office.

The origin of the modern highway system in Wyoming can be traced to the Session Laws of 1911, the creation of the voluntary Wyoming Highways Association in 1912, and the national coast-to-coast Lincoln Highway that was proposed in 1912–1913. The route chosen in 1913 for the Lincoln Highway followed the basic course laid down by the Overland Trail and the Union Pacific railroad grade. Between 1919 and 1924, Wyoming completed its portion of the Lincoln Highway. Wyoming chose a design to meet the demands of the day and of the state's budget. Within the right of way, the graded surface measured 24 feet wide, in the center of which was 16 feet of gravel that measured5 inches thick. Drainage structures were of corrugated metal or reinforced concrete. All bridges were constructed of reinforced concrete (BLM 2007a).

Wyoming completed a new road of "graded gravel" from Medicine Bow west to Rawlins during the early 1920s; an 80-foot bridge was built over the Medicine Bow River. Between 1920 and 1924, the state highway department reconstructed the road between Rawlins and Wamsutter. Portions of the highway were upgraded, rebuilt, and realigned in each succeeding decade up through the 1940s, culminating in the construction of U.S. Highway 30. Remnants of the various grades are frequently encountered in the Rawlins Field Office, although many have been altered or destroyed by Interstate 80 (I-80) and U.S. Highway 30 (BLM 2007a).

Native American Sites

Cultural resources within the Rawlins Field Office that may be sensitive to Native Americans are identified through consultation with the Tribes that historically occupied the area. Cultural resources that are considered sensitive and potentially sacred to modern Native American tribes generally include, but are not limited to, burials, rock art, rock features and alignments (e.g., cairns, medicine wheels, and stone circles), Indian trails, and certain religiously significant natural landscapes and features. These types of resources are generally identified as properties of traditional religious and cultural importance to the Native Americans and may be formally designated as TCPs or Indian Sacred Sites.

A TCP is a site considered eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are (a) rooted in that community's history and (b) important in maintaining the continuing cultural identity of the community. Indian Sacred Sites, as defined in EO 13007, are "any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion." Indian Sacred Sites are not always eligible for the NRHP; however, pursuant to the guidelines in EO 13007, they receive the same protective measures as NRHP-eligible historic properties.

Specific properties of traditional religious and cultural significance to the Native American Tribes identified within the Rawlins Field Office include the Foote Creek Rim and Carbon Basin Traditional Cultural Landscapes. Other sacred sites and areas of traditional religious and cultural significance have been identified by Native Americans within the field office. Because the Tribes are typically not comfortable sharing information concerning these types of sites, the BLM makes every effort to keep any information concerning these sensitive sites confidential to the greatest extent possible.

NRHP Eligible Sites

A majority of prehistoric age cultural resources located in the Rawlins Field Office are allocated for Scientific Use and evaluated for nomination to the NRHP under 36 CFR 60.4, Criterion D. Several other cultural resource sites have been classified as Conservation for Future Use. Properties assigned to this category include the Aimee Eaton Buffalo Kill site. Properties within the area categorized as Public Use include the Overland Trail and other select emigrant trails and associated properties. The JO Ranch, a historic ranch complex, is also an NRHP eligible site. There are no cultural resource properties located in the field office that are currently allocated for experimental use.

Rock Springs Field Office

Prehistoric Sites

Numerous prehistoric sites have been identified in the Rock Springs Field Office, evidencing prehistoric occupation of this area from 12,500 B.P. [Paleoindian period] through the late Prehistoric Period [1650 A.D.]. One of the Rock Springs Field Office sites that has yielded a large amount data on the Paleoindian period is the Deadman Wash site. Late Paleoindian artifacts have been excavated from a portion of Deadman Wash. It is not known if more extensive Paleoindian cultural materials exist at Deadman Wash, because the site was excavated within a data recovery mitigation context associated with pipeline construction. Therefore, research was restricted to the right-of-way (ROW) corridor. The Deadman Wash site has produced Scottsbluff spear points, which have characteristic stemmed haft elements and date to about 8,500 years ago. The Scottsbluff component only occurred within a small percentage of Paleoindian sites. The potential for additional archaeological work to be conducted at Deadman Wash site is very good (Armitage et al. 1982).

The original location site for the Eden projectile point is the Finley site located in the Rock Springs Field Office near Eden, Wyoming. This site was first investigated in the 1940's by scientists from the University of Pennsylvania. It was determined that the Finley site was a kill and butchering site for *Bison antiquous*, an extinct buffalo species known to be larger than modern buffalo. The Pine Springs site, investigated by archaeologists from the University of Utah in the 1960's (Sharrock 1966), is another well-known late Paleoindian site located in the field office. Archeologists have recently expressed renewed interest in the research potential of the Pine Springs site.

Many stratified archaeological sites excavated in the Rock Springs Field Office have had one or more well-developed Middle Archaic components, indicating an increased population during this likely ecologically stable period. Housepit features were found in Middle Archaic-aged deposits at the Maxon Ranch and Sweetwater Creek sites. These features probably indicate year-round occupation of inter-mountain basin environments. When reviewing artifacts from the Middle Archaic, it is possible to differentiate between artifact assemblages that seem to be associated with Great Plains cultures and those from the Great Basin. The abundance of Middle Archaic archaeological materials and the convergence of plains and basin environments make the Rock Springs planning unit an ideal area to study a wide variety of Prehistoric cultures.

The Late Archaic is characterized by the arrival of two distinctive atlatl dart point styles known as Pelican Lake and Besant. Both of these Plains corner-notched dart point types are found in the Rock Springs Field Office. Although several archaeological components excavated in the field office have produced radiometric dates within the range of the Late Archaic period (2,500 – 1,500 years B.P), none seem to have been a pure cultural component from that period. At the Deadman Wash site, for instance, artifacts have produced Late Archaic dates as well as dates and diagnostic projectile points from both the Middle Archaic and Late Prehistoric time periods (Armitage et al. 1982). This situation is likely the result of periodic occupation of sites over great spans of time (Armitage et al. 1982).

The Late Prehistoric period began about 1,500 years ago and ended in about 1650 A.D. when European cultural items began to arrive in the Green River Basin. Roughly one third of the radiometric dates recovered from excavated components in the Rock Springs Field Office fall into the Late Prehistoric period. Two important innovations in the Late Prehistoric period were the introduction of the bow and arrow and pottery into the intermountain west. Atlatl dart technology continued to be used, but the bow and arrow expanded the range of hunting techniques available to hunters at this time. Pottery allowed more effective storage of foods and a broader range of food preparation options. Pottery also was occasionally decorated and, thus, may have been related to culture group recognition; however, pottery is found infrequently in the Rock Springs Field Office and what is found tends to be undecorated.

There is a strong association between playa lakes, sand dunes, and evidence of prehistoric habitation in southwestern Wyoming. The density of archaeological sites documented in the Blue Forest Area, Blue Point Playas, and Adobe Town Rim Playa range from six sites per mile to more than 20 sites per mile, which is much denser than the average four sites per mile found in other areas of the Rock Springs Field Office. A limited amount of archaeological research indicates that dune areas surrounding playa lakes have been intensively occupied for likely more than 4,000 years. Sites identified to be the focus of ongoing research throughout recent years are the Eden-Farson, Finley, Pine Springs, Krmpotich, Morgan sites, and Bozovich site complexes.

Historic Sites

The Rock Springs Field Office contains evidence of nearly all facets of historic period activities, including the fur trade; frontier military; and the mining, railroad, and historic ranching industries. Additionally, railroading history is represented by Camp Carmichael and several other railroad construction and maintenance sites located in the field office. The mining industry is associated with sites, including the Gunn Mine and Townsite, which is partially on BLM-administered land. Evidence of historic ranching is apparent at the Crookston Ranch site, which is recommended for special management and by numerous livestock grazing campsites scattered across the field office. Early development of fluid minerals is exemplified in South Baxter Basin and the Clay Basin region.

Historic development of southwestern Wyoming includes several distinct ethnic groups. Chinese workers were important in the early coal mining industry. Japanese workers were employed maintaining track along the Union Pacific Railroad. Irish emigrants comprised most of the workforce building the railroad. Cornish and Finnish miners helped open the coal mines and also worked in stone quarrying operations. Around the turn of the century, mining operations began to attract a score of different nationalities, including Welshmen, Scots, Italians, Greeks, Slovaks, Slovenians, and virtually every other nationality in Europe. Finally, Basque sheepherders have long been instrumental in the livestock industry in the area. This melting pot atmosphere is exemplified today in the cultural diversity of Rock Springs and all of southwest Wyoming.

Historic Trails

The Rock Spring Field Office has more miles of some of the best preserved NHT's than anywhere else in the nation. Management plans exist for the major historic trails found in the Rock Springs Field Office. The National Park Service, in cooperation with the BLM and state agencies, developed a plan for the Oregon and Mormon Pioneer National Historic Trails (DOI 1998). That plan is the basis of BLM management of those nationally significant trails. Management of historic roads and trails that are eligible for the NRHP, but are not congressionally designated, will generally be the same as for designated trails. These trails include the Overland Trail, the Cherokee Trail, and the Point of Rocks to South Pass Road.

The Cherokee Trail, which is in the general vicinity of the Overland Trail, has not been systematically studied, and there is no written plan for its management. Several other historic trails and roads are known and managed in the field office, including the Rock Springs to Brown's Park Road, the Point of Rocks to South Pass Freight Road, New Fork Wagon Road, Rock Springs to Lander Stage Road, and the Lincoln Highway. Some of these roads were developed after the Transcontinental Railroad was built and are known as Expansion Area roads. Sites such as Dug Springs, LaClede, and Big Timber are stations associated with the historic trail network.

Native American Culturally Sensitive Sites

There are roughly 24 identified rock art sites located in the Rock Springs Field Office. The rock art sites include five locations with several panels and over 100 individual motifs. The rock art sites are valuable for Native American cultural and religious revitalization, in addition to being extremely important archaeological resources. The importance of other features, such as Boars Tusk, Sage Creek Mountain, and the North and South Table Mountains area, lies in the interrelationship between cultural resources and unusual geographic features, which have attracted considerable attention of Native Americans for the past several millennia.

3.3.2 Forest Service

General Planning Area Description

In 1966, Congress declared it to be national policy that the federal government "administers federally owned, administered, or controlled prehistoric and historic resources in a spirit of stewardship for the inspiration and benefit of present and future generations." This legally mandated the Forest Service to identify, evaluate, and manage cultural resources as part of its multiple-use management practices. Cultural resources are an object of definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. They include prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties considered important to a culture, subculture, or community for traditional, religious, scientific, or other purposes. Cultural resources include archeological resources, historic architectural and engineering resources, and traditional resources. Archeological resources are areas where prehistoric or historic activity measurably altered the Earth or where deposits of physical remains have been discovered. Architectural and engineering resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Traditional resources can include archeological resources, structures, topographic features, habitats, plants, wildlife, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

Native American traditional resources include TCP and sites of cultural concern that may or may not be eligible for the NRHP. They are identified as significant by Native American groups and are also protected under AIRFA. In general, Native American traditional resources can include archeological sites; stone alignments; petroglyphs and pictographs; plant, wildlife, and lithic resource collection areas; spiritual sites; and locations that may have spiritual or cultural meanings to Native Americans. The Forest Service communicates with Native American tribes associated with planning efforts and consults with potentially affected tribes to identify sites of cultural concern found on National Forest System land. To protect traditional resources, the locations of such areas are confidential and not released to the public.

Bridger-Teton National Forest

Approximately 97,710 acres of cultural resource inventory has been conducted on the BTNF. This represents only 2.9% of the BTNF. A total of 1,018 sites have been identified, giving a site density of one site for every 96 acres of survey. Of the 1,018 sites recorded, 664 (65.2%) are classified as prehistoric sites, 300 (30.2%) are historic, and 39 (3.9%) have both a prehistoric and historic component.

Only about 240 acres within the identified core area for Greater Sage-Grouse have been intensely inventoried for cultural resources. Two prehistoric sites have been identified within these 240 acres. Given the limited amount of acreage of core sage-grouse areas on the BTNF, it is anticipated that the potential number of prehistoric and/or historic sites within these core areas will be low.

Historic and prehistoric sites tend to be located in close proximity to permanent water (within 0.25 mile), on slopes of less than 15%, and in close proximity to a major change in vegetation type such as at the interface between forested areas and open sagebrush meadows.

Prehistoric Sites

About 73% of the recorded prehistoric sites are classified as lithic scatters indicative of temporary campsites, while 15% are comprised of lithic scatters with evidence of fire blackened rock or fire pit features. These site types are generally indicative of more intense prehistoric occupation and plant or animal processing. Another 6% of the recorded prehistoric sites are listed as stone circle sites or sites with rock cairns or alignments.

Historic Sites

A variety of historic sites have been recorded. These sites include Forest Service Administrative sites such as guard stations, patrol cabins, and fire lookouts; tie hack cabins; isolated trapper or range rider cabins; historic homesteads; and trails such as the Lander Cut-off of the Oregon Trail and the Teton Pass Wagon Road.

Medicine Bow National Forest

Approximately 20% of MBNF has been inventoried for cultural resources, and 3,437 sites have been recorded. Most heritage sites have been found during surveys conducted prior to ground-disturbing activities. Areas without ground-disturbing activities have not been surveyed, but heritage sites likely do occur in these areas. The MBNF has nine sites listed on the NRHP, all of which are associated with the historic period (post 1900).

Approximately 28% (7,800 acres) of land has been surveyed within sage-grouse habitat on the MBNF. A total of 109 known cultural resource sites are located in sage-grouse habitat. These 109 sites consist of 25 historic sites, 71 prehistoric sites, and 13 sites that have both historic and prehistoric components.

Prehistoric Sites

Previous research shows that 30% of the recorded sites within the MBNF are prehistoric. The Cultural Resource Overview of the MBNF (Grasso et al. 1981) describes the typical prehistoric site in the MBNF as a small lithic scatter of non-local materials, often containing several tools. Temporally diagnostic projectile points found by local collectors and archaeologists indicate the presence of prehistoric peoples in the Medicine Bow Mountains 10,000 to 200 years before the present. Sites are frequently located on fairly level stream terraces and in open montane parks. Sites have been found less frequently in timbered areas, on slopes, and on ridge tops. The identification of prehistoric sites within the Forest is hindered by poor surface visibility.

Prehistorically, the Forest was primarily used seasonally for game harvest and plant and lithic material gathering. Although likely, certain areas of the Forest were used as sacred sites. However, there are no managed sacred sites currently on the Forest.

Historic Sites

Previous research shows that about 70% of the sites recorded within the MBNF are historic. There are thousands of sites and site types due to the size of the Forest. Historic site types include early frontier period sites, such as fur trapping, mining, ranching, and homesteading sites. Other sites include governmental administrative sites, lookouts, ranger stations, mining districts, sawmills, townsites, roads, trails, stock drives, weather stations, hunting camps, recreation residences, private lodges, ski areas, and military sites.

Timber and minerals were the primary resources historically extracted from the Forest. Currently, in addition to historical timber and mineral extraction, recreation and grazing are also important uses of the Forest.

Thunder Basin National Grassland

Approximately 20% of National Grasslands lands have been inventoried for cultural resources, and approximately 3,300 sites have been recorded. Most heritage sites have been found during surveys conducted prior to ground-disturbing activities. Areas without ground-disturbing activities have not been surveyed, but heritage sites likely do occur in these areas. The TBNG does not have any sites listed on the NRHP. A total of 3,328 known cultural resource sites are located in sage-grouse habitat including 549 historic sites, 2,305 prehistoric sites, and 474 sites that have both historic and prehistoric components.

Prehistoric Sites

Previous research shows that 69% of the sites recorded within the TBNG are prehistoric. Among the predominating prehistoric sites, lithic scatter localities account for approximately 60% of all prehistoric sites recorded. Open camp sites account for another 20%. Stone circle sites comprise another 10% of the total number of prehistoric sites on record. The remaining prehistoric site types include hearths, bone beds, prehistoric cairn sites, and prehistoric lithic source/quarries.

Currently the TBNG has a Special Interest Area (SIA) on the grasslands. The Cellars SIA is a 960-acre site that is a series of prehistoric camps atop a long ridge. Management of this area emphasizes protecting the archaeological features and increasing our understanding of the site by working in conjunction with contemporary American Indian Tribes.

Prehistorically, the grassland was primarily used seasonally for game harvest and plant and lithic material gathering.

Historic Sites

Previous research shows that 69% of the sites recorded within the TBNG are historic. The historic sites are predominately associated with mining or ranching; debris scatters, roads and trails are also present.

Historically, range use and mineral extraction were the grasslands' primary utilization along with some homesteading. Currently, in addition to the historical uses, recreation is also an important use of the grasslands.

Historic Trails

There are no nationally or regionally designated trails within the TBNG.

3.4 FORESTRY

3.4.1 Bureau of Land Management

General Planning Area Description

The planning area contains approximately 351,830 acres of harvestable forestry acreage. The forestlands comprise commercial conifer tree species that are in economic demand for milling into salable lumber and that could be managed for sustained yield. The commercial conifer species include lodgepole pine, Douglas fir, Engelmann spruce, ponderosa pine, and subalpine fir. Forestlands also include non-stocked areas that have supported or are capable of supporting one or more of the commercial conifer tree species. The primary woodland species are aspen and limber pine.

Aspen throughout the interior west appears to be declining (Bartos and Campbell 1998; Rogers et al. 1998). According to a report on forest health published by the Wyoming State Division of Forestry, forest health data show that the average age of aspen forest is 68 years. The report also points out that conifer invasion is occurring in most aspen stands, which will likely result in further reductions in aspen presence. Barring any major surface disturbance (e.g., fire, mechanical treatment), the majority of the aspen stands will eventually be replaced by conifers (Koch et al. 2001). Aspen stands provide a rich understory of vegetation, are utilized extensively by wildlife and livestock, and often provide a critical riparian/wetland component in the forest system.

Conditions of the forestlands vary from young, healthy, relatively insect- and disease-free stands to those that are quite old with high levels of insect and disease activity and high mortality rates. Most forestland stands in the planning area are starting to exhibit a reduction in vigor and growth; increases in disease and insect susceptibility are resulting in mortality. Primary insects or diseases include bark beetles, dwarf mistletoe, root diseases, and several varieties of rusts.

Maintaining forest health and vigor for the commercial forest stands requires following prescribed silvicultural prescriptions for each forest type. Silvicultural practices in the commercial forest lands would include clearcutting, individual tree marking, shelter wood, thinning, and tree group selection. Harvesting fuelwood (i.e., dead trees) by public demand sales is strictly a wood salvage operation. Meeting the public need for this product is important; however, this action does not improve forest health or tree vigor. Larger commercial sales are necessary to perpetuate forest cover by stand replacement.

Below are the BLM Field Offices in the planning area with a description of their forest habitats.

Casper Field Office

The Casper Field Office administers approximately 66,010 acres of forest and 99,000 acres of woodlands. Approximately 8,000 acres of the forestland are identified as commercial timberland. Most of the commercial timberlands are located in Natrona and Converse counties. A total of 3,314 thousand board feet (MBF) of sawtimber was harvested from 1983 to 1991. Firewood, posts and poles were harvested as well. From 1992 to 2001, there was no activity in the forest program due to the absence of funding. No active forest management occurred on forestlands from 1990 to 2001. There has been no annual appropriation for the forest program since 1992. In 2001, a forest plan was prepared and initiated for the Muddy Mountain Environmental Education Area (EEA). Firewood as well as posts and poles have been harvested there since 2001. Firewood, post, poles, and Christmas tree sales have occurred annually. Prescribed fire is used to regenerate aspen stands for improved wildlife habitat.

Fragmentation of forests and woodland communities within the field office has occurred through localized development of roads, forest management, or from natural processes such as climate, disease, insects, or wildfire. These historic disturbances have affected the size and distribution of forests and woodlands throughout the field office. For example, dwarf mistletoe in conifer stands, blister rust on limber pines, and mountain pine beetle and Ips beetle in conifer stands are the insect and disease damaging agents of primary concern in the field office. Stand densities, age-class distribution, and overall health are affected by the invasion and spread of these agents. The lack of a natural fire return interval in forests and woodlands in the field office has resulted in increasing stand densities and abundant ground fuels. Because natural regeneration of lodgepole pine and aspen relies on fire, fire suppression also has contributed to changes in the composition and structure of forest and woodland communities. In the absence of natural fire regimes, active management is necessary to ensure the health and vigor of forest and woodland communities.

The forests on BLM-administered land in the field office include lodgepole pine, ponderosa pine, and scattered areas of Douglas fir. Included in this acreage are 17 Forest Management Areas (FMAs) on BLM-administered land. The 17 FMAs are scattered throughout mountainous regions of the field office as isolated stands of forests. The importance of these forest stands is a function of their distribution, relatively long rotation age (number of years to maturity), and the diversity of plants and animals they support. Age-class distribution in the field office currently is unbalanced, tending toward mature, heavily stocked stands. Portions of these stands remain healthy, but many are declining in tree vigor and productivity (BLM 2003a). The advanced age and density of these stands, combined with the lack of silviculture treatments and a natural fire regime, have contributed to the decline in overall health of forest stands in the field office.

For the most part, lodgepole pine stands are struggling for growth and survival due to a lack of density and age-class distribution. This species is suffering from mountain pine beetle and dwarf mistletoe infestations in scattered patches throughout the field office. Ponderosa pine forest stands contain better age-class diversity and better spacing than lodgepole pine stands and are, therefore, healthier and more vigorous. Ponderosa pine is more fire tolerant and grows well on poorer sites; however, some stands of ponderosa pine are exhibiting damage from the mountain pine beetle and over-maturity. With the exception of the Muddy Mountain area, no active forest management occurred on forestlands in field office FMAs since 1990. Consequently, current forest inventory data for the field office are limited. Historically, forest products from public lands in the field office have played a small role in the wood product industry. However, since the development of the Muddy Mountain Forest Health Recovery Plan (BLM 2001c), the public has responded to the sale of posts, poles, firewood, and wood for landscaping and furniture.

Kemmerer Field Office

The Kemmerer Field Office administers 22,010 acres of forestland and approximately 15,000 acres of woodland. Forestlands are comprised of lodgepole pine, Douglas-fir, and subalpine fir. Woodlands include quaking aspen, Rocky Mountain juniper, and Utah juniper. Sawtimber-sized trees are found on approximately 56% of the forestlands (BLM 1982). Mountain pine beetles are present and causing mortality throughout the entire range of forest lands with epidemic levels in various locations, including the Commissary Ridge, Dempsey Ridge, and Uinta North Slope areas.

Since 1984, about eight million board feet of sawtimber has been harvested from 500 acres of lodgepole pine forestlands throughout the Kemmerer Field Office (Schiche 2003a). All of these forestlands have successfully regenerated, and approximately 350 acres are ready for pre-commercial thinning to optimize growing conditions (Schiche 2002).

The 19,000 acres of forestland available for forest management contain approximately 7,000 acres of mature sawtimber, with a full average annual allowable sale quantity of 600 thousand board feet. Approximately 250 cords of fuelwood, 50 Christmas trees, and 1,000 posts and poles are sold annually from forestland within the Kemmerer Field Office. Virtually no forest products are harvested from the aspen and juniper woodlands (Schiche 2003b).

Newcastle Field Office

Forested public lands are concentrated along the Wyoming/South Dakota state line in Weston and Crook counties. Small, isolated, scattered tracts of public forestlands intermixed with private land are along the west and northwestern portion of the Black Hills in Crook County. In the Hat Creek Breaks and the German Hills areas in Niobrara County, there are also small tracts of forested public lands. Ponderosa pine (*Pinus ponderosa*) is the main commercial sawtimber species found in the resource area. Noncommercial species, which may be found in association with the ponderosa pine, are Rocky Mountain juniper, paper birch, bur oak, plains cottonwood, and quaking aspen.

During the past decade, about 1,600 acres (10%) of the commercial forest acres have been harvested using a two or three cut shelterwood harvest through commercial and pre-commercial thinning. This is the accepted silvicultural practice in harvesting ponderosa pine. The harvest of trees is done with rubber-tired skidders or whole tree mechanical harvesters.

The major wood product users in or near the field office are sawmills located in Hulett, Wyoming, and the cities of Spearfish, Hill City, and Rapid City, South Dakota. These mills receive most of their supply of timber from the Black Hills National Forest, with the remaining supply coming from private, state, and BLM-administered public lands. Minor forest products (fuelwood, post and poles, and Christmas trees) are sold on a public demand basis.

There is an estimated 41.5 million board feet (MMBF) of timber cut in the field office each year; however, only about 500 MBF is cut from BLM-administered public lands. This volume represents 1.4%of the estimated total levels taken from the planning unit, and has a value of approximately $135,222 based on $225.37 per MBF (log scale price) (Adams 1989). About 5.9 direct and indirect jobs could be involved from this volume of timber produced and marketed. This would contribute an estimated $270,174 in direct and indirect revenues to the economy based on a 1.999 business multiplier supplied by Colorado State University. This timber would probably be processed in line with other timber with no change in work force except under conditions of very high demand, tight work schedules, and a minimum work force line. There are about 1,500 poles and posts plus about 4.75 MMBF of firewood harvested from the field office each year. Table 3-11 shows the timber data for the Newcastle Field Office.

Table 3-11. Newcastle Field Office Timber Data

Newcastle Field Office	Acres	Percent
Forestland	25,300	8% of total BLM-administered land
Commercial forestland	15,800	62% of total forestland
Seedling/Saplings	4,686	29% of commercial forestland
Sawtimber	10,747	69% or commercial forestland
Nonproductive	8,693	38% or total forestland

Pinedale Field Office

Much of the forest acreage is concentrated along the northern, eastern, and western boundaries of the field office and occurs on north and east slopes as narrow, stringer-like stands that originate from larger blocks of timber at higher elevation on National Forest System land. Table 3-12 summarizes the forest acres for the field office. The area has been divided into four individual management units:

1) The Deadline-Pinegrove Unit, which lies between South Piney Creek and LaBarge Creek, includes the Graphite elk winter range, Riley Ridge elk winter range, and Rock Creek ACEC. The unit contains an

estimated 13,450 acres of forestland and 3,510 woodland acres, of which 1,320 acres of forestland and 180 woodland acres are in the Rock Creek drainage, 2,120 acres of forestland and 840 woodland acres are in the Graphite winter range, and 1,030 acres of forestland and 150 woodland acres are in the Riley Ridge winter range.

2) The North Piney Unit, which lies between the Maki Creek drainage and South Piney Creek, includes two elk feedgrounds: Finnegan and North Piney. The unit contains approximately 5,160 acres of forestland and 4,450 woodland acres, of which 710 acres of forestland and 355 woodland acres are in the feedgrounds.

3) The Miller Mountain Unit, which lies between LaBarge Creek and Fontenelle Creek, includes the Fort Hill-Fontenelle elk winter range. The unit contains 8,190 forested acres (4,240 acres of forestland and 3,950 acres of woodland), of which 280 acres of forestland and 150 woodland acres are in the elk winter range. In addition to the forest resource, the Miller Mountain Unit provides yearlong habitat for 200 to 400 elk.

4) The Eastside-Hoback Unit consists of scattered parcels and blocks of forested land along the eastern and northern boundaries of the field office. The unit contains the Scab Creek area and the Franz elk feedground. The unit is composed of 8,740 acres of forestland and 3,370 woodland acres. The Franz feedground has roughly 130 acres of trees (75 acres of forestland and 52 acres of woodland). The Scab Creek area has 180 acres of forestland and 270 woodland acres.

Table 3-12. Pinedale Field Office Timber Data

Timber Type and Size Class	Acres	Net Cubic Foot Volume[1] (per acre)	Total Net[3] Cubic Foot Volume	Total Volume (board feet)
Commercial Conifer				
Lodgepole pine				
Saw timber stands	7,190	2,305	16,566,035	74,547,158
Pole timber stands	2,710	1,788	4,847,268	21,812,706
Seedling/sapling stands	440	578	253,164	1,139,238
Douglas fir				
Saw timber stands	11,020	1,946	21,435,190	96,458,355
Pole timber stands	1,620	1,479	2,395,980	10,781,910
Spruce-fir				
Saw timber stands	6,970	2,650	18,481,100	83,164,950
Pole timber stands	660	1,319	863,945	3,887,752
Seedling/sapling stands	160	242	38,236	172,062
Nonstocked stands	830	260	216,320	933,440
Woodland				
Aspen				
All classes	15,200	955	14,514,090	15,729,930
Whitebark/Limber pine				
All classes	80	NA[2]	NA[2]	NA[2]
Total	**46,870**	**1,699**	**79,611,328**	**308,667,501**

Timber Type and Size Class	Acres	Net Cubic Foot Volume[1] (per acre)	Total Net[3] Cubic Foot Volume	Total Volume (board feet)

[1] Both live and dead volume (approximately 10% is sound dead material).
[2] Data not available.
[3] Original data indicate 4 board feet per cubic foot. Most recent Forest Service (2006) data show 5 board feet per cubic foot.

Rawlins Field Office

Forested areas are located within several mountainous areas: Shirley Mountain, located in the north-central part of the field office; Elk Mountain, located in the south-central part of the field office; Ferris Mountains, located in the north-central part of the field office; Seminoe Mountain; Bennett Mountain; Powder Rim; and the Laramie Peaks area. There are also a number of forested areas on the fringe of the National Forest boundaries. The condition or health of forest stands varies by location. The general absence of large fires over the past 80 years has made forests more susceptible to disease such as dwarf mistletoe, mountain pine beetle infestations, and newly introduced diseases such as white pine blister rust, which has increased the mortality rate and the amount of dead standing timber in federal forests. In addition, species such as lodgepole pine have not experienced the natural regenerative properties of fire. Conifers are encroaching on aspen stands, limiting aspen regeneration. Along with conifer encroachment, disease and insect damage are also playing a major role in the increasing mortality rate of older mature aspen clones. There has also been a decline in timber harvesting over the past decade, allowing for additional buildup of overall biomass. The majority of commercial timber in the field office is located within the Shirley Mountain and Elk Mountain areas. Further descriptions of the forest resources within these two areas follows below and Table 3-13 shows a summary of those resources.

Shirley Mountain Forest

The Shirley Mountains are a relatively isolated mountain range in the northern portion of Carbon County in south-central Wyoming. They are located entirely within the field office and contain a mixture of BLM-managed public lands, state lands, and private land parcels. The Shirley Mountains provide diverse resource values and uses, such as forests, wildlife habitat, recreational opportunities, minerals, watershed, livestock grazing, communication sites, and cultural resources.

The condition of forest resources in the Shirley Mountain Forest is discussed below by forest type. Because of differences in forest management practices, the condition of BLM-managed public parcels and private parcels that have been timbered differs markedly. Diversity is low not only from the standpoint of relative acreage in the different forest types but also because of diversity within different successional stages for all these forest types. This condition is primarily due to the lack of stand-replacing disturbances over the past 80 years.

Lodgepole Pine Forest

The lodgepole pine forest type is the result of past stand-replacing wildfires. This forest type is generally healthy but will decline in vigor and productivity as the forest becomes more decadent. In addition, there are insect and disease concerns that may compromise future health. Infestations of pine beetles and dwarf mistletoe are apparent. Current age class distribution is heavily unbalanced toward the mature age class, reflecting the long period since the last fires.

Spruce-Fir Forest

The major species component of the spruce-fir forest type is subalpine fir, with occasional Engelmann spruce. This forest type is found in small areas of the Shirley Mountain Forest. It is even-aged and fairly young considering the longevity of Engelmann spruce and subalpine fir. Spruce-fir exists as small, isolated stands away from the large acreages of dense lodgepole pine and has the same date of origin as its neighboring stands. Old, remnant lodgepole pine trees are not found in the spruce-fir stands. Occurrence of the spruce-fir forest type is probably a result of less-intense wildfire in the area and an available seed source. There is also an established understory of young subalpine fir seedlings and/or saplings on lodgepole pine and aspen forest types. These forested areas will convert to subalpine fir forests, but this process may take 100 years or more and will occur only if there are no wildfires.

Aspen Forest
The aspen forest type, like the spruce-fir type, is not well represented in the area. Aspen are found primarily on steep, rocky slopes or in low, wet areas; therefore, opportunities for management are limited. However, this conversion is not anticipated to occur within the next 20 years. Aspen is a minor component in more than one-third of the lodgepole pine stands. Removal of the conifers would promote aspen regeneration.

Woodland Forest
The majority of the forested land in the Shirley Mountains is woodland forest type. The most common tree species is limber pine. Juniper woodlands also occur. The trend in vegetative structure in this type of forest is toward increasing tree density. The existing vegetation allows seedlings to establish in previously open areas. This filling-in will increase crown cover and reduce forage for wild and domestic ungulates.

Elk Mountain Forest

Elk Mountain is located in the southeast quarter of Carbon County, just north of the MBNF. Forest types in this area change in relation to elevation. In the subalpine zone, at 9,000 to 11,000 feet, Engelmann spruce and subalpine fir dominate. In the area below this elevation, the forest type is almost exclusively lodgepole pine. Below the lodgepole pine is an area of mixed lodgepole pine and Douglas fir. Aspen, limber pine, scattered ponderosa pine, some Douglas fir, and lodgepole pine predominantly cover the foothills of Elk Mountain. The more productive forest stands are located on areas with a north-to-northeast aspect. Stands that occur on the west and south slopes of the mountain are not as productive.

Forests on Elk Mountain are not in good condition. Past cutting practices, often in the form of high grading, along with past insect infestations and fire suppression, have resulted in a deteriorating forest resource on Elk Mountain on both public and private land. Many acres have had poor natural regeneration. Dwarf mistletoe occurs on all coniferous species on Elk Mountain, with considerable damage appearing in lodgepole pine. The condition of forest resources in the Elk Mountain Forest is discussed below by forest type.

Lodgepole Pine Forest
The majority of lodgepole stands have reached their recommended rotation age of 100 years; thus, growth has slowed. Some patches have severely deteriorated. Virtually all of the lodgepole stands owe their origin to fires that occurred in the 1800s. Because of extensive even-aged lodgepole pine stand growth, overcrowding occurs. The Douglas fir forest type is generally found in association with lodgepole pine in this area, on the lower reaches of the mountain. Many of these trees are residual trees from prior stands.

Spruce-Fir Forest
There are large areas where subalpine fir constitutes a major portion of the overstory. Engelmann spruce occupies a mixed conifer forest with subalpine fir, the latter being the first species to grow.

Aspen Forest
Aspen occupy wet draws and drainages on Elk Mountain. Aspen stands generally provide an overstory for subalpine fir seedlings, with the probability that the stand will eventually reach a spruce-fir climax condition. Many of the aspen stands are disease-ridden and of poor quality.

Woodland Forest

Limber pine occupies the more exposed and harsh sites throughout the area. The drier south-facing slopes on Elk Mountain are often covered with widely spaced limber pine. In some locations, the limber pine appears to be invading sagebrush-covered meadows, competing successfully with the deep-rooted sagebrush.

Table 3-13. Rawlins Field Office Timber Data

Rawlins Field Office	Forest/Woodland	Acres
Shirley Mountain Forest	Lodgepole Pine	9,860
	Spruce-Fir	330
	Aspen	810
	Woodland	11,840
Elk Mountain Forest	Lodgepole Pine	1,080
	Spruce-Fir	2,490
Other Forest Land		170,520
Total Forest Land		196,930

Rock Springs Field Office

The Rock Springs Field Office contains commercial forestland. There are seedlings/saplings, pole timber, and sawtimber (Table 3-14). Sawtimber accounts for 51% of the total commercial forest land. This timber type is mature to over-mature. Many of these stands are decadent and exhibit considerable mortality. Lack of past management actions has resulted in these unhealthy stand conditions. Pole timber in many of these stands is as old as the sawtimber stands. However, these trees are smaller in size because of over stocking and resulting growth stagnation. The large expanse of juniper acreage within the southern half of the field office is currently receiving very little management activity. Only a few permits are sold annually for juniper firewood and Christmas trees. Reforestation is being accomplished by natural seeding and occasionally by planting containerized stock or direct seeding. At present, no timber stand improvements (thinning, treatments, etc.) are being conducted in the field office other than through post/pole and Christmas tree sales. At the present level of harvesting for these products, the acreage treated is insignificant. Some of the field office supports forest and woodland ecosystems, which provide multiple benefits and uses (personal and commercial).

The field office is divided into four timber compartments for timber management: Wind River Front, Pine Mountain, Little Mountain, and Hickey Mountain-Table Mountain. Hickey Mountain-Table Mountain will be managed as described in the woodland prescriptions. The Wind River Front is a restricted forest management area where forest resources will be managed for commercial forest value to improve the health, vigor, and diversity of forest stands and give full consideration to other resource values such as watershed, wildlife, minerals, recreation, and scenic values.

Much of the aspen occurs in variable sized stands adjacent to the downslope edge of the conifer zone. Aspen stands may be intermixed with both categories of conifer or can be totally isolated. Two additional species, narrow leaf cottonwood and Rocky Mountain juniper, are also found in the field office. Small amounts of cottonwood are found growing in riparian zones adjacent to streams and rivers. Juniper stands are found predominantly south of I-80 in fairly continuous, moderately stocked stands scattered throughout the transition zone between the valley bottoms and the mountains. Pine Mountain, Little Mountain, and the

Wind River Front all have firewood, post/pole, and Christmas tree sale areas that are designed to meet public demand and help achieve forest management objectives for these areas.

The majority of the commercial conifer species are located along the Wind River Front. These stands are primarily found extending from timbered areas on National Forest System land. The field office stands extend downslope away from the Wind River Range reaching the transition zone of sagebrush hills. Moderate-sized stands of commercial conifers are also found on the Pine Mountain compartment and Little Mountain compartment near the Colorado and Utah borders. These two compartments also contain large stands of juniper scattered throughout their lower elevations. The Hickey Mountain-Table Mountain unit is composed primarily of scattered stands of juniper with small pockets of aspen and Douglas-fir intermixed on Hickey Mountain.

The conifer stands can be divided into two categories. The first category includes the north-facing, cooler slopes that are mostly occupied by the Engelmann spruce/subalpine fir complex (spruce-fir) with occasional Douglas fir intermixed. This complex is dominated by subalpine fir. The second category includes the south, east, and west facing slopes that are occupied by lodgepole pine and the transition zone from north to east that is occupied by limber/white bark pine complex and spruce-fir. Lodgepole is the most prevalent species in this complex. Aspen stands are found throughout the field office. The most dominant occurrences are on east to northeast facing thoroughfares.

Insects and diseases are present in most of the timber stands in the field office. Dwarf mistletoe is the most common disease and the mountain pine beetle is the most common insect affecting the commercial timber stands. They are currently at endemic or static levels. However, due to the age and general condition of many of the sawtimber stands, insect levels could rapidly change from endemic to epidemic proportions especially during prolonged drought conditions.

Based on the 1985 calculations, the Rock Springs Field Office could annually harvest from 104,000 cubic feet to 225,000 cubic feet, depending upon management constraints. A large number of subalpine fir seedlings are becoming established under lodgepole, aspen, and Douglas fir overstories and may affect the future commercial quality of many stands. Subalpine fir will become the major stand component without management activity (e.g., harvesting) that favors the other species. This could have an important effect on the merchantability of forest products on BLM-administered lands. Subalpine fir is a less desirable commercial species because of its lower strength and nail holding characteristics, higher susceptibility to rotting, and higher warpage percentage.

Table 3-14. Rock Springs Field Office Timber Data

Rock Springs Field Office	Acres	Volume (cubic feet)
Total Commercial Forest	7,900	13,9472,439
Saw timber	4,040	na
Seedlings/Saplings	360	na
Pole timber	3,550	na

3.4.2 Forest Service

General Planning Area Description

National Forests in Wyoming provide a wide variety of forest habitat types from high elevation whitebark pine forest to low elevation ponderosa pine and juniper habitats. Forest habitat types are a reflection of elevation, aspect, soils, latitude and climate. Forest habitats are also influenced by management strategies, insects, disease, wildlife, atmospheric phenomenon and fire. Forest habitats naturally change over time.

Bridger-Teton National Forest

The condition of forest stands varies by location within the Greater Sage-Grouse habitat areas. Commercial timber species on the BTNF are lodgepole pine, Douglas fir, subalpine fir, and Engelmann spruce. Lodgepole pine and Douglas fir would coexist in some instances with Greater Sage-Grouse habitat; however, subalpine fir and Engelmann spruce would generally not coexist due to elevation and moisture requirements. Woodland species include limber pine, Rocky Mountain juniper, and quaking aspen and exist in some locations on the fringe of Greater Sage-Grouse habitat areas. Woodland species are occasionally used for firewood and decorative or hobby applications but are not important commercially.

Current Management Practices

All pine species on the Forest are in decline due to dwarf mistletoe, mountain pine beetle infestations, and diseases such as white pine blister rust. Along with conifer encroachment, disease and insect damage are also playing a major role in the increasing mortality rate of older mature aspen clones. Woodland species have encroached into sagebrush habitat in some locations, which is most directly related to fire exclusion for the past century.

The use of prescribed fire and commercial timber harvest are current management practices that are used to change the forested landscape. However, these human-caused practices are limited in the scale of what can actually be affected. Changing the vegetation across 3.4 million acres is difficult when timber sales and prescribed fires, both small in scale, are only hundreds of acres in size. In addition, the Forest is guided by the Lynx Amendment, which prescribes the amount of vegetation change that can occur by Wilderness Areas (approximately one-third of the total forest acreage), off limits to timber harvest, and by the lack of timber companies that actually implement the harvest. While the Forest uses a wide range of silvicultural prescriptions and management activities to treat grassland, sagebrush, aspen and other vegetative communities, the change that is actually brought about is limited in scale and has resulted in an aging, disease, and insect infected forest.

Medicine Bow National Forest

The MBNF supports many forest types. The most common include lodgepole pine dominated, spruce-fir, aspen, cottonwood, limber pine/ juniper, and ponderosa pine/Douglas- fir forest types. These conifer and hardwood forest types are intermixed with wet meadows and sagebrush/grass dry meadows. There are approximately 960,360 acres of forest land within the MBNF (88% of the total MBNF). Within the MBNF, 98% of the total forest land is timberland that can be used for industrial wood products, while 2% is woodland that is typically not used for wood products.

The absence of natural forest fires over an approximate 100 year period has allowed many of the forest types to become mature and overstocked. Drought has also added stress to all forest types. Since 2004, naturally occurring bark beetle populations have been at epidemic levels in all conifer types, resulting in near total mortality of mature stands. Sudden aspen decline has been found in many mature aspen stands. The introduction of white pine blister rust has also resulted in increased mortality in limber pine. The majority of forest types on the MBNF have been experiencing a rapid transformation from a mature forest to a younger regenerating forest.

Current Management Practices

All forest types are managed under a variety of management objectives, from multiple uses to Wilderness area management. Commercial timber species are actively managed for forest products. This includes a wide range of silvicultural prescriptions and management activities in site-specific project areas. Woodland encroachment is treated in grassland, sagebrush, aspen, and other vegetative communities where it is determined to be detrimental to other resource values such as wildlife. Woodland encroachment is typically treated using prescribed burning.

Thunder Basin National Grassland

Ponderosa pine and juniper are the most common forest types on the TBNG and have been encroaching on sagebrush and grass-dominate prairie. On the grassland, increases in insect populations have also caused an increase in tree mortality. The TBNG contains 25,780 acres of forest land, 77% of which is ponderosa pine timberland and 23% of which is juniper woodland (Steed 2008).

Current Management Practices

The National Grassland is managed under a variety of management objectives from cattle grazing to mineral extraction.

3.5 Lands and Realty

3.5.1 Bureau of Land Management

General Planning Area Description

Land ownership and jurisdiction is summarized in Chapter 1. Although the BLM administers the leasing of the mineral estate underlying Forest Service and Bureau of Reclamation (BOR) withdrawn lands, mineral management decisions on these lands may be made by the surface management agency depending upon regulatory authority. On many of the private lands, the mineral estate (either all of the minerals or portions of the minerals) is reserved for the U.S. Government. In these cases, the mineral estate is administered by the BLM, although the private landowners administer the surface estate.

Land Tenure Adjustments

Land ownership (or land tenure) adjustment refers to those actions that result in the retention of public land, disposal of public land, or the acquisition by the BLM of nonfederal lands or interests in land. The FLPMA requires that public land be retained in public ownership unless, as a result of land use planning, disposal of certain parcels is warranted and in the public interest. Land exchanges are an important tool to consolidate land ownership for more efficient management. Exchanges are also helpful for securing important objectives of resource management, enhancement, development and protection; meeting the needs of communities; promoting multiple-use management; fostering sustainable development and fulfilling other public needs. However, the BLM will evaluate and consider the full range of land disposal and acquisition tools to be able to accomplish these objectives prior to proceeding with a land exchange. Acquisition of and interests in lands are important components of the BLM's land tenure adjustment strategy. Acquisition of and interests in land can be accomplished through several means, including exchange, purchase, donation, and condemnation.

Disposal

Public lands have potential for disposal when they are isolated and/or difficult to manage or when it is in the public interest. Disposal actions are usually in response to public request, such as community expansion. Disposals result in a title transfer, wherein the lands leave the public domain. All disposal actions are coordinated with adjoining landowners, local governments, and current land users.

Public sales are managed under the disposal criteria set forth in Section 203 of the Federal Land Policy and Management Act (FLPMA). Public lands determined suitable for sale are offered via the initiative of the BLM or through a nomination/request for sale from the public. The lands are not sold at less than fair market value. Lands suitable for sale must be identified in the RMP. Any lands to be disposed of by sale that are not identified in the current RMP require a plan amendment. Disposal of the mineral estate must conform to Section 209 of FLPMA (for sales) and 206 of FLPMA (for exchanges). This will require a mineral potential report; the mineral estate may be retained depending on the mineral values.

Exchanges

Land exchanges are initiated in direct response to public demand or by the BLM to improve management of the public lands, and the lands need to be formally determined suitable for exchange. Nonfederal lands are considered for acquisition through exchange of suitable public land on a case-by-case basis, where the exchange is in the public interest and the acquisition of the nonfederal lands will contain higher resource values than the public lands being exchanged. In all land exchanges, keeping the surface and mineral estate intact on both the disposed and acquired lands would benefit the future owners and their use of the land.

Acquisition

Acquisition of lands can be pursued to facilitate various resource management objectives. Acquisitions, including easements, can be completed through exchange, purchase, donation or condemnation. Funding for acquisitions may come from the land and water conservation funds (LWCF) or donations. Lands considered for acquisition would be those lands that meet specific land management goals identified in the RMP.

Withdrawals

Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. They segregate a portion of public lands and suspend certain operations of the public land laws, such as the location of mining claims and sites. Federal policy restricts withdrawals to the minimum time required to serve the public interest in order to maximize the use of withdrawn lands consistent with their primary purpose. Withdrawals are periodically reviewed to verify if they are serving their intended purpose and may be revoked if they are not.

Land classification is a process required under specific laws to determine the suitability of public lands for certain types of disposal or lease or suitability for retention and multiple use management. Most land classifications also segregate public lands from operation of some or all of the public land laws and (or) mineral laws. Several classifications were established under the 1964 Classification and Multiple Use Act. The lands were classified for retention and multiple use management and against sale, agricultural entry, and mining location, but they remain open to mineral leasing.

Rights-of-Way

Corridors established to contain ROWs are preferred routes for transportation and transmission facilities. The Programmatic EIS, Designation of Energy Corridors on Federal Land in the 11 Western States (2008), designated energy corridors in the Casper, Rock Springs, Rawlins and Kemmerer field offices. These corridors were specific to oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities. ROWs for transportation or utility systems and facilities in the field office include roads, natural gas pipelines, transmission lines and telephone lines. To the extent possible, linear ROWs, such as roads and pipelines, are routed where impacts would be least disturbing to environmental resources, taking into account the point of origin, point of destination, and purpose and need of the project. Although established corridors exist, this does not preclude the location of transportation and transmission facilities in other areas if environmental analysis indicates that the facilities are compatible with other resource values and objectives. Further identification of corridors may not necessarily mandate that transportation and transmission facilities be located within these areas if they are not compatible with other resource uses, values, and objectives in and near the corridors or if the corridors are saturated. ROWs are issued with surface reclamation stipulations and other mitigating measures. Restrictions and mitigating measures may be modified on a case-by-case basis, depending on impacts on resources.

Leases and Permits

Section 302 of FLPMA states that public lands may be authorized to state and local governments and private citizens to use, occupy, or develop. Uses that may be authorized include agricultural development, residential (under certain conditions), commercial, and advertising. Permits are usually short-term authorizations not to exceed three years. Leases are long-term authorizations that usually involve a significant economic investment in the land.

Recreation and Public Purposes Act

The Recreation and Public Purposes (R&PP) Act authorizes the BLM to lease or convey public surface to state and local governments and qualified nonprofit organizations for recreation or public purpose uses.

Lands are leased or conveyed for less than fair market value or at no cost for qualified uses. Examples of typical uses under the R&PP Act include historic monument sites, campgrounds, schools, parks, public works facilities, and hospitals. Lands usually are leased first until development of the area is completed and then, if appropriate, title may be conveyed.

Lands proposed to be leased or conveyed under the R&PP Act must first be classified as suitable for such use. R&PP classifications segregate the land from operation of the public land laws except for the R&PP Act, which precludes disposal by sale, exchange or other means, but specifically allows for R&PP lease or conveyance. R&PP classifications also segregate from operation of the mining laws, closing the area to mining of locatable minerals. R&PP classifications do not segregate from mineral leasing. R&PP leases and conveyances reserve all minerals in the land to the United States.

Renewable Energy

Renewable energy is generally defined as energy derived from sources continuously replenished by natural processes. These sources include wind, solar, biomass, and geothermal energy. Wind energy is the process by which wind is used to generate electrical power. Wind turbines convert the kinetic energy of the wind into mechanical power that a generator converts into electricity (BLM 2011a). Solar energy is the use of the sun's energy to produce electricity, often through the use of photovoltaic panels that convert sunlight directly into electricity using semiconductor materials. Biomass (also called bioenergy) is the process of converting forestry and agricultural crops, crop-processing wastes and residues, animal manures, and landfill methane gas into electricity. These waste products are either burned directly or converted into fuels that can be burned to produce energy. Geothermal energy is heat in the form of hot water, steam, or rocks near the surface of the Earth's crust used for direct heating and cooling or for the generation of electricity. Nonrenewable energy sources generally are limited to fossil fuels, such as coal, oil, and gas, which the Mineral Resources section of this document addresses.

Wyoming represents one of the strongest potential wind resources in the country and presently is an exporter of wind power to several surrounding states. The state also has some potential for solar, biomass, and geothermal energy; however, the demand for these renewable energy sources is not as strong.

Currently, the installed renewable energy capacity in Wyoming is 1,412 megawatts (MW) of wind energy, 0.05 MW of solar energy, and 0 MW of biomass and geothermal energy (American Wind Energy Association [AWEA] 2011; U.S. Energy Information Administration Website 2012). A recent study, "Assessing the Potential for Renewable Energy on Public Lands," presented a nationwide overview of renewable resources on BLM–administered lands. In this study, Wyoming was determined to have a high potential for wind-energy development and a low potential for solar, biomass, and geothermal energy development (BLM 2003b). Wyoming's wind resource is ranked 8th in the nation (AWEA 2011).

Casper Field Office

The land ownership pattern in the Casper Field Office is diverse. The eastern portion, mostly Platte, Goshen, and eastern Converse counties, have scattered public land parcels that are isolated by large private landholdings. This scattered ownership pattern makes these lands difficult to manage as part of the public land system. The small size of many scattered parcels and their isolation from other parcels of public land make them of marginal utility to the public. Lack of public access diminishes their public utility. Some areas of exception occur, such as along the eastern flank of the Laramie Range west of Wheatland (e.g., Mule Shoe Flats and Cooney Hills), where large parcels are present. In western Converse County and largely throughout Natrona County, large blocks of federal land are present, though scattered isolated parcels of private lands remain.

Leases and Permits

Leases, permits and easements under FLPMA are issued to authorize uses of public land, ranging from long-term (leases) to a few days (filming permits). Although the Casper Field Office currently has one agricultural lease under this section of FLPMA, there have been permits in the past and there are likely to be permits in the future.

Recreation and Public Purposes Act Leases and Conveyances

The Casper Field Office administers 12 R&PP conveyances covering approximately 2,850 acres and 14 R&PP leases covering approximately 640 acres.

Exchanges

Only modest exchange activity has taken place in recent years within the Casper Field Office, although interest in exchanges continues to increase. Recent exchanges resulted in the acquisition of 5,910 acres of private land in the South Bighorns area and 660 acres of private land in the Pine Mountain area.

Purchases

Only one land purchase for six acres using appropriated funds was completed in the Casper Field Office. One conservation easement on 156 acres was acquired and four purchases covering 509 acres were completed using monies from the Land and Water Conservation Fund.

Donations

The BLM occasionally receives gifts or donations of lands or interests in land when an entity elects not to receive the market value for the interests being conveyed. Two access easements were donated to the BLM by the State of Wyoming for the Muddy Mountain access road. The city of Casper donated two easements for roads and utilities as well as approximately ten acres of land to the BLM for the National Historic Interpretive Trail Center in Casper.

Land Sales

The Casper Resource Management Plan identified 224,830 acres of public lands as potentially suitable for disposal. Prior to disposal, site-specific analysis with public participation is conducted. At that point, a determination is made on whether disposal of the parcel is in the public's best interest. The parcel is retained in public ownership if the disposal is not in the public's best interest. To meet community expansion needs, the Casper Field Office considers proposals to dispose of lands within a 5-mile buffer of communities by sale, exchange, or other means. Proposals are evaluated on a case-by-case basis to ensure compatibility with resources and other land uses. In addition, 5,450 acres are identified for disposal in Decision 6046, on a restricted basis.

The following sale activity shows the limited nature of land sales within the Casper Field Office.

- In 1986, 14 parcels in the Goshen Hole area of Platte and Goshen counties totaling approximately 1,040 acres were sold.
- In 1987, 280 acres were sold to Umetco Minerals Corporation to accommodate a uranium mill tailings disposal site.
- In 1992, approximately 70 acres were sold to the town of Midwest to meet their needs for a sanitary landfill.
- In 1992, 2.5 acres were sold to a family in fulfillment of their 20-year commitment toward developing a cabin site under a small tract lease.

Withdrawals

Existing withdrawals and classifications are listed in Table 3-15. Included in the table are existing withdrawals established by the BLM to protect the existing resource values as well as withdrawals transferring public land to other federal agencies to accomplish their mission goals.

Table 3-15. Withdrawal Summary for the Casper Field Office

Withdrawals	Administering Agency	Acres
Alcova Fossil Area*	BLM	5,810
Cedar Ridge TCP*	BLM	4,060
Jackson Canyon*	BLM	11,390
North Platte River	BLM	3,230
Sand Hills Management Area*	BLM	17,600
South Bighorns/Red Wall Management Area*	BLM	75,910
Bald Eagle Roosts (excludes Jackson Canyon)*	BLM	37,290
Fremont Canyon (C&MU)	BLM	1,260
Habitat Fragmentation*	BLM	168,390
Muddy Mountain C&MU	BLM	1,030
NHTs and Other Historic Trails*	BLM	80,290
Public Water Reserves	BLM	1,390
R&PP Classifications	BLM	3,490
Stock Driveways	BLM	56,330
Air Navigation Site	FAA	200
Camp Guernsey (*partial)	State of Wyoming (National Guard)	11,850
Fort Laramie National Historic Site	NPS	940
Grey Reef Power Site	Federal Energy Regulatory Commission	29
Spook Site Uranium Mill Tailings	DOE	90
Mill Tailings UMETCO*	DOE	990
National Forests	Forest Service	81,770
Thunder Basin National Grasslands	Forest Service	163,240
National Wildlife Refuge	United States Fish and Wildlife Service	7,460
Naval Petroleum Reserve Number 3	DOE	9,320
Reclamation	BOR	18,080

*Decisions from Casper RMP (2007), not fully implemented yet.
Note: Due to overlapping resources, numbers are not additive.
Source: BLM 2010a

Rights-of Way

As of January 2003, more than 1,000 ROWs existed in the Casper Field Office, which were issued under a variety of laws over time and administered according to the conditions specified in the ROW grants. In the 20-year period from 1982 through 2002, 632 ROWs were issued on approximately 9,960 acres of public land in the field office. On average, 32 ROWs authorizing use of approximately 15 acres per ROW, or about 500 acres total per year, are authorized by ROWs in the Casper Field Office.

There are six designated communication sites (ROW use areas) in the Casper Field Office. The communication sites are the preferred locations for adjacent placement of future communication site ROW.

There are eight designated ROW corridors. ROW corridors encompass 92,110 acres of federal surface lands. Designated Casper Field Office ROW corridors are identified by the Western Utility Group (WUG) Western Regional Corridor Study (WUG 1992) and the West Wide Energy Corridors Programmatic EIS (BLM 2008c). ROW exclusion areas contain 442,040 acres of public land, and ROW avoidance areas have 539,800 acres.

The majority of road ROW and the majority pipeline ROW are directly related to oil and gas lease development (195 Application for Permission to Drill (APD)-related roads compared to 57 other roads and 176 oil and gas pipeline ROW out of 632 total ROWs in the past 20 years). During the 20-year period from 1982 through 2002, four major ROW applications (1983, 1989, 1996, and 2001) were processed and approved by the Casper Field Office. Most of these ROW used designated corridors. This level of major ROW project activity is expected to continue.

In the past 20 years, only two ROW applications have been rejected due to management plan restrictions. In areas currently managed as ROW exclusion areas, one proposed ROW application was denied because it was located in the Jackson Canyon ACEC. One in the South Bighorns also was denied, but the need was met by other means (e.g., generator power). Approximately 32 new or amendment ROW applications are processed annually within the Casper Field Office.

Renewable Energy

Currently, no wind farms are located on public land in the Casper Field Office. The anticipated demand for future development of solar and biomass energy projects is low. At this time, renewable energy development within the Casper Field Office is limited to isolated wind-energy development on private lands; however, potential for increased wind-energy development exists. There are 1,145,600 acres of outstanding/superb and fair/good/excellent potential areas where wind development is allowed within the Casper Field Office. Renewable wind energy development avoidance and exclusion areas are identified for the protection of specific resource values or uses and comprise 363,578 and 458,006 public surface acres respectively.

Kemmerer Field Office

The Kemmerer Field Office contains approximately 1.5 million acres of private land, 840,000 acres of other federal land (e.g., BOR, United States Fish and Wildlife Service (USFWS), Forest Service, NPS), 155,000 acres of state land, and 1.4 million acres of BLM-administered surface estate.

Leases and Permits

Section 1732(b) of the FLPMA authorizes the BLM to issue leases, permits, and easements for the use, occupancy, and development of public lands. Leases under Sections 302, 303, and 310 of the FLPMA are long-term and typically require a substantial economic investment in the land. The Kemmerer Field Office has not had a demand for land use leases for the past 20 years. Historic lease uses included agricultural development and National Guard use.

Permits are typically issued to resolve trespass cases or to authorize minimum impact activities that involve either little or no land improvement, construction, or investment. Historically, permits within the Kemmerer Field Office area have been requested for rig stack construction associated with oil and gas development or to provide interim authorization for trespass issues.

Recreation and Public Purposes Act Leases and Sales

There are two active R&PP Act leases currently authorized in the Kemmerer Field Office. A lease for the Pine Creek Ski Area near Cokeville, issued to Lincoln County, and a youth camp in Star Valley, issued to The Buford Foundation. R&PP patents have been issued to the Town of Star Valley Ranch for an area for public works/recreation, Wyoming Department of Transportation (WYDOT) for a shooting range, and to Lincoln County for the Lions Club Park. The Kemmerer Field Office has received further inquiries from local communities to develop R&PP leases, but it does not have any applications on file at the present time.

Exchanges

At present, the only recent land exchange within the Kemmerer Field Office is the Rocky Mountain Elk Foundation consolidated land exchange completed in 2003.

Land Sales

Properties identified for disposal are identified in Appendix G of the Kemmerer RMP.

Withdrawals

There are nine existing withdrawals to other federal agencies within the Kemmerer Field Office and eight administered by the BLM in the Kemmerer Field Office (Table 3-16). Other agency withdrawals usually do two things: transfer jurisdiction to the other agency and withdraw the public land from the operation of the public land laws, including mineral location. This plan does not make decisions on revocation of existing withdrawals to other federal agencies. However, should a withdrawal be revoked, suitable lands are returned to public land status for management by the BLM. The returned lands would be managed in the same fashion as adjoining public lands. It is now federal policy to restrict all withdrawals to the minimum time required to serve the public interest, maximize the use of withdrawn lands consistent with their primary purpose, and eliminate all withdrawals that are no longer needed.

Table 3-16. Withdrawal Summary in the Kemmerer Field Office

Withdrawals	Administering Agency	Acres
Green River Reclamation Project[1]	BOR	17,000
Seedskadee Reclamation Project[1]	BOR	3,600
Meeks Cabin Reservoir	BOR	440
Seedskadee Wildlife Refuge[1]	USFWS	1,060
Grey's River Elk Refuge	USFWS	660
Fossil Butte National Monument	NPS	7,420
Flaming Gorge National Recreation Area	Forest Service	120
Recreation, Administration, and Roadside Sites	Forest Service	3,950

Withdrawals	Administering Agency	Acres
Air Navigation Site	WYDOT	120
Public Waterway Reserves	BLM	2,105
Stock Driveways[2]	BLM	480
Coal	BLM	136,100
Phosphate	BLM	44,600
Oil Shale[2]	BLM	420,000
Developed Campgrounds[3]	BLM	3
Areas with Special Status Plant Species[3]	BLM	890
Bridger Antelope Trap (federal section) [3]	BLM	640

[1] Some of these areas may overlap; actual acreage withdrawn is less than the sum of the individual withdrawals. Lands originally withdrawn for the Green River Project, which was never built, are now managed as part of the Seedskadee Project.
[2] These withdrawals have been recommended for full or partial restoration; however, final action has not been taken.
[3] Decisions from Casper RMP (2007), not fully implemented yet.

Rights-of-Way

More than 1,600 ROW exist in the Kemmerer Field Office issued under a variety of laws over time and administered according to the conditions specified in the specific ROW grant. On the average, 100 to 125 new or amendment ROW applications are processed annually. In the 20-year period from 1985 through 2005, the BLM issued approximately 1,150 ROW, or 45,000 acres of public land, in the field office. On average, 60 ROW authorizing use of around 27 acres per ROW, or 1,620 acres total per year, have been authorized in the field office. The majority of the ROW workload in the Kemmerer Field Office results from oil and gas lease development. During the last 20 years, the BLM approved more than 500 APDs within the Kemmerer Field Office. On average, each APD has a corresponding road ROW as well as a pipeline ROW.

During the 20-year period from 1985 through 2005, a large number of major ROW applications were processed and approved in the Kemmerer Field Office. These major ROW include fiber optic lines as well as major pipelines, plant sites, and large powerlines. The fiber optic lines followed I-80 and railroad lines as well as pipeline routes. Most of the large pipeline projects begin or end at the Williams Opal Plant near Opal, Wyoming, and pass through the Muddy Creek Compressor area before heading east toward the Granger Plant, southwest toward Utah and California, or west on the Ignacio-Sumas Pipeline route. There are three major communication sites in the Kemmerer Field Office, each with more than three users. In addition to these three sites, 24 other communication sites occur in the Kemmerer Field Office. On average, the Kemmerer Field Office processes two major ROW applications per year and expects this level of major ROW project activity to continue.

Corridors were designated in the Kemmerer RMP, decision #6008, pages 2-42 (the document was signed on May 24, 2010.) The West Wide Energy Corridor effort (2008) only designated one corridor along I-80. Typically, ROW were established in the least environmentally damaging areas and followed de facto utility and travel systems, but these are not necessarily located in preferred locations. Recommendations for the siting of utility corridors through the field office were made by the Western Utility Group-Western Regional Corridor Study Committee (WUG 1992).

A large portion of the regional demand for public ROW has focused on exporting renewable and nonrenewable energy products through and from sparsely populated western states to areas of high population. Recently, west coast power demands dominated this activity. The upsurge of exploration and development of cleaner burning energy fuels, such as natural gas and coal bed methane, has resulted in the need for more pipelines and higher pipeline capacities.

The demand for ROW and corridors is influenced by specific actions, such as oil and gas leasing, and by economic forces and other external pressures and conditions independent of resource management decisions. For example, the demand for expanded infrastructure capabilities results from state or national needs and requirements. Technological advancements also have brought new demands for public land, largely related to wind and solar energy and telecommunications (e.g., cellular and fiber optic).

Renewable Energy

One geothermal energy development project exists within the Kemmerer Field Office. The Auburn Hot Springs in the Star Valley contains numerous vents emitting carbon dioxide and hydrogen sulfide gas and saline water ranging from 68°F to 140°F. Hot springs locations occur along northwest-trending high angle faults (Hinckley 1977; Hinckley and Breckenridge 1977).

At present, there are two wind farms located within the Kemmerer Field Office administrative boundary. The Mountain Wind Power, LLC operates a wind power project in Uinta County, outside of Fort Bridger, Wyoming. The Uinta County Wind Project, administered by Uinta County Wind Farm, LLC, a subsidiary of FPL Energy Wyoming, LLC, comprises 80 windmills, all located on private and state lands. While no windmills are located on BLM-administered lands, there are 14 miles of associated access roads and powerlines permitted on BLM-administered lands, totaling 136 acres. An additional 27 miles of access roads and powerlines are located on adjoining private and state lands.

Newcastle Field Office

The Newcastle Field Office is comprised of approximately five million acres in Crook, Niobrara, and Weston counties. The BLM administers 291,000 acres of BLM-administered public land surface and 1.4 million acres of federal mineral estate. The public lands in the Newcastle Field Office consist primarily of small, isolated tracts. There are few areas of concentrated public lands.

Land Disposals

Land disposals in the Newcastle Field Office have been completed for both exchanges and sales. There were 13 land sales, totaling 620 acres, from 1985 through 1989. There were three land exchanges, totaling 2,020 acres, from 1985 through 1990.

Local demand for land disposal actions has been low because of things such as high market value, processing timeframes, lower workload priority, and lack of funding for processing small parcels (1 to 120 acres) of public land. If these current practices continue, the demand for disposal actions will not be expected to increase significantly.

Withdrawals

Withdrawals and classifications in the Newcastle Field Office are listed in Table 3-17. Classifications and withdrawals are used to protect resource values or to restrict land use authorizations or mineral entry.

Table 3-17. Withdrawal Summary in the Newcastle Field Office

Withdrawals	Administering Agency	Acres
Withdrawal	BLM	404,700
Coal	BLM	286,680
Power site	BLM	440

Rights-of-Way

All public lands, except some withdrawals and the Whoopup Canyon ACEC, have been available for rights-of-way and temporary use permits. There are 317 rights-of-way and two temporary use permits affecting approximately 4,000 acres of public lands in the Newcastle Field Office.

The majority of rights-of-way are granted for access roads, pipelines, and electrical distribution lines associated with oil and gas wells and production facilities. These rights-of-way may be temporary (six months to two years) for wells that are dry holes or used for an extended period (more than two years) when wells produce oil or gas. The number of rights-of-way granted averages ten to 15 per year and may fluctuate depending on the level of oil and gas activities in the area.

Rights-of-way are located next to existing facilities whenever possible; common use is required whenever feasible. Utility corridors have not been designated because of the scattered public land pattern in the Newcastle area. Only existing utility and transportation rights-of-way have the potential to decrease the need for new rights-of-way routes (e.g., power lines or buried telephone cables that use existing road rights-of-way).

Pinedale Field Office

The Pinedale Field Office administers approximately 922,880 surface acres and 1,199,280 acres of federal mineral estate in Sublette and Lincoln counties. Although the BLM administers the leasing of the mineral estate underlying Forest Service and Bureau of Reclamation (BOR) withdrawn lands, mineral management decisions on these lands may be made by the surface management agency depending upon regulatory authority. On many of the private lands, the mineral estate (either all of the minerals or portions of the minerals) is reserved for the U.S. Government. In these cases, the mineral estate is administered by the BLM, although the private landowners administer the surface estate.

Leases and Permits

There are currently 12 leases within the field office. The leases are for ranching, county and industrial purposes.

Withdrawals

Currently, 147,320 acres are under a coal withdrawal, and 1,190 acres are under a phosphate withdrawal, totaling approximately 148,510 acres. The purpose for which these withdrawals was established is no longer pertinent because these minerals, other than oil shale, are now acquired through a leasing system and are no longer available for location. In addition, commercial quantities of these minerals are not present in the Pinedale Field Office.

Rights-of Way

The Pinedale Field Office currently receives an average of 200 ROW applications per year. The majority of these applications are related to oil and gas activity for pipelines and roads. In the last 15 years (from 1998 to 2013), the Pinedale Field Office approved 5,200 APDs. On average, each APD has a corresponding road ROW, as well as a pipeline ROW. The Pinedale Field Office administers more than 3,800 ROW casefiles. They have been authorized under a variety of different laws over time and administered according to the terms and conditions specified in each specific ROW grant. Areas not identified as avoidance, exclusion, or restriction areas are open to ROWs. Common ROW routes have been designated, where appropriate, to minimize impacts. A major pipeline ROW route containing 5+ pipelines leaves the Pinedale Anticline area, proceeds south to the Jonah Field, and then onto the Opal Plant located outside of Opal, Wyoming.

The Pinedale RMP, dated November 26, 2008, page 2-15 states, "Utility facilities will be restricted to existing routes and designated corridors where practicable, including environmental and socioeconomic considerations. Corridor routes include U.S. Highways 189 and 191 and State Highways 189, 191, 350, 351, 352, 353, and 354. New corridors could be established as oil and gas fields are developed."

Communication sites have been processed on a case-by-case basis. Emphasis is placed on development of already existing, multiple use sites, rather than on establishing new sites. There are currently three major communication sites in the Pinedale Field Office. In addition to the three sites, 42 other communication sites are authorized.

Renewable Energy

The potential in the Pinedale Field Office for wind energy development is low. The Hogsback is the only area that has been classified as having potential for wind energy development. The Hogsback area is classified as a low potential area for wind energy in the document *Assessing the Potential for Renewable Energy on Public Lands* (BLM 2003b). However, there is no existing infrastructure (i.e., power lines) to transport the electricity out of potential wind energy fields.

Rawlins Field Office

The Rawlins Field Office manages approximately 3.5 million acres of public land. The most prominent land resource feature in the Rawlins Field Office is a large swath of land that is divided into a checkerboard pattern of ownership. This swath of land is approximately 40 miles wide and runs from east to west across the entire field office. The checkerboard pattern, with alternating sections of private and public land, runs 20 miles to the south and 20 miles to the north of the Union Pacific (UP) railroad line. Each section in the checkerboard is one mile square. Ownership is divided among private land, BLM-managed public land, and state land.

Within the checkerboard, there are few instances of consolidation of public lands to create larger blocks. East of Medicine Bow, the public land checkerboard becomes less dominant due to lands leaving federal ownership prior to the passage of the FLPMA. Near Cheyenne and east to the Nebraska border, there are almost no public lands of note, save for some isolated parcels. Over the past 20 years, there has been a trend of selling private sections within the checkerboard to be subdivided for sale to people who want to "own a piece of the West" or live away from established cities and towns. As this ownership and land use changes in the future, there is potential for management of the public lands to become much more complicated, with potential conflicts and increased impacts to BLM-administered portions of the checkerboard.

Disposals

Under the disposal criteria of the FLPMA, about 63,460 acres were identified for consideration for disposal during the most recent LUP revision. However, that acreage figure was reduced to 46,230, because parcels that contain legal access across them were eliminated from consideration for disposal.

Withdrawals

Current withdrawals of public land comprise approximately 935,530 acres (Table 3-18) within the Rawlins Field Office (Valentine 2002). In the past, the largest withdrawals have been made for coal, oil shale, and stock driveways, with coal representing the largest withdrawal at over 600,000 acres. BOR lands and public water reserves constitute more than 120,000 acres. The remaining acres that have been withdrawn include wildlife refuges, air navigation sites, power sites, and administrative sites.

Table 3-18. Withdrawal Summary for the Rawlins Field Office

Withdrawals	Administering Agency	Acreage[1]
Stratton Hydrology	BLM	2,700
Administrative Sites	BLM	93
Administrative Sites	Forest Service	720
Reclamation	BOR	73,290
Wildlife Refuges	USFWS	3,920
Air Navigation Sites	FAA	440
Public Water Reserves[2]	BLM	46,100
Oil Shale	BLM	564,760
Coal Withdrawals	BLM	610,170
Power Sites[3]	BLM	5,150
Stock Driveways[3]	BLM	263,260
Total Existing Withdrawals[4, 5]	-	935,530

[1] Because of land surface overlaps, acreage figures for individual areas do not add up to the total acreage value.
[2] The original public water reserve withdrawals included segregation against the location of nonmetalliferous minerals. Withdrawal review reports completed in 1982 revealed that this segregation is unnecessary to protect the water sources. Public Water Reserve 107 also said that all water sources existing on the date of the withdrawal order were protected and withdrawn even if they were not noted on the official records. Therefore, 4,850 acres of previously unrecorded water sources are included. Public water reserves withdrawn under Secretarial Order 107 and other classification orders will be reviewed to determine if they meet the retention requirements of legal opinions of the Solicitor of the Department of the Interior and the agreement made between the State of Wyoming and the Department of Justice (for the Department of the Interior) concerning the adjudication of water rights. Withdrawals will be terminated on public water reserves that do not meet retention requirements.
[3] These withdrawals segregate the land against operation of the public land laws but not the 1872 General Mining Law.
[4] Except for power sites and stock driveways, these withdrawals segregate the land against operation of the public land laws and from mineral location under the 1872 General Mining Law.
[5] These withdrawals are scheduled for future review. Recommendations from the reviews will be arrived at on a case-by-case basis. It is possible that portions of the BOR withdrawals may be revoked, returning the lands to the jurisdiction of the BLM.

Rights-of Way

ROW grants associated with oil and gas development are spread throughout the Rawlins Field Office. The majority of ROW grants within the field office are for oil and gas development. The checkerboard land pattern that resulted from early railroad grants made by the federal government to the Union Pacific Railroad Company crosses the Rock Springs Field Office from east to west (now owned by Anadarko

Company). Nearly every odd-numbered section within 20 miles of each side of the railroad mainline right-of-way is under private ownership. This ownership pattern creates a major impact on resource management. Lands north and south of the checkerboard are predominantly solid blocked public lands. Additionally, there are 34 meteorological tower authorizations covering approximately 636,700 acres of public land, and two wind energy development project proposals under National Environmental Policy Act of 1969 (NEPA) ongoing review/analyses that comprise 124,000 acres and approximately 1,000 wind turbines.

Existing major transportation and utility ROWs provide an adequate net (de facto corridor) for the placement and development of future ROWs. Current ROWs are sufficient to meet the priorities for interstate transmission of telephone communication, electric power, fluid mineral resources, and interstate commercial and private travel. These facilities include—

- The state and interstate highway system (I-80 and I-25), Federal Highway 287, and State Routes 789 and 230
- Major natural gas delivery systems (i.e., Sinclair pipeline system from Sinclair, Wyoming, to Billings, Montana; Colorado Interstate Gas pipeline from Greasewood, Colorado, to Wamsutter, Wyoming; Lost Creek pipeline from Crooks Gap to Wamsutter; Exxon/Frontier Pipeline in the northwest portion of the field office; Pioneer/Conoco pipeline from Croydon, Utah, to Sinclair, Wyoming, along the I-80 corridor; and I-80 and I-25 highway routes utilized for major natural gas pipeline transportation routes)
- Electric transmission lines (i.e., Wyoming Area Power Administration [WAPA] electric power delivery system corridor from Seminoe Reservoir to Cheyenne; the power line located in the northwest portion of the field office, from I-80 heading north-northeast to the field office boundary; the Spence-Bairoil-Jim Bridger 230 kV transmission line; and the electric transmission line running northeast from Cheyenne, Wyoming, to Nebraska)

These corridors, with the exception of the WAPA line, Federal Highway 287, and State Route 789, satisfy future needs for energy transmission and are identified by the 2008 West Wide Energy Corridors Programmatic EIS. Recent requests for new energy transmission facilities initiated primarily by the need to meet the increasing demand for “green energy” in the west and offset spacing requirements between existing and new high voltage lines (up to 500MW capacity lines) will need to be considered where new transmission lines proposed to cross Greater Sage-Grouse key habitat areas exist.

Renewable Energy

Wind energy ROWs on BLM-managed land comprise approximately 12,400 acres, with 35 turbines (as of mid-2010) on public land. The original Wyoming Wind Project, located on Foote Creek Rim above Arlington, had an initial output of more than 85 MW of electricity, enough for about 27,000 average homes. Since development of the original 69-turbine project, several subsequent phases have been constructed, and the project now totals 183 turbines, with a generating capacity of 134.7 MWs. This project has a total of 34 turbines on public land with a capacity between 17 and 34 MW. The Chokecherry/Sierra Madre Wind Project, proposed by the Power Company of Wyoming (PCW), consists of two wind farm sites encompassing 1,000 wind turbines on more than 227,638 acres of mixed public and private land ten miles south of Rawlins, in Carbon County, Wyoming. The Chokecherry/Sierra Madre Record of Decision (ROD) was signed by Secretary of the Interior Ken Salazar on Oct. 9, 2012; site specific NEPA is underway as well as coordination with the USFWS for concurrence of avian plans and a decision on an eagle take permit. These decisions are anticipated by June 2015.

Rock Springs Field Office

The major land owner in the Rock Springs Field Office is the federal government. Major nonfederal landowners are the Union Pacific Resource Corporation, Rock Springs Grazing Association, and the State of Wyoming.

The checkerboard land pattern that resulted from early railroad grants made by the Federal Government to the UP Railroad Company crosses the Rock Springs Field Office from east to west (now owned by Anadarko Company). Nearly every odd-numbered section within 20 miles of each side of the railroad mainline ROW is under private ownership. This ownership pattern creates a major impact on resource management. Lands north and south of the checkerboard are predominantly solid blocked public lands. Two major cities (Green River and Rock Springs), one incorporated town (Superior), and several unincorporated populated areas (Reliance, Eden-Farson, Jamestown-Rio-Vista, Point-of-Rocks, Table Rock, Bitter Creek, Burntfork, Lonetree, and McKinnon) are located within the area.

Sales and Exchanges

Fifteen sales have been held over the past ten years to provide approximately 2,000 acres of land for community and industrial expansion. In addition, two isolated tracts have been sold to adjacent landowners. Five sales currently are planned to settle longstanding trespass situations. Four exchanges have been processed, resulting in the acquisition of 750 acres of land within the Rock Springs Field Office. Two of these exchanges were for the acquisition of lands within the Rock Springs District.

Exchanges are being planned using Land and Water Conservation Funds to acquire state inholdings within wilderness study areas (WSA) and the Fort LaClede Stage Station.

Withdrawals

There are overlapping mineral withdrawals within the area: coal/oil shale (263,970 acres), phosphate/oil shale (480 acres), and phosphate/ coal (160 acres). It is now federal policy to restrict all withdrawals to the minimum time required to serve the public interest, maximize the use of withdrawn lands consistent with their primary purpose, and eliminate all withdrawals that are no longer needed.

Rights-of-Way

The realty program is primarily driven by the local mineral industry, and the majority of ROWs are issued in support of oil and gas development.

Approximately 58,900 acres are under ROW within the Rock Springs Field Office. Of this total, there are 6,200 acres of oil and gas access road and 20,900 acres of pipeline. The remaining acreage is for powerlines, waterlines, telephone cables, highways, and other facilities. An average of 109 realty grants are processed annually. Of these, 33% are oil and gas pipelines and 30% are APD access roads. Corridors were designated by the West Wide Energy Corridors Programmatic EIS (2008). Further corridors are being considered as part of the Rock Springs RMP revision.

Renewable Energy

Renewable energy development is a national priority and will be a major issue in the Rock Springs RMP revision. The Rock Springs Field Office is in the southern wind corridor area of Wyoming. As of January 2014, there are four Type II wind test cases, and no wind development projects in processing.

3.5.2 Forest Service

General Planning Area Description

The National Forest System lands and Realty and Special Use Programs secure and protect the American public's rights, title, value, and interests in its public lands and authorize a variety of uses on those public lands in order to meet the needs of present and future generations. Lands and realty actions ensure that public lands are managed to benefit the public.

Land and realty actions can be divided between landownership adjustments, which include exchange, purchase, donation, and ROW acquisition, and special use authorizations. The objectives of the National Forest System land ownership adjustment program are to achieve the optimum landownership pattern for the protection and management of resource uses, settle land title claims, and provide resource administrators with title information about the use of and resources on the land they administer. Special use permits (SUP) authorize and administer use of public lands by individuals, companies, organized groups, other federal agencies, and state or local levels of government in a manner that protects natural resource values and public health and safety. For example, SUP authorize uses that contribute to the nation's infrastructure for generating and transmitting energy resources such as electric transmission facilities, oil and gas pipelines, hydropower facilities, and wind and solar facilities. They authorize uses for communications, commerce, public health and safety, and homeland security, such as fiber-optic and wireless telecommunications; water development systems; and federal, state, and local highways. The Organic Administration Act of 1897 and the FLPMA authorize the majority of the uses.

Bridger-Teton National Forest

The BTNF Lands Program secures and protects the rights, title, value, and interests of the National Forest and authorizes certain uses on those public lands.

Surface and Mineral Ownership

The BTNF was combined as an administrative unit and is comprised of two National Forests, the Bridger and the Teton Forests. The combined surface ownership acreage of the two forests within the Proclamation Boundary is 3,439,240 acres. The ownership pattern is quite solid, with only a few remaining in-holding opportunities to secure additional lands for inclusion in the Forest through land ownership adjustments (purchase, exchange, donation, and ROW acquisition).

Methods of Public Land Management

Boundary and Title Management

The BTNF contracts with the Regional Office for survey and maintenance of land line boundaries. The Boundary and Title Group maintains records of National Forest land areas, land transactions, land status, and encroachments. The Forest resolves landownership cases related to title claims, trespass, and unauthorized uses to protect public access and achieve effective management of National Forest System lands. The trend is an increase in the number of encroachment cases due to the increased amount of private land development.

Land Ownership Adjustments

The Forest is working with several landowners who are willing sellers and who have a desire to move their lands into public ownership to be managed as a part of the Forest. The Forest has received several donations of land but has no active cases at this time. Exchange of land parcels is another land adjustment tool which has been used by the Forest, but at this time, the Forest has no active exchange proposals. Most purchases of land are contingent upon receipt of LWCF. The Forest competes with 12 other forests in Region 4 for funding. The BTNF has not received LWCF in the last ten years; however, the Forest did receive LWCF funding in 2013 for the proposed purchase of a 37 acre parcel (Poison Creek). Table 3-19 shows the land ownership adjustments for the BTNF.

Table 3-19. Land Ownership Adjustments for the Bridger-Teton National Forest

Land Purchases (desired)	Acres
Poison Creek (2013 funding to complete purchase of this parcel)	37
Gilcrease Foundation (2013 funding to begin purchase of these parcels)	180
Blind Bull Meadows	110
Box Y	240
Hatchet Meadows	28
Trails End Ranch	160
Jorgensen	40
Snake River Ranch	140

Land Exchanges
There are currently no proposed exchange cases within the BTNF.

Acquisitions
The Forest has received LWCF funding and is working with the owner to acquire the Poison Creek property. The Forest expects the case to be closed in 2013.

Rights-of-Way
The BTNF works to improve legal public access of National Forest System lands by securing ROWs for roads and trails. In doing so, the Forest also ensures that market value is obtained for lands or interests in lands to protect the public and private property owners' interests. The Forest also coordinates with other public road agencies, such as county or state, to gain legal public access. The legal interest need not be limited to Forest Service ownership, as long as the public is granted access.

Special Use
Land Use Authorization and Permits
Land Use Authorizations, also known as SUP, is a substantial Forest program, with 811 authorized uses distributed across the Forest. The permits include 31 different use type categories, with multiple subdivisions within a permit type. Both recreation and non-recreation permits are included under this program.

The BTNF authorizes and administers use of National Forest System lands by individuals, private companies, organized groups, other federal agencies, and state or local governments. The proponent's application is reviewed, accepted or rejected, disclosed in NEPA, permitted with terms and conditions, and billed for use of the land. Land Use Authorities are typically issued for 20 years or less. Some permits have been issued as easements or leases, such as access roads or water ditches or communication sites. Permits are administered in the field by forest personnel and, depending on the type of use, are inspected annually.

Permits may be reissued at expiration if the permittee shows a need and only after a review in NEPA. Permittees not interested in renewing their permit are required to remove any improvements at the expiration of the permitting term. Recreation summer homes with a 20-year permit term are renewed at permit expiration. '

The majority of requests for land use occur in the Jackson, Pinedale or Afton areas of the Forest. Fewer numbers are requested in the Big Piney, Black Rock and Kemmerer areas. Following is a listing of some of the use/type categories of Land Use Authorizations (SUP) both for recreation and non-recreation use permitted by the BTNF. Other types of use/permits not included in the table include three ski areas, two pipelines, and 13 power lines. The list is current as of 04/23/2012 (SUDS Database). Table 3-20 displays the use type permits for the BTNF.

Table 3-20. Use Type Permits for the Bridger-Teton National Forest

Use Type Permits	Number
Noncommercial, Privately-Owned Improvements Authorized to Individuals (Isolated cabin, Recreation residence)	135
Concessions Involving Government-Owned Improvements (Concession Campground and Outfitting/Guide)	211
Roads (roads, easements, etc.)	59
Water (ditches, easements, pipelines, dams, springs, wells, etc.)	181
Communication Use (2-way, TV, radio, passive reflector, cell/telephone, etc.)	82

Medicine Bow National Forest

Surface and Mineral Ownership

The planning area includes the MBNF, which is made up of three segregated, distinct areas in the southern portions of Carbon and Albany counties as well as the Laramie Peak portion located diagonally across Converse, Natrona, Albany, and Platte counties. These boundaries and surface land ownership are shown in Map 1-2. Although the BLM administers the leasing of the mineral estate underlying National Forest System lands, mineral management decisions on these lands are made by the surface management agency. On many of the private lands the mineral estate is reserved to the U.S. Government. In these cases, the mineral estate is administered by the BLM, although the private land owners administer the surface estate.

Methods of Public Land Management

Within the MBNF, the lands and realty program objectives are to manage National Forest System land ownership, special uses (e.g., electronic sites, utility corridors), and ROW throughout the Forest.

Land Ownership Adjustments

Most of the opportunities for land ownership adjustments are located on the Douglas Ranger District of the Forest primarily due to the fragmented ownership patterns. In the Laramie and Brush Creek/Hayden Districts, most of the mineral and homesteading inholdings have been subdivided, which limits the exchange opportunities. Over the past ten years, the Forest has used purchases, tripartite and fee exchanges, donations, and Small Tract Act sales to improve land ownership patterns. Table 3-21 shows the land ownership and acres for the MBNF.

Table 3-21. Landownership and Acres for the Medicine Bow National Forest

Land Ownership	Acres
National Forest System	1,096,890
Other non-National Forest System	307,010
Total	1,403,890

Land Exchanges

Land exchanges are either initiated in direct response to public demand or by the Forest Service to improve management of the public lands; a feasibility and NEPA analysis needs to be completed before land exchanges may occur. Land adjustments are based on a willing seller concept. The landowner must be willing to exchange lands at the appraised values. The Forest has identified parcels that meet the criteria to be exchanged out of federal ownership. Other parcels not presently identified will be evaluated under the merits of each proposal. Nonfederal lands are considered for acquisition through exchange of suitable public land, on a case-by-case basis, where the exchange is in the public interest and acquisition of the nonfederal lands will contain higher resource values than the public lands being exchanged. In all land exchanges, keeping the surface and mineral estate intact on both the disposed and acquired lands would benefit the future owners and their use of the land.

Acquisition

Acquisition of lands can be pursued to facilitate various resource management objectives. Acquisitions, including easements, can be completed through exchange, LWCF purchases, donations, the Small Tracts Act, or receipts from the Federal Land Transaction Facilitations Act (FLTFA) sales or exchanges. Lands considered for acquisition would be those lands that meet specific land management criteria identified in the LRMP Amendment. Most funding for purchases comes from the LWCF. LWCF is a competitive national fund but is undependable and an inconsistent source of securing funding for land purchases on the Forest. In the future, most adjustments will be done with land exchanges.

Rights-of-way

Established ROW corridors are preferred routes for transportation and transmission facilities. Rights-of-ways within the Forest are for pipelines, roads, and electrical and telephone lines. To the extent possible, linear ROW, such as roads and pipelines, are routed where impacts would be least disturbing to environmental resources, taking into account the point of origin, point of destination, and purpose and need of the project. Although established ROW corridors exist, this does not preclude the location of transportation and transmission facilities in other areas if environmental analysis indicates that the facilities are compatible with other resource values and objectives. Further identification of rights of way corridors may not necessarily mandate that transportation and transmission facilities be located within these areas if they are not compatible with other resource uses, values, and objectives in and near the ROW or ROW corridors or if the corridors are saturated. Rights-of-way are issued with surface reclamation stipulations and other mitigating measures. Restrictions and mitigating measures may be modified on a case-by-case basis, depending on impacts on resources. Areas closed to mineral leasing, having no surface occupancy (NSO) restriction, or otherwise identified as unsuitable for surface disturbance or occupancy are generally avoidance or exclusion areas for ROWs.

Wind energy development proposals have not been initially analyzed by authorizing meteorological towers (MET); however, wind energy construction projects have not been feasible to construct as of this time on the Forest. The potential in the Forest for wind energy development is high in many locations, but the terrain and lack of accessibility to the grid makes it generally unsuitable for development. None of these permitted areas have been located in core or general Greater Sage-Grouse habitat.

Special Use
Permits and Applications
Special use permits are used to authorize occupancy and use of National Forest System lands by federal, state, and local agencies and private industry and individuals. Several different public laws regulate activities under special use authorizations. The Organic Act of 1897 and the FLPMA authorize the majority of the uses. The Ditch Bill, an amendment to FLPMA, is also used to provide permanent easements for agricultural water systems in use before 1976. Water users had ten years from the passage of the bill to apply for existing structures located on National Forest System lands. Currently, 48 easements have been issued under this law with an estimated ten additional applications are being processed.

Special land use applications continue to increase as more people make use of National Forest System lands. As of April 2012, the MBNF had permitted 631 different activities under special use permits. The more popular permit types include road use permits (116), recreation residences (104), oil and gas pipeline permits (33), and outfitter and guide permits (77). In addition to those just listed, the Forest had also authorized numerous other permit types including, but not limited to, ditches, dams and reservoirs, resorts, and research/education. While no permitted activities are known to occur in core Greater Sage-Grouse habitat, some recreational outfitter and guide permit activity may occur within general Greater Sage-Grouse habitat.

Recreation Residence Permits
There are nine summer home groups with a total of 104 cabins located in the Forest. In many areas, this use has existed since 1925. None of these groups are located in core or general Greater Sage-Grouse habitat.

Permits for the recreation residences are issued for 20 years. The purpose was to encourage use of the National Forests by allowing individuals to build cabins and occupy them for a portion of the year. The program was successful, and several thousand permits were issued nationwide. The current national policy is not to issue any additional recreational residence permits; instead, the protocol is to continue to acknowledge the recreational values, conducted with the proper environmental analysis with existing recreational residence authorizations, and to re-issue permits when the current permit tenure expires. It is the intent of the MBNF to conduct the proper environmental analysis and reissue those correctly issued recreation residence permits when the current permit tenure expires.

Thunder Basin National Grassland

The TBNG Lands Program secures and protects the rights and interests of the National Forest System lands and authorizes certain uses on those lands.

Surface and Mineral Ownership
The TBNG is mixed between National Forest System land, state lands, and private surface. The public lands are used for a wide variety of purposes, and conflicts among competing uses are common. TBNG includes those lands within Campbell, Converse, Niobrara, and Weston counties that are administered by the Douglas Ranger District. The majority of the mineral estate within the planning area is federal estate. On those portions of leasable minerals, the BLM is the lead agency on mineral administration. Approximately 76% of the surface ownership in the planning area is private land, while 9%is State of Wyoming land. Federal land comprises 14% of the assessment area.

Methods of Public Land Management
Several aspects of public land management must be considered in the LRMP amendment process, including land ownership adjustments (e.g., disposals, acquisitions, exchanges, withdrawals, and use and occupancy authorizations), ROW, and permits.

Land Ownership Adjustments

Broad authority for the Forest Service to purchase, exchange, and dispose of lands and interest in lands granted by the various Congressional Acts is found in Title 7, Code of Federal Regulations, section 2.60 (7 CFR 2.60). Additional direction on land transactions can be found in Forest Service Manual (FSM) 5400 and Forest Service Handbooks (FSH) 5409.12, 5409.13, and 5409.17.

The objective of National Forest System land ownership adjustments is to achieve an optimum land ownership pattern for resource uses that would meet current and future needs of the public. The more recent lands transaction history on the TBNG is described in Table 3-22.

Table 3-22. Land Adjustments by Year for the Thunder Basin National Grassland

Year	Federal acres exchanged	Private acres acquired	Private inholdings	Isolated Parcels eliminated	ROWs acquired
1998	4,380	2,960		10	13
1999	3,300	3,130	1	1	
2000	640	640			
2004	4,480	4,320		2	4
2011	720	600		2	1
TOTAL	**13,520**	**11,660**	**1**	**15**	**18**

Source: TBNG Grassland Plan 2001 and updated from Dull Center LEX and Cow Creek LEX

Land Exchanges

The overall Forest Service concept for land exchanges and land purchases is to consolidate federal land ownership into more manageable, larger-sized blocks, and to concurrently reduce the number of scattered, isolated tracts of federal land. Isolated tracts of land are difficult to manage effectively as federal lands for a variety of reasons, such as lack of public access.

Most transactions are conducted on a willing seller basis. However, the federal government is endowed with the power of eminent domain. The Constitution of the United States contains limitations upon this power and requires that the owner whose property is taken receives just compensation. In addition, any taking of private property must be pursuant to and in accordance with legislative authority (FSM 5480.1). In fact, the Forest Service seldom exercises the right of eminent domain and only then when there is a great or significant public need for the land and informed negotiations with the landowner have been unproductive.

Withdrawals

Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. They segregate a portion of public lands and suspend certain operations based upon public land laws, such as mining claims. Currently, the planning unit does not have any withdrawals.

It is now federal policy to restrict all withdrawals to the minimum time required to serve the public interest, maximize the use of withdrawn lands consistent with their primary purpose, and eliminate all withdrawals that are no longer needed.

Rights-of-Way and Easements

Corridors established to contain ROWs are preferred routes for transportation and transmission facilities. ROWs in the planning area are for railroads, pipelines (large and small oil, gas, and water), roads, electrical, fiber-optic, and telephone lines. To the extent possible, linear ROWs, such as roads and pipelines, are routed where impacts would be least disturbing to environmental resources, taking into account the point of origin, point of destination, and purpose and need of the project. Although established corridors exist, this does not preclude the location of transportation and transmission facilities in other areas if environmental analysis indicates that the facilities are compatible with other resource values and objectives. Further identification of corridors may not necessarily mandate that transportation and transmission facilities be located within these areas if they are not compatible with other resource uses, values, and objectives in and near the corridors or if the corridors are saturated. ROWs are issued with surface reclamation stipulations and other mitigating measures. Restrictions and mitigating measures may be modified on a case-by-case basis, depending on impacts on resources. Areas closed to mineral leasing, having a no surface occupancy (NSO) restriction, or otherwise identified as unsuitable for surface disturbance or occupancy are generally avoidance or exclusion areas for ROWs. Most ROWs are issued through the SUP program described below, which sets forth use requirements and conditions of approval (COA). These SUP are not exclusive use permits. Other permanent uses can be issued as an easement. This formal easement is usually only used for certain cases that are considered permanent such as highway easements.

Special Use

Permits

Section 302 of FLPMA states that public lands may be authorized to state and local governments and private citizens to use, occupy, or develop. Uses that may be authorized include agricultural development, residential access (under certain conditions), commercial, advertising, and military training. Permits vary in the length of the authorizations from short-term (1-3 years) to long term uses (10-20 years). The unit does deal with leases that are sold to interested parties for mineral development; those are long-term authorizations that usually require a significant economic investment in the land. Temporary use permits are considered for areas to be used only during construction or for other short-term needs.

Wind energy development projects are administered and permitted through the Special Use program. The TBNG has also been identified as having potential for wind energy development; however, the general area in and around TBNG has been classified low potential in the document *Assessing the Potential for Renewable Energy on Public Lands*. Currently, there has been only one wind energy development project application submitted, but the application is currently incomplete. No further action has been taken on that application to date.

As of April 2012, the TBNG had 121 active SUP. The more popular permit types include oil and gas pipelines (22), Rural Electrification Act (REA) Powerlines (20), WYDOT Easements (34), and FLPMA Easements. In addition to those just listed, the TBNG had also authorized numerous other permit types including, but not limited to stock pile sites, water quality monitoring, Forest Road and Trail Act (FRTA) Easements, and railroad ROWs.

3.6 LANDS WITH WILDERNESS CHARACTERISTICS

3.6.1 Bureau of Land Management

General Planning Area Description

As part of the original FLPMA, Section 603-mandated inventories for lands with wilderness characteristics were conducted. Inventories that were conducted during past RMP revisions and amendment efforts and through other various lands with wilderness characteristics inventory updates also followed this protocol. Inventories for wilderness characteristics that were conducted between 2011 and 2013 reflect the most up-to-date lands with wilderness characteristics baseline information for this planning area. For inventories that were conducted after 2011, findings were documented following guidance in *IM 2011-154, Requirement to Conduct and Maintain Inventory Information for Wilderness Characteristics and to Consider Lands with Wilderness Characteristics in Land Use Plans*, which is now encompassed in BLM Manuals 6310 and 6320. Lands with wilderness characteristics inventories will be updated for any site-specific project NEPA analyses that are conducted in the planning area to determine if a project will have impacts to lands with wilderness characteristics identified through previous or updated inventory efforts. Map 3-33 displays lands with wilderness characteristics for the planning area.

The purpose and need of the National Greater Sage-Grouse planning effort is limited to making land use planning decisions specific to the conservation of Greater Sage-Grouse habitats. No decisions related to the management of lands with wilderness characteristics will be made as part of this planning effort; therefore, management of lands with wilderness characteristics is considered outside the scope of this plan amendment process. Impacts to lands with wilderness characteristics from the alternatives being analyzed for this planning effort are presented in Chapter 4.

Casper Field Office

During the land use planning process for the Casper RMP, the BLM conducted an analysis of the management situation, including consideration of wilderness characteristics. Using existing resource information, the BLM evaluated all public lands in the planning area, including the proposal for the South Fork of the Powder River roadless area northeast of Notches Dome, to determine those features of the land associated with the concept of wilderness (naturalness and opportunities for solitude and primitive and (or) unconfined recreation). Specifically, the BLM identified areas containing little or no man-made physical intrusions and (or) unique resource values. The evaluation determined that these areas did not meet the criterion of naturalness, nor did they contain outstanding opportunities for solitude or primitive and unconfined recreation. Lands with wilderness characteristics inventories and evaluations are ongoing in the Casper Field Office when new information is identified, new lands are acquired, or as part of ongoing NEPA analysis.

Kemmerer Field Office

Lands with wilderness characteristics inventories are ongoing within the Kemmerer Field Office; however, geographic information system (GIS) modeling has revealed that no lands have wilderness characteristics outside of the existing WSA. To date, all of the remaining areas throughout the Kemmerer Field Office planning area were determined not to contain lands with wilderness characteristics due to lack of sufficient size, naturalness, or opportunities for solitude and/or primitive recreation.

Newcastle Field Office

The BLM completed an initial inventory for wilderness characteristics in the Newcastle Field Office in 1978 and 1979. Given the land ownership patterns in the Newcastle Field Office, coupled with historic mineral development across the few large public land parcels, no units meeting the size and naturalness criteria were identified in the Newcastle Field Office.

Per BLM Manual Section 6310, the BLM will determine when it is necessary to update its wilderness characteristics inventory. Under the following circumstances, the BLM will consider whether to update a wilderness characteristics inventory or conduct a wilderness characteristics inventory for the first time:

1. The public or the BLM identifies wilderness characteristics as an issue during the NEPA process.
2. The BLM is undertaking a land use planning process.
3. The BLM has new information concerning resource conditions, including wilderness characteristics information submitted by the public that meets the BLM's minimum standard described in the Wilderness Characteristics Inventory Process section of this policy.
4. A project that may impact wilderness characteristics is undergoing NEPA analysis.
5. The BLM acquires additional lands.

The BLM has not internally identified any parcels potentially meeting the 5,000 acre roadless requirement nor have any citizen's groups nominated parcels that may contain wilderness characteristics. Thus, no inventory forms have been produced to date.

Pinedale Field Office

Within the Pinedale Field Office, a lands with wilderness characteristics inventory has been conducted over the last two years and has determined the following units contain wilderness characteristics: Mesa Springs (WYD01-6300-101, 2012, 8,790 acres); Alkali Draw (WYD01-6300-203, 2013, 9,680 acres); Alkali Creek (WYD01-6300-202, 2013, 43,810 acres); Milison Draw (WYD01-6300-204, 2013, 27,860 acres); Miller Creek (WYD01-6300-400, 2011, 6,750 acres); Perkins Creek (WYD01-6300-406, 2011, 18,520 acres); Fort Hill (WYD01-6300-420, 2011, 13,420 acres); and Dry Hollow (WYD01-6300-401, 2012, 6,850). Remaining areas throughout the Pinedale Field Office either have not yet been assessed, or were determined not to contain lands with wilderness characteristics due to lack of sufficient size, naturalness, or opportunities for solitude and/or primitive recreation.

Rawlins Field Office

During a 2012 inventory of the Rawlins Field Office, ten units were determined to have wilderness characteristics: Pedro Mountain (11,380 acres), Rotten Springs (6,110 acres), Bates Hole (5,020 acres), Ferris Mountain West (5,260 acres), Adobe Town Fringe Area E (13,490 acres), Adobe Town Fringe Area F (4,670 acres) North Cow Creek (10,070 acres), Adobe Town Fringe Area C (10,570 acres), Adobe Town Fringe Area D (7,530 acres) and portions of Rawlins Field Office-H (38,280 acres). All of the remaining areas throughout the Rawlins Field Office planning area were determined not to contain lands with wilderness characteristics due to lack of sufficient size, naturalness, or opportunities for solitude and/or primitive recreation. Management of these areas will be determined in the RMP amendments currently in process.

Rock Springs Field Office

The Field Office has identified nine areas that meet the lands with wilderness characteristics evaluation criteria. Management of these areas will be determined in the RMP revision currently in process.

The Rock Springs Field Office has identified nine areas that meet the lands with wilderness characteristics evaluation criteria. Management of these areas is being evaluated as part of the ongoing revision to the Green River RMP and is outside the scope of this amendment. During a 2011 inventory of the Rock Springs Field Office, nine inventory units were determined to have wilderness characteristics: Bear Creek Trail

(WY040-2011-088, 6,350 acres); Bush Creek (WY040-2011-074, 8,240 acres); Mowing Machine Draw (WY040-2011-069, 8,110 acres); Hay Ditch (WY040-2011-062, 6,420 acres); North Pacific Creek (WY040-2011-059, 8,010 acres); Laney Rim (WY040-2011-029, 5,090 acres); Teepee Mountain (WY040-2011-021, 10,720 acres); Little Mountain Slopes (WY040-2011-019, 10,670 acres); and Dry Hollow Creek (WY040-2011-014, 6,070 acres). All of the remaining areas throughout the Rock Springs Field Office planning area were determined to not contain lands with wilderness characteristics due to lack of sufficient size, naturalness, or opportunities for solitude and/or primitive recreation.

3.7 LIVESTOCK GRAZING

3.7.1 Bureau of Land Management

General Planning Area Description

The livestock grazing on BLM-managed public lands within the field office are primarily cattle, but also include sheep, goats, bison, and horses. There are over 1,500 allotments for the region with over 1.2 million animal unit months (AUM) of livestock forage distributed throughout the six field offices. An AUM is the amount of forage for the sustenance for one cow/calf unit or its equivalent for one month. Carrying capacities for livestock average about six acres per AUM.

Stock driveways (SDW) are authorized under the Stock Raising Homestead Act of 1916 created by secretarial order for the specific purpose of creating lanes and reserving water sources for trailing livestock. In general, SDWs are fenced lanes; however, in some areas, they are unfenced passages through adjacent allotments. Use of the SDWs is an important part of livestock operations, especially for ranchers trailing livestock between summer and winter ranges. The BLM annually issues trailing permits and supervises the use of these areas.

The Taylor Grazing Act of 1934 established grazing districts and initial livestock stocking rates on public land. Between the 1940's and 1960's the BLM in southwest Wyoming conducted vegetation surveys to determine the amount of forage available for livestock grazing. From these surveys, grazing capacity was adjudicated for the allotments in the area. In most cases this meant a reduction in the number of livestock allowed to utilize public land. This was done in an effort to make livestock grazing sustainable and to meet a multiple-use sustained-yield objective.

Grazing use on public lands is also administered through agreements between the various field offices. In addition, multiple allotments are being operated under allotment management plans (AMP), coordinated resource management plans (CRMP), or management agreements. These plans typically prescribe more intensive grazing systems in an effort to improve or maintain healthy range conditions on the allotment.

The BLM manages domestic livestock in accordance with the Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management (August 12, 1997). The standards are used to enhance sustainable livestock grazing and wildlife habitat while protecting watersheds and riparian ecosystems. Monitoring of rangelands is conducted primarily by the field office Rangeland Management staff, which generally documents use levels, conditions, and trends in rangeland attributes in coordination with current processes such as the Wyoming Standards for Rangeland Health and grazing permit renewals. Allotment specific, appropriate actions are being implemented to improve rangeland conditions in areas not meeting standards.

A grazing permit is issued for use of lands located within a grazing district. A grazing lease is issued for use of lands located outside a grazing district.

Livestock use typically varies due to forage conditions, market prices, and changes in livestock operations. Because most of these operations have existed for three to four generations, adjusting to varying climate conditions, including drought, is a normal aspect of annual grazing management. In addition to modifying livestock numbers and use, other practices include locating additional pasture, weaning and/or shipping early, and increasing the use of irrigated, private lands. Livestock grazing management strategies fall generally into the following seven categories:

- **Permit Long.** Grazing occurs for part of or for the duration of the permitted time, often lasting from late spring through fall.
- **Yearlong Permit.** Grazing is permitted for any time during the year.
- **Rotation.** Grazing is rotated during the growing season between pastures in the allotment to provide partial growing season rest before use or recovery time after use.
- **Deferred Rotation.** Grazing is rotated between pastures or allotments to provide full growing season rest every second or third year.
- **Dormant Season.** Grazing occurs after seed-set by grasses; this includes late summer, fall, and/or winter grazing.
- **Split Season.** Grazing occurs during two separate time periods, by removing livestock from the allotment and returning them later in the year to provide partial growing season rest.
- **Rest Rotation.** Grazing is rotated between pastures, with each pasture receiving no grazing use for an entire year (usually every third or fourth year).

Several other recent factors that influence livestock numbers and management have been high numbers of wild horses that exceeded appropriate management levels (AML), large increases in elk populations across Wyoming and neighboring states, and expansion of invasive poisonous plants due to surface disturbance activities.

Beginning in 1981, the BLM established three allotment categories to identify areas where management was potentially needed as well as to prioritize workloads and the use of range improvement dollars. Grazing allotments are classified as: Improve Existing Resource Conditions (I); Maintain Existing Resource Conditions (M); and Custodial Management (C). To improve rangeland quality of these lands, rangeland best management practices (BMP) have been implemented on livestock grazing allotments since the 1980s and seek to improve rangeland quality. Examples of range improvement projects include prescribed burning, water developments (wells, springs, reservoirs, and pipelines), fencing and cattle guards, adjustments to season-of-use, and vegetation manipulation projects (prescribed burns, herbicide sprays, and mechanical treatments). Recurrent monitoring is conducted on grazing allotments to determine whether objectives are being met and if adjustments in management strategies need to be made. Some of the established monitoring methods include: greenline transects, belt transects, proper functioning condition assessments, upland and riparian utilization monitoring, photo plots, and ocular observations.

Over the past half century, rangeland conditions have improved largely due to advancements in grazing management practices; development of range improvement projects; and, in some cases, the reduction of livestock numbers or change in breed of livestock permitted to graze an allotment. To various degrees, improvements in range condition generally are anticipated to continue based on vegetation treatment and range improvement projects as well as the development of guidelines for those areas determined not to meet rangeland health standards.

Casper Field Office

The Casper Field Office manages 557 livestock grazing allotments covering approximately 1,269,112 acres (Map 3-2). The average grazing allotment is 2,278 acres. The Casper Field Office administers 480 grazing leases, which provides approximately 183,377 AUMs of livestock forage. Actual AUM use in the field office is considered to correspond with authorized AUM use.

Of the 480 grazing leases, 72% authorize cattle only; 9% authorize both cattle and sheep; 10% cattle and horses, 3% authorize cattle, sheep, and horses; 1% authorizes sheep only; less than 1% authorizes horses only; and less than 1% authorizes bison and goats. The use of horses for ranch operations is common and is authorized on 9% of the leases. At this time, approximately 6,020 acres of BLM-administered public lands are not available for livestock grazing.

The number of AUMs authorized by the Casper Field Office has declined slightly since 1985. The decline is attributed in part to changes in ownership from patenting of mining claims, closing areas to grazing, and allotment boundary adjustments made with adjoining BLM offices. Suspension of AUMs has also arisen from rangeland suitability and land-tenure adjustments. Furthermore, population growth is expected to continue around existing cities, especially Casper, Wyoming, which could result in local decreases in AUMs.

Historically, more than 200 miles of SDWs existed in the Casper Field Office. Today, there are two major SDW systems—the 33-Mile SDW and the Bates Hole SDW—that comprise approximately 44,070 acres and sustain 5,797 AUMs. Each year, trailing permits are issued by the Casper Field Office and the agency supervises the use of the SDWs. Segments of the SDWs are seldom used, because they have been incorporated into adjacent grazing allotments. Annual use of the SDWs has remained the same.

Management Categories

Of the 480 grazing leases in the field office, approximately 72% are authorized for yearlong use. This approach to usage is a reflection of the intermingled land pattern that exists across the Casper Field Office as well as the small percentage of public land found in the majority of livestock grazing allotments. The majority of participating ranch operations use pastures containing public land throughout the year. However, this is not indicative of year-round use of an individual pasture containing public lands.

Of the current 557 grazing allotments, the Casper Field Office contains 52 livestock grazing allotments categorized as I lands. Sixty-eight allotments are classified as M, and 437 allotments are classified as C. The I and M category allotments contain approximately 76% of the total acreage held within the Casper Field Office. In the past, allotments in the I category generally received top priority for range development projects. However, recent emphasis has been placed on evaluating rangeland health from a watershed basis. Management actions implemented on M or C category allotments have been taken to resolve problems within a watershed. Comparison of range condition data from surveys completed in the 1950s and 1960s and surveys completed in the 1980s and 1990s indicate that the condition of public lands in the field office has improved due to improved livestock management both by the BLM and grazing lessees.

Fourteen livestock grazing allotments, totaling 182,020 acres, are currently operated under AMPs, CRMPs, or management agreements within the Casper Field Office. Current management plans strive to maintain and improve rangeland health on all grazing leases, emphasizing I and M category allotments.

Rangeland Condition

Approximately 10% of public lands in the field office are assessed annually for rangeland health. By the end of FY 2004, 50 livestock grazing allotments, totaling 477,820 acres, had been evaluated for rangeland health. Twenty-six allotments (280,240 acres) were found to meet rangeland health standards. The remaining 24 allotments (197,590 acres) did not meet one or more standards. For two of the 24 deficient grazing allotments not meeting standards, livestock were determined to not be the primary factor causing degradation of rangeland health. Conversely, for the remaining 22 deficient livestock grazing allotments, past or present livestock use was determined to be a contributing factor of poor rangeland health. Other than past and present livestock use, factors contributing to rangeland health degradation include county roads channeling runoff into stream channels, production water from oil and gas wells increasing bank sloughing and sediment loading, and heavy browse use by wildlife on winter ranges.

Range Improvement Projects

Rangeland improvement projects have and will continue to be implemented on lands within the Casper Field Office. Between 1985 and 2004, approximately 430 acres per year were treated with prescribed burns. Furthermore, an estimated 1,950 acres per year were burned by wildfire between 1985 and 2004. Prescribed burns and wildfires in the allotment improved forage quantity and quality for both livestock and wildlife and helped to improve the distribution of livestock. Additional prescribed burns and other vegetative treatments are being proposed within the allotment.

Other range improvement projects conducted in the Casper Field Office consist primarily of improving fences, reservoirs, springs, and water wells and applying vegetative treatments. On average, the Casper Field Office has completed five to six new range improvement projects each year over the last five years to meet specific management goals and objectives.

Kemmerer Field Office

The Kemmerer Field Office administers grazing on 221 allotments ranging in size from 40 acres to 467,060 acres and accounts for a total of 156,152 AUMs across all allotments (Map 3-3). These allotments occur within the former Pioneer Trails and Star Valley Planning Units and include allotments that cross the Wyoming state line into Utah and Idaho. A total of 301 permittees and lessees use these allotments. Livestock that graze within land administered by the Kemmerer Field Office consists of cattle, sheep, and horses, of which cattle account for 96,806 AUMs (62%), sheep account for 58,825 AUMs (38%), and horses account for 521 AUMs (less than 1%). Cattle graze on 186 allotments, sheep graze on 74 allotments, and 42 allotments are grazed by both cattle and sheep. Ten of these allotments are also utilized by horses.

Management Categories

Livestock grazing is managed primarily in designated livestock allotments. Legislative acts, federal policies, and other policies specify the Kemmerer Field Office's authorization and management of livestock grazing on public lands. In 2008, additional guidance was given by the BLM Washington Office (IM WO 2009-018) on re-categorizing allotments, taking into consideration current or expected land health status as well as potential conflicts with sage-grouse habitat or other critical wildlife habitats. This new guidance also shifted the purpose of allotment categories from prioritizing funds for range improvements to prioritizing BLM staff workloads for monitoring and grazing permit renewal.

The BLM Kemmerer Field Office is currently updating all of its allotment categories based on this guidance. At the time a Standards for Healthy Rangelands assessment is completed for an allotment, the allotment category is reassessed for appropriateness and changes are made as necessary. A summary of current allotment categorization is given in Table 3-23.

Table 3-23. Kemmerer Field Office Allotment Categorizations

Category	Number of Allotments
Improve (I)	39
Maintain (M)	116
Custodial (C)	66

Rangeland Condition

Improved soil and vegetative conditions benefitting livestock, wildlife, and riparian resources have resulted from successful implementation of rangeland management plans. *The Standards for Healthy Rangelands for Wyoming* provides the standards for the basis of assessing and monitoring rangeland conditions and trends within the Kemmerer Field Office. Rangeland health assessments have been performed on 146 of the Kemmerer grazing allotments. Only 36 allotments did not meet one or more standards of the assessment; reasons for not meeting standards included reasons other than livestock grazing. Table 3-24 summarizes the findings of these Standards for Healthy Rangelands assessments.

Table 3-24. Standards for Healthy Rangelands Assessments

Rating	Number of Allotments	Percent
Meeting Standards	110	50%
Not Meeting Standards	31	14%
Not Meeting Standards (for reasons other than livestock grazing)	5	2%
Assessments Not Yet Completed	75	34%

When issues are identified as a result of a Standards for Healthy Rangelands assessment, trend monitoring data, or other pertinent information, actions are taken to fix the problems and bring the allotment into conformance with the rangeland health standards. All such actions are site specific and may include: water development, reduced stocking rate, change in season-of-use, implementation of rotational grazing strategy, or other changes to grazing permit terms and conditions. Allotment-specific appropriate actions are being implemented to improve rangeland conditions in areas not meeting standards.

Currently, there are 19 allotments that have established AMPs. There are two allotments that have CRMPs. These plans typically prescribe more intensive grazing systems in an effort to improve or maintain healthy range conditions on the allotment.

Range Improvement Projects

Range improvement projects in the Kemmerer Field Office address challenges facing livestock grazing and balancing multiple resource uses. Existing challenges in the field office include controlling livestock access and seasonal use, limiting soil erosion, maintaining diverse vegetation and sufficient forage, providing sufficient water, managing the relatively small and isolated parcels of public lands, managing the distribution of livestock, managing potential conflicts with recreation and oil and gas development, and enforcing unauthorized use. Specific methods to address these issues are wildlife compatible fences, coordination with ranchers, the public and interested stakeholders, prevention of the spread of noxious weed species, use of livestock grazing management strategies to improve I category allotments and address long-term monitoring needs, and assessment of rangeland health standards. Other examples of range improvement projects include: grazing rest rotation, deferred grazing rotation, changes in season-of use, and managing placement of mineral blocks to protect riparian habitat and cultural resources.

Newcastle Field Office

The Newcastle Field Office authorizes livestock grazing on approximately 287,000 acres of public land within 367 grazing allotments within Wyoming (Map 3-4). In addition, grazing on approximately 4,000 public acres within the field office boundaries are administered by adjacent field offices. For grazing lease holders, BLM–administered land is an integral part of individual livestock operations, but it is a moderate or small percentage of the total operation. Seventy-seven (21%) of the grazing allotments include more than 1,000 public acres, and no allotments include 10,000 or more public acres.

Rangeland Condition

The majority of livestock operations are cow/calf, yearlings, or a combination of both. Of the 48,095 AUMs authorized for annual harvest, 92% are cattle use, 6% are sheep use, and the remaining 2% are bison and horse use. The majority of grazing use on public land occurs between June and October. Grazing use also occurs in spring and/or winter on some allotments. Carrying capacity for livestock averages six acres per AUM. About 55% of the planning area has been evaluated for compliance with the Wyoming Standards for Rangeland Health. Livestock were determined to be a causal factor in failure to meet one or more standards on 6,380 public acres.

Pinedale Field Office

The Pinedale Field Office consists of 219 livestock grazing allotments (Map 3-5). Of the 219 allotments, 197 are exclusively available to cattle operations and the remaining 16 provide access to only horses, or both horses and cattle. In total, cattle are allotted 97% of the available 107,536 AUMs permitted by the Pinedale Field Office. Over recent years, only approximately 70% of the permitted AUMs have been authorized annually for use due to drought and a diminished livestock population throughout the field office (BLM 2007b).

Livestock grazing in the Pinedale Field Office are trailed across public land and highway ROWs to reach allotments managed by the BLM. Livestock trailing activities are authorized on a case-by-case basis. There are two SDWs located in the Pinedale Field Office: the Cora SDW and the Silver Creek SDW. The Cora SDW extends from the Cora Y west of Pinedale to the National Forest System lands on the Upper Green River area north of Pinedale. The Cora SDW is used during a two week period in June when roughly 7,000 cattle are moved to summer pasture and during a one month period in the fall when the cattle are driven back to the home ranches. Essential components of the Cora SDW are Trapper's Point and the holding pasture at the Cora Y. The Silver Creek SDW is within the Cottonwood common allotment and provides a trail from the public lands to the Forest Service allotments located to the east (BLM 2007b).

Management Categories

Twenty-six Pinedale grazing allotments are designated as C category, 147 allotments are designated as M category, and 40 allotments are designated as I category. Most of the C category allotments are small parcels intermingled with larger tracts of private and/or state land and do not require much administrative oversight. M category allotments are allotments in good condition or allotments containing very few sensitive resources. I category allotments either exhibit unsatisfactory vegetation conditions or contain significant sensitive resources that justify investments of time and money. I allotments require the most resources for monitoring and range improvement development (BLM 1997a; BLM 2007b).

Season of Use

The majority of the Pinedale livestock grazing allotments are considered lower-elevation allotments. Livestock turnout in the lower-elevation allotments occurs between May 1 and June 1, the peak growth period for most forage vegetation. Four to six weeks after turnout, the livestock grazing on the lower-elevation allotments are relocated to higher-elevation pastures in other BLM allotments, on private lands, or most commonly, on Forest Service-administered allotments. Seventy-three of the Pinedale allotments are small and scattered federal acreage, fenced in with larger tracts of private and state land. Annual grazing authorizations for these allotments contain a stipulation stating, "Seasons of use and livestock numbers are not restricted as long as over-use of forage and range deterioration do not occur." Several Pinedale grazing allotments are located at higher elevations and do not permit grazing until June or early July. Generally, the season of use for the higher elevation allotments is two to three months. However, two higher elevation allotments (each containing approximately 100,000 acres) permit livestock grazing for a 5-month season (BLM 2007b).

Weather and range readiness can delay the start of Forest Service allotment turnout dates, causing extended periods of grazing on BLM-administered allotments as livestock wait to be admitted to Forest allotments. The Forest Service and BLM cooperate in determining range readiness for the allotments and coordinate movement of livestock from BLM allotments to Forest Service allotments. During some years, Pinedale allotments are not ready for livestock grazing on the traditional turnout dates. If this occurs, permit holders are allowed to defer grazing until the Pinedale range is ready.

In addition to the 219 Pinedale livestock grazing allotments, there are 21,000 acres of unallocated parcels. These parcels range in size from less than five acres to as much as 1,200 acres. Most of these unallocated parcels are located in small corners of public lands and are fenced into private hay meadows.

Rangeland Condition

The most recent ecological condition inventory in the Pinedale Field Office occurred in the mid-1980s. Results of the inventory indicated 5,610 acres were classified as potential natural community, 479,170 acres were late seral stage, 420,570 acres were mid-seral stage, 16,750 acres were in early seral stage, and 9,530 acres were unclassified. As a whole, vegetation communities in the Pinedale Field Office are stable. Approximately 65% of the field office has been evaluated for compliance with the Wyoming Standards for Rangeland Health (BLM 1997a). Based on the compliance assessment, 122 livestock grazing allotments meet the Wyoming standards. Twenty allotments (283,510 acres) do not meet one or more standards as a result of grazing, and 72 allotments have not been assessed.

In allotments not meeting the standards due at least in part to livestock grazing (Appendix G) (283,510 acres), the general causes are riparian condition and alterations in the functional/structural groups on upland sites. Poor riparian condition typically results from excessive bank trampling, lack of sufficient riparian vegetation to stabilize banks, and lack of sufficient age classes of riparian shrubs. Alteration of functional/structural groups on upland sites is characterized by overabundance of sagebrush as compared to ecological site descriptions, with lower than expected production of mid-stature perennial bunchgrasses, and sometimes a shift in the grass community to rhizomatous grasses.

Range Improvement Projects

Currently the Pinedale Field Office has 492 water developments. Forty-five are spring developments, 113 are well developments, 308 are reservoir developments, and 26 are other types of water developments. Forty-three new water developments have been constructed since 1988. The condition of many water improvements is currently unknown. Spring developments pipe water away from a spring to water tanks or troughs, thereby protecting the spring from animal trampling bank erosion. Many spring developments are also fenced to further protect the spring's production and water quality. Well developments are drilled in areas where other water sources cannot be feasibly developed. Reservoir developments are constructed using native soils to form a dam or pit across drainage ways. Reservoirs are designed to catch seasonal or storm runoff and provide livestock with drinking water after the ephemeral streams have dried (BLM 2007b).

The majority of the Pinedale livestock grazing allotment boundaries are fenced. Major highways in this area have also been fenced. New fences are designed to reduce impacts on big game animals and comply with BLM Manual H-1741-1. Since 1988, 17 new fences have been constructed, including pasture division fences designed to improve livestock management and distribution and reconstruction of existing allotment boundary fences (BLM 2007b).

Vegetation treatments are another effective range management practice used on livestock grazing allotments. Prescribed burns are commonly designed to mimic natural wildfires and break up shrub age class and increase herbaceous forage production. Another form of vegetation treatment involves herbicide spraying. Since 1988, 8,700 acres have been prescribed burned, 3,660 acres have had herbicide applied, and 4,440 acres have been treated mechanically (BLM 2007b).

Rawlins Field Office

The Rawlins Field Office consists of 582 livestock grazing allotments (Map 3-6). Of the 600 allotments, 87% are used by cattle alone, 9% are shared by cattle and sheep, and less than 2% are used by sheep alone. In addition, five allotments are shared by cattle and domestic horses. One allotment is shared by cattle and bison. Four allotments are used by horses alone. Lastly, one allotment is used by goats alone. There are a small number of allotments available to working horses used in ranching operations. Nine allotments are not permitted for use by livestock and are instead managed as wildlife management units; grazing use is authorized on a temporary, non-renewable basis in conjunction with Wyoming Game and Fish Department (WGFD) (BLM 2007a). Allotments range in size from 20 acres to 291,950 acres of public land. Of the total 582 allotments, 222 allotments contain 640 acres or less, 160 allotments contain between 640 and 2,500 acres, 115 allotments contain between 2,500 and 10,000 acres, and 80 allotments contain more than 10,000 acres.

The public and other federal lands on which the BLM administers grazing provide 469,575 AUMs for grazing use. The number of AUMs continues to fluctuate for various reasons. Reductions occur as a result of such actions as sheep-to-cattle conversions or following changes in season or duration of use. Over the past 25 years, there have also been increases in available AUMs, with an additional 4,225 AUMs becoming available due to improvements in management and forage availability. The percentage of actual use by cattle and sheep on public lands between 2000 to 2009 averaged 285,000 AUMs, with a range of 250,117 to 377,479 AUMs. The percentage of cattle use, in AUMs, has increased from 92% in 2000 to 94% in 2009, while sheep use has dropped from 7% to 5% over the same time period.

Several other recent factors that have influenced livestock numbers and management include drought, high numbers of wild horses that exceed appropriate management levels, large increases in elk populations across Wyoming and neighboring states, and expansion of invasive poisonous plants due to surface disturbance activities relating to oil and gas development. Drought occurred in the North Platte River valley in 2001, in the Adobe Town Wild Horse herd management area (HMA) in 2002, and region-wide in 2006, particularly at lower elevations. Voluntary nonuse of livestock AUMs in the Adobe Town Wild Horse HMA from 2002 through 2009 averaged 80% of the livestock permitted use (approximately 26,000 AUMs) in allotments within the HMA boundary. Additional loss of AUMs occurred in allotments outside the HMA as wild horses moved to find forage and water. Expansion of poisonous invasive species like halogeton may also lead to higher levels of nonuse, particularly by sheep and, to a lesser extent, by cattle (BLM 2007a).

Management Categories

Within the Rawlins Field Office, 56% of allotments are used on a permit-long basis, 20% are managed with a deferred rotation system, and 16% are managed with a rotation system. Four percent of allotments are permitted for yearlong use and often are used as utility pastures when needed. Dormant season, split season, and rest rotation management systems make up the balance of the allotments, in order by their percentage of use.

The largest 80 allotments comprise 76% of the livestock grazing lands contained within the Rawlins Field Office. Of the 80 largest allotments, 75% have grazing systems or adequate management for the resources present. These allotments have received the majority of attention since 1983 under the previous national direction and RMP ranking of allotments into I (improve), M (maintain), and C (custodial) categories.

Rangeland Condition

All allotments were evaluated for meeting the Standards for Healthy Rangelands on a watershed basis between 2001 and 2008, with 88 allotments (15%) failing to meet one or more standards due to livestock management. This was primarily related to wetland/riparian habitat health, resulting in either fencing of isolated seeps and springs or adjustments to livestock management in terms of season or duration of use. Standards have also not been met due to wild horse use, wildlife use, oil and gas development, weed expansion, gradient adjustments, and plant succession/community decadence. Elk and wild horses often share the same winter range and must be factored into livestock grazing management and range condition.

Range Improvement Projects

Improvement projects and grazing systems, which have become known as BMPs have been under way for the past 40 to 50 years. These efforts have occurred singly or cooperatively among livestock permittees, the University of Wyoming Extension Service, and state and federal agencies. The efforts have been further improved over the past ten years through education workshops and seminars, federal and nonprofit cost-sharing opportunities, and more active participation by local conservation districts in all aspects of this process. The goal of such efforts is to enable sustained livestock use without damaging the vegetation and watershed resource, while supporting the presence of healthy wildlife, fish, and wild horse populations.

Water improvements along Sage Creek within the Pine Grove allotment have included intensive water quality monitoring and improvements to reduce siltation. Portions of Sage Creek, Loco Creek, McKinney Creek, Littlefield Creek, and Muddy Creek have been removed from the Wyoming 303(d) list of impaired streams due to improved grazing management.

Several additional spring developments are planned to protect important riparian habitat and to improve livestock distribution. These include enhancements to bank cover, increased stream width-to-depth ratio, improved herbaceous species composition, riparian shrub regeneration, decreased upland shrub density and diversified age structure, and improved waterfowl habitat. Additionally, more than 82 wells and 30 miles of pipelines, 18 spring developments, and 11 reservoirs have been constructed, providing more than 220 additional acres for wildlife habitat and livestock grazing.

Fencing projects (more than 80 miles) have resulted in the creation of additional pastures within the grazing allotment areas. Fencing of spring and riparian zones has also resulted in increased water flow and improved water quality. Long-term vegetation treatment programs, including prescribed burning, are used to treat pest species and to improve range health.

Rock Springs Field Office

The Rock Springs Field Office contains 79 livestock grazing allotments covering approximately 3.5 million acres and authorizes 318,641 AUMs per year (Map 3-7). However, in recent years, actual use has been less than 200,000 AUMs. Annual fluctuations in the authorized AUMs are the result of user demands, climatic conditions, and/or the collection of monitoring information. A portion of the grazing allotments contain lands unsuitable for livestock grazing, and approximately 15,110 acres throughout the Rock Springs Field Office are unallocated lands.

Livestock grazing on specific allotments is authorized during different seasons. The grazing seasons vary with elevation and geographical change, resource needs, and user preference. The higher elevation allotments are generally grazed during summer and fall. The lower elevation areas may be grazed during any season but are generally used in the fall, winter, and spring. Most of the allotments are operating under grazing strategies incorporating rest, seasonal rotations, deferment, and prescribed use levels that provide for adequate plant recovery time to enhance rangeland health.

Management Categories

All of the allotments in the field office have been designated as M, I, or C category lands. The categories broadly define management objectives and future management requirements. Multiple-use management prescriptions can be developed for these allotments, and priorities can be established for distribution of available funds and personnel. AMPs have been developed for 33 of the grazing allotments, and additional plans are being developed for eight allotments. The AMPs ensure the proper placement of rangeland improvements, distribution of livestock, type and class of livestock, season of use, suitable grazing systems, plant and animal requirements, and vegetative land treatments.

Rangeland Condition

Rangeland monitoring information has been analyzed for all of the allotments in the Rock Springs Field Office. The analysis has been performed to identify specific critical issues that currently exist or have the potential to exist within each allotment. The critical issues affect forage availability, condition and utilization of the allotment, and potential livestock management conflicts.

In recent years, the area has experienced drought conditions. This has resulted in less forage available for livestock use and the need for livestock operators to take voluntary nonuse. During drought years, the livestock operators and the BLM have worked closely to tailor the adjustments in livestock use to meet the needs of the land and the ranch operation. When rangelands are not meeting resource objectives, changes in grazing management are implemented.

Range Improvement Projects

Rangeland improvement projects and grazing systems, which have become known as BMPs, have been used in rangeland management since the early 1970's. These efforts have occurred independently or cooperatively among livestock lessees, the University of Wyoming Extension Service, state and federal agencies, conservation districts, and interested publics. These efforts have been further improved in recent years through education workshops and seminars and federal and private nonprofit cost-sharing programs. The goal is to allow sustainable livestock use to continue on public lands without damaging the vegetation resource and maintain healthy watersheds and wildlife populations.

A number of range improvement projects have been constructed both for the enhancement and protection of watershed and wildlife values and for the management of domestic livestock grazing. Many of the recent range improvement projects have focused on plant composition improvement along riparian areas. Additionally, water developments (piping, reservoirs, wells, etc.), vegetative manipulations (prescribed burns, herbicide applications), and miles of fence line have been implemented throughout grazing allotments contained in the Rock Springs Field Office.

3.7.2 Forest Service

General Planning Area Description

The Forest Service has been managing rangelands for over 100 years and has a long history of partnerships with livestock producers who rely upon National Forest System lands. Livestock grazing on National Forests reserved from the public domain is administered under a number of statutes, including the Granger-Thye Act of 1950, the Multiple-Use Sustained-Yield Act of 1960, the Forest and Rangeland Renewable Resources Planning Act of 1974, and the FLPMA, among others. These laws augment the authority in the Organic Act of 1897, which established the National Forests and directed the agency to regulate the use and occupancy of the forests to protect them from destruction. Livestock grazing on National Grasslands is also administered under the Bankhead-Jones Farm Tenant Act of 1937. This law authorized a program of land conservation and utilization to improve past land use practices.

Today, there are grazing allotments on approximately 90 million acres of National Forest System lands in 34 states. The Forest Service administers approximately 8,800 allotments, with over 8,500 active livestock grazing permits and about 9.6 million AUMs of grazing by cattle, horses, sheep, and goats. Nearly all (99%) of this permitted grazing is located in the Western Regions, with only about 1% occurring in the Eastern Regions. Grazing permits are recognized under three categories: Temporary Permits, Livestock Use Permits, and Grazing Permits with Term Status. A brief description of each is listed below.

- **Temporary Permits:** Issued for a period not to exceed one year to graze specified number, kind, and class of livestock for a specific season and area of use.
- **Livestock Use Permits:** Issued for a period not to exceed one year if the primary use is other than livestock production.
- **Grazing Permits with Term Status:** Issued for periods up to ten years. It grants the permittee priority for renewal. Types include the Term Grazing Permit, Term Grazing Association Permit, Term Permit with On-and-Off Provision, Term Private Land Grazing Permit, and Grazing Agreement.
- **Grazing Agreements:** A grazing agreement is a document authorizing eligible associations, organized under state law, to make a specified amount of grazing use on National Forest System lands for a period of ten years or less (FSM 2231.03). Grazing agreements include provisions for the association to issue and administer grazing permits. Such administrations must conform to AMPs and rules of management developed by the Forest Service and associations.

The Forest Service manages diverse ecosystems that produce an equally diverse array of tangible and intangible products. Tangible products include forage for grazing and browsing animals, wildlife habitat, water, minerals, energy, recreational opportunities, wood products, plants, and animals. These are important economic goods. Rangelands produce intangible products such as natural beauty and wilderness, satisfying important societal values. These are often as economically important as the more tangible commodities.

Today, the Forest Service concentrates its efforts on managing the vegetative resources to serve a multitude of resource needs. Rangeland management provides such things as habitat for a variety of plant and animal species, clean water, and sustainable grazing and browsing. The Forest Service inventories, classifies, and monitors rangeland conditions to determine if vegetation objectives are being met. When an area is determined to not be meeting vegetation objectives, the Forest Service utilizes changes in livestock management and vegetation treatments to achieve Allotment Management Plan (AMP) objectives. Forest Service rangeland management includes a whole host of partners (both public and private) working together to make sure Forest Service rangelands are healthy and functioning properly.

Bridger-Teton National Forest

The BTNF is comprised of six Ranger Districts: Kemmerer Ranger District, Big Piney Ranger District, Grey River Ranger District, Jackson Ranger District, Buffalo Ranger District, and Pinedale Ranger District (Table 3-25).

Table 3-25. Bridger Teton National Forest Ranger Districts

Kemmerer Ranger District	
Total Number of Allotments	25
Total Acres of Allotments	282,330
Total Number of Allotments with Greater Sage-Grouse General Habitat	7

Total Acres of Allotments with Greater Sage-Grouse General Habitat	8,010
Total Number of Allotments with Greater Sage-Grouse Core Habitat	0
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	0
Total Number of Permitted AUMs	26,380
Total number of Active Allotments	25
Total number of Vacant Allotments	0
Big Piney Ranger District	
Total Number of Allotments	26
Total Acres of Allotments	438,380
Total Number of Allotments with Greater Sage-Grouse General Habitat	11
Total Acres of Allotments with Greater Sage-Grouse General Habitat	49,410
Total Number of Allotments with Greater Sage-Grouse Core Habitat	0
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	0
Total Number of Permitted AUMs	6,366
Total number of Active Allotments	10
Total number of Vacant Allotments	16
Greys River Ranger District	
Total Number of Allotments	40
Total Acres of Allotments	428,240
Total Number of Allotments with Greater Sage-Grouse General Habitat	1
Total Acres of Allotments with Greater Sage-Grouse General Habitat	4,790
Total Number of Allotments with Greater Sage-Grouse Core Habitat	0
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	0
Total Number of Permitted AUMs	69,390
Total number of Active Allotments	35
Total number of Vacant Allotments	5
Jackson Ranger District	
Total Number of Allotments	18
Total Acres of Allotments	379,970
Total Number of Allotments with Greater Sage-Grouse General Habitat	14

Total Acres of Allotments with Greater Sage-Grouse General Habitat	80,260
Total Number of Allotments with Greater Sage-Grouse Core Habitat	0
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	0
Total Number of Permitted AUMs	7,783
Total number of Active Allotments	16
Total number of Vacant Allotments	2
Buffalo Ranger District	
Total Number of Allotments	3
Total Acres of Allotments	53,730
Total Number of Allotments with Greater Sage-Grouse General Habitat	3
Total Acres of Allotments with Greater Sage-Grouse General Habitat	11,730
Total Number of Allotments with Greater Sage-Grouse Core Habitat	1
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	180
Total Number of Permitted AUMs	382
Total number of Active Allotments	1
Total number of Vacant Allotments	2
Pinedale Ranger District	
Total Number of Allotments	32
Total Acres of Allotments	515,910
Total Number of Allotments with Greater Sage-Grouse General Habitat	22
Total Acres of Allotments with Greater Sage-Grouse General Habitat	72,500
Total Number of Allotments with Greater Sage-Grouse Core Habitat	4
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	3,090
Total Number of Permitted AUMs	81,443
Total number of Active Allotments	31
Total number of Vacant Allotments	1
Total Allotments within BTNF	**144**
Total Allotment Acres within BTNF	**2,098,560**
Total Permitted AUMs within BTNF	**191,744**

The BTNF manages grazing allotments in parts of Teton, Sublette, Lincoln, Park and Fremont counties. The majority of BTNF lands are located within Teton, Sublette and Lincoln counties. Approximately 2,098,560 acres of National Forest System lands exist within 118 allotments (Map 3-8). The BTNF administers 112 Term Grazing Permits of up to 191,744 AUMs.

Classes of livestock authorized under Term Permits on the BTNF include cattle, horses, and sheep.

A total of 54 active allotments are managed under current (post 1990) NEPA decisions. Another 35 allotments (19 for cattle and 16 for sheep) are in various stages of analysis for subsequent decisions affecting grazing authorization. The remaining allotments are managed in accordance with current Forest-wide goals, objectives, standards and guidelines until allotment-specific desired conditions and management plans can be developed.

An approximate total of 3,270 acres of core sage-grouse habitat occurs throughout the BTNF grazing allotments. Approximately 226,700 acres of general sage-grouse habitat occurs within the BTNF grazing allotments. The core sage-grouse habitat comprises less than 1%, while the general sage-grouse habitat comprises about 11% of the total grazing acres throughout the BTNF grazing system.

Current Management Practices

The BTNF allotments are managed under various grazing systems, including rotational rest, rotational deferment, herded once-over grazing (sheep), and season-long grazing. Many BTNF allotments are managed to achieve indicator thresholds consistent with either RMRS GTR 104 "Indicators of Rangeland Health and Functionality in the Intermountain West" or the "Range Inventory Standardization Committee Report" (1983).

Substantive changes to grazing management on BTNF allotments are usually implemented following the development of revised AMPs. AMP revision (and associated NEPA analysis) is completed according to the BTNF Proposed Grazing NEPA Schedule, as required by the 1995 Rescissions Act (as amended). The BTNF is currently developing quantifiable habitat objectives for sensitive species including the sage-grouse.

Rangeland Condition

Where recent site or allotment specific data has been collected concerning vegetation communities, no grazing related vegetation conditions or trends have been identified that would adversely affect sage-grouse habitat. Though sagebrush communities in these areas show somewhat higher canopy cover (i.e., too much area with sagebrush canopy cover above 25%) than is thought to be desirable according to Forest-wide desired conditions, current livestock management is not thought to be a significant contributing factor. In fact, some data from these areas indicate recent decreases in sagebrush canopy cover constituting a trend toward desired conditions. Data reflecting stream-bank disturbance has been used to identify grazing related issues in some areas of allotments currently under analysis. These areas, however, are small and isolated and are not thought to be representative of stream and riparian function overall. To date, no site or allotment specific issues affecting sage-grouse or their habitat have been identified in grazing analyses on the BTNF.

Medicine Bow National Forest

The MBNF is comprised of three Ranger Districts: Brush Creek-Hayden Ranger District, Laramie Ranger District, and Laramie Peak portion of the Douglas Ranger District (Table 3-26).

Table 3-26. Medicine Bow National Forest Ranger Districts

Brush Creek-Hayden Ranger District	
Total Number of Allotments	48
Total Acres of Allotments	594,212
Total Number of Allotments with Greater Sage-Grouse General Habitat	17
Total Acres of Allotments with Greater Sage-Grouse General Habitat	21,190
Total Number of Allotments with Greater Sage-Grouse Core Habitat	10
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	2,930
Total Number of permitted AUMs	30,500
Total number of Active Allotments	38
Total number of Vacant Allotments	6
Douglas Ranger District (Laramie Peak)	
Total Number of Allotments	56
Total Acres of Allotments	335,560
Total Number of Allotments with Greater Sage-Grouse General Habitat	16
Total Acres of Allotments with Greater Sage-Grouse General Habitat	12,340
Total Number of Allotments with Greater Sage-Grouse Core Habitat	5
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	5,570
Total Number of permitted AUMs	47,647
Total number of Active Allotments	51
Total number of Vacant Allotments	3
Laramie Ranger District	
Total Number of Allotments	28
Total Acres of Allotments	365,550
Total Number of Allotments with Greater Sage-Grouse General Habitat	1
Total Acres of Allotments with Greater Sage-Grouse General Habitat	170
Total Number of Allotments with Greater Sage-Grouse Core Habitat	0
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	0
Total Number of permitted AUMs	28,481
Total number of Active Allotments	19
Total number of Vacant Allotments	8

Total Allotments within MBNF	125
Total Allotment Acres within MBNF	1,321,520
Total Acres of Allotments with Sage-grouse General Habitat within MBNF	33,700
Total Acres of Allotments with Sage-grouse Core Habitat within MBNF	8,500
Total Permitted AUMs within MBNF	119,163

The primary use of allotments is by cattle, followed by sheep, and one allotment within the Laramie District contains horses (Table 3-27). All other permitted horses are incidental pack and saddle stock used to manage permitted cattle or sheep.

Table 3-27 Type of Livestock Use

District	Active Allotments	Cattle	Sheep	Horse
Brush Creek/Hayden	33	26	7	0
Laramie	16	14	1	1
Laramie Peak (Douglas)	53	51	2	0

Brush Creek-Hayden and Laramie District

The Brush Creek-Hayden and Laramie Districts manage grazing allotments on the Sierra Madre, Snowy Range and Sherman mountain ranges in Albany and Carbon counties. Domestic livestock under permit include cattle, sheep, and horses. There are 76 grazing allotments on the two districts. Typical habitat ranges between sagebrush and forests, with the bulk being lodgepole pine forests. Designated sage-grouse habitat (both general and core) is located in the foothills of the Sierra Madre and Snowy ranges and falls within 18 different allotments (17 on Brush Creek Hayden, one on Laramie Ranger District) (Table 3-26). On Pass Creek and Hartt Creek allotments, the sage-grouse habitat is located on private and state-owned land only. There are approximately 21,360 acres of general sage-grouse habitat on National Forest System lands on the two districts, and they occupy approximately 2% of the total acreage of the grazing acreage on those allotments. The majority of acreage is (21,190 acres) located on Brush Creek-Hayden District, with only 170 acres located on Laramie District. There are approximately 2,930 acres of sage-grouse core habitat within the Brush Creek-Hayden Ranger District. There is no sage-grouse core habitat in Laramie Ranger District.

All allotments on the MBNF are managed under AMPs and/or annual operating instructions (AOI) that implement livestock grazing standards and guidelines of the MBNF Revised LRMP (2003).

An AMP is a document that describes the specific management prescriptions for defined areas of federal lands (allotments) where grazing use is authorized. Essential Elements of an AMP include (from FSH 2209.13, Chapter 90):

- Management Objectives
- Livestock Management Practices
- Range Improvements
- Monitoring
- Associated Maps

AOIs are the instrument for the implementation of specific management actions on an annual basis to achieve resource management objectives. They must remain within the scope of the project-level decision and are, hence, not subject to administrative appeal (though this question has been tested in court). The AOIs state clearly the permittees and agencies responsibilities for the coming year.

Maximum allowable use guidelines in the MBNF Plan are moderate; no more than 50% use of forage under a deferred rotation system and no more than 55% use of forage under a rest rotation system. Lower allowable use guidelines (40% to 45%) are applied to rangelands in unsatisfactory condition. Additional guidelines for riparian areas include leaving four to six inches of residual stubble in riparian areas at the end of the grazing season.

Douglas Ranger District (Laramie Peak Unit)

The Douglas Ranger District manages the Laramie Peak Unit of the MBNF. The majority of the National Forest System lands are located within Albany, Platte and Converse counties (Map 3-9). There are approximately 335,560 acres on the Laramie Peak Unit (Table 3-26). The Douglas Ranger District administers grazing permits on 56 allotments on this unit (Table 3-26). Term permits of up to ten years are issued for sheep, cattle and horses. Only two of the allotments have sheep permitted, while the rest of the allotments are cattle permits with some horses permitted as well. All allotments have current NEPA completed (post 1995) and are in process of being reviewed for NEPA sufficiency according to the MBNF Proposed Grazing NEPA schedule, as required by the 1995 Rescissions Act (as amended).

The area affected by the sage-grouse analysis includes a very small portion of the Laramie Peak Unit. There are five allotments located in sage-grouse core areas (totaling 5,570 acres) and 16 allotments that contain general sage-grouse habitat (totaling 12,340 acres or about 4% of the grazing acres).

Forest Plan standards and guidelines are designed to maintain and improve rangeland conditions. Desired rangeland vegetation conditions are specified for individual allotment areas, and grazing systems are designed to achieve and maintain the desired conditions. Allowable forage utilization is stipulated on a site-specific basis and is dependent on the type and condition of vegetation present, soil and water concerns, and season and intensity of grazing. When allowable utilization meets prescribed levels, livestock are moved from the pasture or grazing area or removed from the allotment for the season.

Current Management Practices

Brush Creek-Hayden and Laramie Districts

All but one of the allotments on the Brush Creek-Hayden and Laramie Districts are managed under current (post 1995) NEPA decisions. AMP dates range from 1998 to 2010. The exception is Boswell Allotment, which has a management plan from the 1980's but is currently under analysis with completion of a new AMP scheduled for 2013.

Of the allotments, 15 are cattle allotments and one is a sheep allotment. Three of the cattle allotments currently under permit are stocked with yearling cattle, while the others are stocked with cow/calf pairs. The sheep allotment, Snowy Range Sheep, which includes 1,450 acres of sage-grouse general habitat, is vacant and has been so since 2002. One of the cattle allotments, Bow River, which includes 41 acres of sage-grouse general habitat on National Forest System lands, is also vacant, and has been vacant since 2002. Two allotments (Six Mile and Battle Mountain) contain pastures that are designated as wildlife pastures and are generally not grazed by livestock. The Battle Mountain wildlife pasture has not permitted livestock grazing since 1985, while the Six Mile wildlife pasture has been grazed by permitted livestock only twice since 1967. These wildlife pastures include 920 acres of sage-grouse general habitat (Battle Mountain) and 100 acres of sage-grouse core habitat (Six Mile). Altogether, there are 2,510 acres of designated sage-grouse habitat on National Forest System lands (100 acres of core, 2,410 acres of general) that have not been grazed under permit for the past ten years or longer. There are also two fenced riparian exclosures within general habitat areas. These are on Big Creek Allotment and Cow Creek Allotment and are 24 and 22 acres in size, respectively. They were established in 1996 (Cow Creek) and 2006 (Big Creek). They have received some unauthorized livestock use since establishment but have been ungrazed most years.

Removal of livestock from grazing allotments is required when maximum allowable use is reached on key areas within the allotments. A key area is a portion of rangeland selected because of its location, grazing or browsing value or use. It serves as a monitoring and evaluation point for the degree of grazing use and, therefore, guides the general management of the entire area of which it is a part. On cattle allotments in the Brush Creek-Hayden and Laramie districts, key areas are generally riparian areas and wet meadows. They are key areas because they are preferred by cattle, have high ecological value, and are most susceptible to overuse. In general, when key areas in a pasture reach maximum allowable use and cattle are removed, upland shrublands, including sagebrush habitats, are grazed well below maximum allowable use levels. In most shrubland sites on slopes greater than 15% to 20% or more than one quarter mile from water sources, forage utilization by livestock is light to very light, averaging 25% or less. Localized heavy use of shrublands occurs in areas where salt blocks are placed, around water developments, and at some fence corners. These sites are very small relative to total acreage of Greater Sage-Grouse habitat.

Season of Use

In the Brush Creek-Hayden and Laramie Districts, all of the allotments that contain sage-grouse habitat use rotational grazing systems managed by riders or fenced pastures, or both. Management systems include rotational grazing, deferred rotation with two to seven pastures, deferred grazing, and rest rotation grazing. All but Cottonwood Allotment have grazing seasons that fall between early June and mid-October. The exception has an intensive system in which cattle are moved through seven pastures from late May through late June and possibly re-graze those pastures late July through early September in favorable precipitation years.

Range Improvement Projects

Designated sage-grouse habitat on the Brush Creek-Hayden and Laramie Districts is located at the lower elevation margins of the allotments and is, therefore, adjacent to the National Forest Boundary fence and sometimes also interior pasture fences. Much of the National Forest Boundary in these two districts was fenced between the late 1930's and the 1960's. Most of the fence is 4-strand barbed wire with wood posts, steel posts, or a mix of wood and steel. There are also some segments of wood buck and pole fence.

Douglas Ranger District (Laramie Peak Unit)

On Laramie Peak, there are 22 water developments within the 13 grazing allotments and approximately 155 miles of allotment fence. Of the 22 water developments, 11 are on federal land. Of the miles of fence, 52 miles are on federal land.

Rangeland Management Categories

The allotments located within sage-grouse habitat on the Douglas Ranger District are permitted for livestock use from late spring through early fall. No late fall, winter or early spring use is permitted, as forage is generally not available for livestock consumption. Generally, permittees will calve in another location and then move cattle to the mountain allotments for the summer. Of the 14 allotments discussed in this document, two have sheep permits with the remainder being cattle permits. The allotments are managed under a variety of grazing systems including rotational rest, rotational deferment, and season long grazing. Grazing is managed to achieve the vegetative use guidelines as outlined in the Forest Plan. Forage use by livestock generally meets maximum allowable use guidelines identified in the MBNF Forest Plan.

Rangeland Condition

In general, vegetation trend data is collected every five to ten years. There are no grazing related vegetation concerns in either the core or general sage-grouse habitat that would adversely affect sage-grouse habitat. In general, vegetation is in a stable to upward trend. Much of the area listed in core and general habitat is timbered, with small intermingled areas of sagebrush/grass meadows.

Range Improvement Projects

There are 21 small stock water ponds, one ungrazed (and fenced) small irrigation reservoir, and four spring developments within sage-grouse habitat. Only one pond is located within sage-grouse core habitat, while the rest of the water developments are within sage-grouse general habitat. There are another five small ponds and three spring developments near (within 0.25 mile) of designated Greater Sage-Grouse habitat. Stock water ponds are not fenced and are generally less than 0.25 acre in size. Spring developments consist of a fenced spring with collection box and a pipeline to a metal or rubber tire watering tank. Water tanks are equipped with devices to allow for escape of small mammals and birds, though they vary in design, and not all would be considered suitable for large birds such as the Greater Sage-Grouse.

Thunder Basin National Grassland

The TBNG is managed by the Douglas Ranger District (Thunder Basin Area) (Table 3-28). Acres in the table include both private and National Forest System lands.

Table 3-28. Douglas Ranger District (Thunder Basin Area)

Total Number of Allotments	180
Total Acres of Allotments	1,186,540
Total Number of Allotments with Greater Sage-Grouse General Habitat	180
Total Acres of Allotments with Greater Sage-Grouse General Habitat	1,186,540
Total Number of Allotments with Greater Sage-Grouse Core Habitat	83
Total Acres of Allotments with Greater Sage-Grouse Core Habitat	402,890
Total Number of permitted AUMs	271,469
Active	179
Closed	1

Livestock grazing is a permitted use on National Forest System lands in the TBNG. Livestock grazing permits are issued for the use of forage produced in grasslands, shrublands, riparian zones, wetlands and some forested areas. Livestock grazing is an important economic activity in the planning area. Coordinating livestock grazing with other land uses and management activities on the national grasslands is an important responsibility of the Forest Service. For example, livestock share the rangelands with wildlife that also depend on these lands for forage and cover throughout the year, in addition to other uses that can occur on public lands. Domestic livestock are considered to be cattle, sheep, goats, and horses. Although some states do not recognize bison as domestic livestock, for this analysis they are included as a class of permitted livestock.

Current Management Practices

Permitted grazing use in 2011 on the TBNG was about 121,000 AUMs (on the approximate 554,000 National Grassland acres). The number authorized often varies based on annual climatic conditions (the number is usually less in dry years and higher in wet years).

The management of livestock on the TBNG is divided into three grazing associations. The Spring Creek Grazing Association manages the Spring Creek unit of the Grassland. Generally, grazing on this unit is late spring, summer and early fall due to snow cover in the winter. The northeast section of the lower portion of the Grassland is managed by the Inyan Kara Grazing Association. Grazing is generally restricted to late spring, summer and early fall as well, although some grazing in the winter does occur. The remainder of the Grassland is managed by the Thunder Basin Grazing Association. Livestock use is spread throughout the year. Private and state lands are intermingled with National Forest System lands across the Grassland, and the Associations aid in the management of these intermingled lands.

Forage reserve pastures, fenced exclosures, and those pastures or allotments rested by grazing permittees for personal convenience nonuse, contribute to the total acres rested from grazing in any given year. In the last ten years, rested acres have varied annually from 1-6% of the total grassland acres. However, during the extensive drought years of 2006 to 2008, many ranches destocked all or portions of their herds, and overall rested acres were many times this amount.

In compliance with the established 15-year schedule for the Rescissions Act, updated allotment NEPA analysis and allotment planning were completed for all 180 allotments on the Grassland between 2004 and 2008. Approximately 90% of the allotments were placed under various rotation systems, about 5% were placed in deferred use (entry after the growing season), and another 5% were identified as season-long use. Portions of seven allotments are currently managed as forage reserve pastures.

Several pipeline systems have been installed on the grassland in the last five years to bring high quality and dependable water to a number of pastures. In several cases, these improvements have been specifically designed to provide water sources that will pull livestock and big game up and away from riparian areas and improve woody draw habitat and grassland tree recruitment.

Table 3-29 displays grazing use in terms of permitted and authorized AUMs. This data uses the Natural Resources Conservation Service (NRCS) definition of an AUM as "the amount of forage required by one mature cow of approximately 1,000 pounds and a calf up to weaning, usually six months of age, or their equivalent, for a period of one month" (U.S. Department of Agriculture 2003).

Table 3-29. Historic Grazing Use for the Thunder Basin National Grassland

Grazing Levels	1985 Forest Plan (Projected AUMs)	1996 Permitted (AUMs)	20 Year Average Authorized (AUMs)
AUMs	169,000	137,000	112,700
Stocking Levels (ac/AUM)	-	3.9	4.7

Site-specific environmental analyses for livestock grazing occur during the allotment management planning process. National forest and grassland units have 15 years to update and revise AMPs as mandated by the Rescission Act of 1995 (Public Law 104-19, section 504). Allotment management plans are developed using goals, objectives, standards, and guidelines found in the LRMPs. More specific grazing prescriptions can be developed during the allotment management planning process to address site-specific resource issues; that is also when decisions for stocking levels are made.

Over the past 50 years, changes in stocking levels have occurred on some units. Initial stocking rates for the land utilization projects (later to become the national grasslands) were determined by the Soil Conservation Service. On some units, these rates increased over time as more intensive grazing systems were developed and range developments were implemented.

Grazing Distribution

Under current management direction, most rangelands are grazed annually by livestock. Exceptions are mostly areas that are inaccessible or incapable. A number of forage reserve pastures are established on the TBNG, each of which is grazed on a less-frequent basis. A number of fenced exclosures also exist, many around reservoirs, which are managed for woody species, emergent vegetation, waterfowl, and wildlife hiding and nesting cover. The Grassland Plan contains a requirement that 1-10% of the total TBNG acres are to be rested each year.

The distribution of livestock grazing across the rangelands is largely determined by topography and the amount of fencing and water developments. The effects of fencing and water developments on livestock grazing distribution on each planning unit were evaluated using a GIS model. The results are expressed in terms of amounts of primary, secondary, and inaccessible ranges. Primary range is level to gently sloping with nearby water sources (usually within one mile) for livestock and generally receives the most livestock and uniform use. Secondary range is often characterized by steeper terrain and is usually more distant from available livestock water sources. These areas generally receive less and more sporadic use by livestock. Inaccessible range is simply those areas without livestock water or those areas that are generally too steep for livestock.

On the TBNG, 86% of the rangelands are classed as primary range, 14%as secondary, and just under 1% as inaccessible. Much of the secondary range is almost exclusively the result of topography and not lack of water. The amount of secondary range due to distance from water is minimal. These results suggest that most suitable rangeland is primary range, which likely receives relatively uniform grazing in most years.

Habitat throughout the TBNG is highly favorable for the sage-grouse, and sage-grouse general habitat is found throughout every grazing allotment within the TBNG. Sage-grouse core habitat is only found on 83 (46%) of the grazing allotments (402,890 acres) making the TBNG one of the higher densities of sage-grouse habitat within the National Forest parts of the planning area.

Rangeland Management Categories

Suitable Rangeland Acres

The MBNF LRMP, which was approved in 1985, included management of the TBNG. In 2001, the TBNG portion of the LRMP was revised and separated the management of the TBNG from the MBNF. The remaining portion of the MBNF LRMP was revised in 2003. In the revised 2001 TBNG LRMP, all of the TBNG, a total of 572,520 acres, was listed as suitable and open for grazing.

Capable Rangeland Acres

A rangeland capability analysis was completed in 1998 to identify areas with physical characteristics conducive to livestock grazing. Criteria included the following:

- Areas with slopes less than 40% and accessible to livestock.
- Areas producing at least 200 pounds of forage per acre.
- Areas with stable soils.
- Areas with natural or developed water available or capable of being developed.

For the 1998 rangeland analysis, a total of 532,100 acres of the TBNG were classified as capable acres. This is 96% of the 552,490 total National Grassland (total acres changed as a result of a series of small land exchanges since 1985).

Forage Production

The ability of the land to produce forage is an important component of rangeland management. It is also an important component in calculating livestock grazing levels. On the TBNG, analysis results indicated the capable acres produced just over 1,000 pounds per acre (535,725,000 pounds of forage produced on 532,100 capable acres).

Season of Use

Timing of livestock grazing is an important variable influencing wildlife and wildlife habitat. The use of current grazing systems and seasons of use is a very basic component of wildlife habitat assessments for public rangelands. Rangelands can be disturbed by wildlife; however the Forest Service does not control or manage the wildlife, as it only has responsibility for habitat management. Livestock grazing is a contributing factor to wildlife habitat and cover. Typically, an assessment is made of the relative amounts of disturbed (livestock present) versus undisturbed (livestock absent) habitat/cover based on key dates. While direction is not given as to what grazing systems should be used or when use should occur, it is important to understand the current situation so any changes in livestock management can be assessed. Table 3-30 shows current grazing systems in use on the TBNG, expressed as a percentage of land in each allotment.

Table 3-30. Current Grazing Systems in the Thunder Basin National Grassland

System	Percent Acres
Continuous system	7
Deferred use	3
Deferred rotation	90
Total	**100**

Although most capable acres of rangeland are grazed annually, not all acres are grazed simultaneously. Generally, no more than 40% of the TBNG capable acres are grazed at any one time.

Range Improvement Projects

Water

Water developments play a major role in the distribution of livestock. These developments can also help create a mosaic of vegetation conditions and patterns. At the same time, primary range (those areas within one mile of a water source) increases and secondary range decreases. While an increasing number of these developments are wells and pipelines with watering tanks that provide more dependable and generally higher-quality water, the vast majority are impoundments such as dams and dugouts. All these water sources provide water for livestock during the permitted use season as well as season-long or year-round water to wildlife.

The TBNG currently has just over 1,800 water developments, which is an average density of 2.12 water sources per section. An approximately equal number of developments are located on the private, state, and other lands fenced into and managed as an integral part of the allotments.

Fences and Pasture Size

The amount of fencing and the size of a pasture also contribute to the distribution of livestock. Pasture size influences livestock grazing distribution and may influence scenic values, recreation use, wildlife movements, and other land uses.

The average pasture size on the TBNG is 1,640 acres. With about 554,000 National Grassland acres and 711,000 private and state acres fenced into the 180 grassland allotments, there is a total of nearly 5,400 miles of allotment boundary and division fences on the TBNG.

3.8 Minerals and Energy

3.8.1 Bureau of Land Management

General Planning Area Description

Leasable Minerals

Oil and Gas

In simplest terms, oil and gas are most often found in the porous spaces of sedimentary rocks (e.g., sandstone and limestone), having migrated there from source rocks (e.g., marine shales) rich in organic material. When rocks containing this organic material are subjected to heat and pressure, the organic compounds break down over time, resulting in oil and natural gas. As the oil and gas are generated, they migrate through the porous spaces of the rock or along fractures until they encounter a structural or stratigraphic trap with an impermeable seal.

Leasing procedures for oil, non-Coal Bed Natural Gas (CBNG), and CBNG are the same. Based on the federal Onshore Oil and Gas Leasing Reform Act of 1987, all parcels must be subject to competitive sale. Lands that are not leased during a competitive sale are available for noncompetitive leasing for a period not to exceed two years. Currently, the BLM holds quarterly competitive sales. Leases are issued for a term of ten years and expire unless they are extended, suspended, or held by production. If the lessee establishes hydrocarbon production, leases are held as long as oil or gas is produced. The federal government receives yearly rental fees on nonproducing leases. The State of Wyoming also receives 49%of all money generated from the sale and rental of oil and gas leases; the federal government receives 51% of the money generated from the sale and rental of oil and gas leases. The federal government receives royalties on producing leases, of which 48% are returned to the State of Wyoming (BLM 2006a).

Prior to drilling on a federal lease within the planning area, an APD must be filed with the Wyoming Oil and Gas Conservation Commission (WOGCC) and the BLM. If the BLM holds the mineral lease, but not the surface estate, the BLM's permitting process is used. The BLM requires a good faith effort for the operator to reach a Surface Use Agreement with the surface owner. When agreements cannot be reached, operators post a bond to ensure proper reclamation of the surface. If the BLM holds the surface estate, but does not hold the mineral estate, the drilling permit is authorized by the WOGCC and the BLM issues the operator a ROW for the surface use necessary for mineral development. Once the permit is approved, the company proceeds with drilling according to the applicable oil and gas lease stipulations and any site-specific COAs that are applied to the permit at the time of approval.

When an oil and gas lease is issued, it constitutes a valid existing right to develop the mineral resources in a reasonable manner subject to other rights. The BLM cannot unilaterally change the terms and conditions of the lease. Existing leases would not be affected by decisions resulting from the LUP Amendments that designate areas administratively unavailable for oil and gas leasing. New restrictions such as controlled surface use or timing restrictions in the form of stipulations could not be added to an existing lease. Existing leases would not be terminated until the lease expires. However, based on site or project-specific environmental analysis, COAs could be applied at the APD and Sundry Notice stages, and at subsequent development stages, to mitigate potential impacts from oil and gas operations within existing lease areas, provided the leaseholder's right to develop the lease remains intact. By regulation, nondiscretionary closures to oil and gas leasing, exploration, and development would apply to incorporated municipalities and WSAs. As provided by regulation, existing pre-FLPMA oil and gas leases are exempt from this restriction. Map 3-11 (Federal Mineral Estate and Existing Oil and Gas Leases) shows the federal mineral ownership for the six field office planning areas and Map 3-12 (Major Oil and Gas Field Locations) displays oil and gas field developments for the planning area.

The extraction of CBNG often involves pumping large amounts of water in the initial stages of development to lower hydrostatic pressure. The quality of the extracted water resource varies, and options for its disposal are highly dependent on its quality and economics. One of the disposal methods currently used in the planning area is to reinject produced water into zones with equal or poorer quality water than that from the production zone. Exceptions could be granted on an individual well basis if the water in question contained less that 500 ppm total dissolved solids; had a defined beneficial use associated with a responsible party; met all EPA, Department of Environmental Quality (DEQ), and other agency standards; and had an approved disposal plan for excess water beyond that required for the beneficial use. Discharge into surface water features, including ephemeral channels, is taking place. Under all disposal options, operators must obtain all necessary state permits.

Geophysical exploration is a tool of the oil and gas industry that bounces shock waves off subsurface rock layers to determine their thickness and geometry. Shock waves are produced by an energy source, and instruments record the waves when they return to the surface. The energy typically comes from the detonation of explosives in a shallow drill hole or from a heavy weight either dropped or vibrated on the ground surface. Sensors pick up the resulting shock waves through a line of sensors, or geophones, connected to a recording truck. Seismic operations use existing roads when feasible but also require off-road travel.

Generally, there are two kinds of seismic surveys: two-dimensional (2-D) and three-dimensional (3-D). The 2-D surveys are single or multiple linear lines with their receivers and source points in the same line extending up to several miles in length. Contrarily, 3-D surveys are conducted over a grid pattern and their source lines and receiver lines are separate.

The BLM is responsible for authorizing and administering geophysical exploration operations on all BLM surface lands within the planning area, while the WOGCC is responsible for authorizing all operations on state and private surface land, except exploration authorized under a lease. Geophysical operations are authorized using guidance from BLM Handbook 3150-1 and the Wyoming Supplemental Handbook 3150. Operators may apply for geophysical projects using Form 3150-4 (Notice of Intent to Conduct Oil and Gas Geophysical Exploration Operations), or, if the project is located entirely on-lease, geophysical operations can be applied for and authorized under a Sundry Notice (Form 3160-5). Geophysical operations occur on leased and unleased lands and are authorized on a case-by-case basis. COAs are added to the project based on site-specific reviews in order to minimize the impacts to various resources.

Pipelines

An extensive natural gas transmission system now exists in Wyoming and the Rocky Mountain region. The state has over 12 major natural gas pipelines and 14 natural gas storage facilities. In addition, seven major pipelines are regulated by the Federal Energy Regulatory Commission and transport natural gas from the region in all directions of the interstate system. Northwest Pipeline is part of a 1,500-mile natural gas system. About 210 miles of this system pass through Wyoming. The Pipeline's value in Wyoming is $68.7 trillion. This pipeline serves the northwest United States market. A $400 million expansion was completed in 1993 and enables the transport of an incremental 140 million cubic feet of natural gas from the Wyoming supply area. Approximately $308 million of new transmittal facilities was planned for 1995 and will provide market outlets for an additional 30 million cubic feet per day of Wyoming produced gas.

In Wyoming, Williams Field Services Company operates a 1,100-mile gas gathering system and a cryogenic processing facility with a capacity of 575 million cubic feet of gas per day. The company also operates a supply hub near Opal, which Northwest, Kern River, and Colorado Interstate Gas pipelines access for transmission of their gas. Gathering lines take gas from about 1,400 producing wells in Sublette, Sweetwater, Lincoln, Carbon, Uinta, Park, Fremont, and Washakie counties. The bulk of these wells are in Sublette, Sweetwater, and Lincoln counties.

Pipeline facilities, like railroads, are constrained by the mountainous topography of the West. These topographical controls have dictated creation of three east-west natural gas pipeline corridors across the continent. The central pipeline system extends from the Wyoming Overthrust Belt, through the resource area, and to the Great Lakes and eastern states.

Coal

Wyoming has the largest federal coal program in the BLM and is the nation's largest producer of coal, with about 34% of the nation's coal production. Most Wyoming coal is used for steam generation in the electrical utility industry. The planning area contains bituminous and sub-bituminous deposits.

Exploration on federal lands is subject to the requirements and conditions of the coal exploration license process, the result being a set of project-specific stipulations and conditions designed to limit impacts from exploration on other resources. Before the area can be considered for leasing, the amount of overburden, volume and quality of coal, and other information needed to plan a mine must be gathered.

Geothermal

Geothermal resources found on federal mineral estate are considered leasable minerals. The same laws and regulations governing other leasable minerals cover exploration and development of geothermal resources. Use of low temperature geothermal resources is most common in warm water heating systems in homes and businesses. Although not yet widespread, low temperature geothermal use is increasing as prices for other types of energy increase.

Other Solid Leasables

Other leasable minerals include sodium (trona), phosphates, oil shale, and tar sands. Uranium, bentonite, gypsum, limestone, and other hardrock minerals occurring on acquired public lands not closed to mineral leasing can be developed only under a leasing system. Access to the leasable federal mineral estate is at the BLM's discretion. Map 3-13 shows the active leases for coal and trona for the planning area.

Locatable Minerals

The General Mining Law of 1872 (as amended) allows the location and maintenance of mining claims on those federal mineral estate lands not withdrawn from mineral location. Potentially locatable metallic (gold, silver, lead, platinum, copper, uranium, and chromite) and nonmetallic (talc, mica, white marble, building stone, fluorspar, chemical-grade limestone, gypsum, Rare Earth elements, and bentonite) minerals exist in the planning area. Precious and semiprecious stones that exist or potentially exist include jade, diamond, iolite, ruby, sapphire, heliodor beryl, and kyanite. The BLM considers common varieties of sand, gravel, stone (e.g., decorative stone, limestone, and gypsum), clay (e.g., shale and bentonite), limestone aggregate, borrow material, clinker (scoria), and leonardite (weathered coals), to be salable minerals. Unlike cases of leasable minerals (e.g., oil, gas, or coal) or salable minerals (e.g., sand and gravel) where issuance of a lease or permit is at the BLM's discretion, the discovery and location of a locatable mineral claim is at the discretion of the claimant. Current mineral potential assessments and reports for BLM Field Offices can be found at http://www.blm.gov/wy/st/en/programs/Planning/rmps.html.

Salable Minerals

Salable minerals, also known as mineral materials, include common varieties of sand, stone, gravel, pumice, pumicite, cinders and clay. Sand, gravel, and fill material are used by the Wyoming Highway Department; by other federal, state, and local agencies; and by private contractors and homeowners on roads, highways, and construction projects. Mineral materials are disposed to public agencies under a Free Use Permit (FUP), with disposals to the Federal Highway Administration for federally aided highways done under a Title 23 appropriation and part of the highway ROW. Other types of disposals are sales of sand, gravel, moss rock, and flagstone. Mineral material disposal is a discretionary action; generally it is Bureau policy to facilitate mineral material disposals in cases where it would promote better public road systems, oil and gas roads, other public projects, and private uses.

Most salable minerals are common construction materials; demand for these materials is linked to the area's economy. Planning area demand generally coincides with activity in the oil and gas industry, highway construction, and urban use. Additional demand for construction materials is tied to activity associated with any future proposals for new mines (e.g., coal and uranium). Leonardite demand depends on oil- and gas-drilling activity.

Mineral materials are basic natural resources used in construction; however, they are generally bulky and have low unit prices. The sheer weight of mineral materials results in high transportation costs; therefore, adequate local supplies of these basic resources are important to the area's economy. When made available, exploration for and removal of these minerals must protect public surface resources and the environment and minimize damage to public health and safety.

Casper Field Office

Leasable Minerals

Oil and Gas

Sedimentary basins in the Casper Field Office include the Powder River, Wind River, Denver-Julesburg, and Shirley basins, of which portions of each underlie the Casper Field Office. Of the four basins, the Powder River and Wind River basins are the most prolific, while production from the Shirley and Denver-Julesburg basins are negligible.

Another mode of occurrence for natural gas is CBNG, where the gas is trapped in the coal where it was generated. As a well-known hazard in coalmines, CBNG has also become economically important with some of the largest reserves found in the Powder River Basin. The Mineral Occurrence and Development Potential Report (BLM 2004f) contains a more detailed explanation of these processes. Table 3-31 lists important oil- and gas-producing formations in the Denver-Cheyenne, Powder River, and Wind River basins (BLM 2005f).

Table 3-31. Oil and Gas Producing Formations in the Casper Field Office

Age	Denver-Cheyenne Basin	Powder River Basin	Wind River Basin	Comments
Paleocene	-	Fort Union Formation	Fort Union Formation	Primary source of coalbed natural gas
Upper Cretaceous	-	-	Lance Formation	Major gas production in the Wind River Basin
	-	Lewis Shale	-	Minor production from Teckla Sandstone Member
	-	Mesaverde Formation	Mesaverde Formation	Minor production from Teapot Sandstone and Parkman Sandstone members
	Codell Sandstone	-	-	-
	-	Frontier Formation	-	Major production from Wall Creek and "2nd Wall Creek Sand"
	-	Mowry Shale	-	Minor production

Age	Denver-Cheyenne Basin	Powder River Basin	Wind River Basin	Comments
Lower Cretaceous	Muddy (J) Sandstone	Muddy/Newcastle Sandstone	Muddy Formation	Major production in the Powder River and Wind River basins
	-	Fall River (Dakota) Formation	Part of Inyan Kara Group	Major production in the Powder River Basin
	-	Lakota Formation	-	
Jurassic	-	Sundance Formation	-	Minor production
Permian	-	Goose Egg Formation	-	Minor production from Minnekahta Limestone Member
Pennsylvanian	-	Minnelusa Formation (Tensleep and Amsden formations in western portion of basin)	Tensleep Formation	Major production in Powder River Basin

Source: BLM 2005a
– None Identified

Approximately 1.96 million acres of federal land in the Casper Field Office are covered by 2,978 oil and gas leases. Within the sage-grouse core area, 696,480 acres of federal land are covered by 881 leases. Within the Casper Field Office there are 5,664 wells for inspection, 4,167 active wellbores, and 2,676 plugged and abandoned wells.

Within the Casper Field Office, Natrona County has the largest number of APDs filed (8,508 as of mid-February 2005), followed by Converse County (4,357 applications filed), Goshen County (249 filings), and Platte County (97 applications filed since the WOGCC began recordkeeping) (WOGCC 2005).

Presently and historically, almost all of the oil and gas produced in the Casper Field Office comes from Natrona and Converse Counties. Based on production records from the State of Wyoming Oil and Gas Conservation Commission for 2002, 14% of the state's oil and 5% of the state's gas were produced from Natrona and Converse Counties.

Oil and gas reserves, both proven and potential, can be evaluated using different methods and assumptions. With the continuing increase in demand, a number of studies identify where and how much oil and gas remains to develop. The most comprehensive of these studies, completed by the USGS in 1996, looked at potential onshore oil and gas reserves in the United States. Other studies, completed since the USGS study, focus on a particular geographic region or basin. The Reasonable Foreseeable Development (RFD) scenario for oil and gas describes studies pertaining to the Casper Field Office, including their assumptions and results (BLM 2005a).

The baseline unconstrained RFD scenario for oil and gas projects approximately 2,800 conventional, deep, and CBNG wells (1,988 federal and 812 state and fee) to be developed between 2001 and 2020. Similarly, the unconstrained RFD projects 700 wells (497 federal and 203 state and fee) will be drilled for CBNG by 2020 as this resource is developed (BLM 2005a).

CBNG is one of the largest contributors to total natural gas production in Wyoming, and coals of the Powder River Basin are the largest source of CBNG. Of the 336 billion cubic feet (Bcf) of natural gas produced in the Powder River Basin in 2004, 298 Bcf (almost 89%) was CBNG. Development of CBNG resources in the Casper Field Office is limited, with six wells completed on federal land and 33 completed on state or fee (private) land (WOGCC 2005).

According to the RFD scenario for oil and gas, the Casper Field Office approved 15 2-D and 17 3-D projects between 1995 and 2003, with 3-D projects comprising most of the activity since 1999 (BLM 2005a). This trend and level of activity is expected to continue.

Coal

The coal-bearing formations in the Southern Powder River Basin Field are the Wasatch, Fort Union, and Lance formations. The Wyodak-Anderson Zone is the main producing coal zone and includes the Canyon, Anderson, Wyodak, and Big George splits. North of the Casper Field Office, the coal zone is a single bed, but splits into two beds: the upper Anderson and lower Canyon splits (BLM 2004f).

Wyoming produces approximately one-third of all coal produced in the United States. The Powder River Basin, which extends into northern Converse County, contains some of the largest low-sulfur coal deposits in the world. The Powder River Basin Coal Review (BLM 2006b) discusses coal activities in the Powder River Basin. Two other coal fields, the Goshen Hole Coal Field of the Denver Basin and the Wind River Coal Field of the Wind River Basin, also extend into the Casper Field Office; however, neither of these is currently producing (BLM 2004f).

Coal production began in 1883 near the towns of Glenrock and Douglas in south central Converse County. Prior to closure in 2000, the Dave Johnston mine produced an annual average of 2.4 million tons of coal over 43 years with a peak production of 4.1 million tons in 1997. This mine is now undergoing reclamation. Further north, on the Converse-Campbell County line, the Antelope Mine began production in 1986. Production from this mine has increased steadily; however, the New Source Review Air Quality permit limits production to 32.58 million tons per year (Wyoming DEQ 2003). In 2004, the mine produced 29.7 million tons of coal (BLM 2004f).

The entire coal development production area falls within the TBNG and is jointly managed by the BLM and the Forest Service. Two recently issued leases include acreage in the Casper Field Office. One is a 3,540 acre extension of the Antelope Mine. The lease for the West Antelope Lease by Application (LBA) extension was issued with an effective date of February 1, 2005. The second lease is an extension of the North Antelope/Rochelle Mine (NARO) complex covering 4,500 acres, a portion of which extends into Converse County (BLM 2004f). The applicant successfully acquired the NARO South LBA, and a lease was issued effective September 1, 2004. A new LBA was received in April 2005, proposing to add acreage to the Antelope Mine. An additional area adjacent to the NARO South LBA is under consideration as a potential exchange tract and may add additional mining reserves within Converse County. Approximately 59,690 acres have been found acceptable for further consideration for coal leasing as a result of previously applied land use planning screens in 43 CFR 3420.1-4. Table 3-32 identifies mined and unmined leasable coal areas. Table 3-33 displays coal development potential for northern Converse County.

Table 3-32. Mined and Unmined Leasable Coal Areas (acres)

	Leased	Unmined	Mined/No Coal
Federal Coal	8,655	3,502	5,153
Lease by Application	1,353	1,353	0
Exchange Area	822	822	0
State Coal	807	59	748
Total	**11,637**	**5,736**	**5,901**

Source: Wright 2005

Table 3-33. Coal Development Potential for Northern Converse County (acres)

2001 Screening[1]	Acres
Federal coal with development potential	61,960
Areas deleted by unsuitability criteria	2,270
Areas deleted due to multiple use conflicts	0
Areas deleted by surface owner consultation	0
Areas of Federal coal acceptable for further consideration for leasing[2]	59,690
Conflict Administration Zone	0
Coal and coalbed natural gas conflict area	5,060

Source: Wright 2006
[1]Scoping for the RMP revision did not identify the need for additional screening.
[2]Subsequent to 2001, 5,900 acres were leased and mined, leaving 53,790 acres (6 billion tons) of coal acceptable for further consideration for leasing.

Geothermal

There are three areas of natural thermal springs: the Alcova Hot Springs in southern Natrona County (now under Alcova Reservoir), the Douglas Warm Spring south of the town of Douglas in southeastern Converse County, and Immigrants Washtub in east central Platte County. A bathing facility constructed in 1961 near the Douglas Warm Spring is the only commercial use of thermal waters (BLM 2004f). In addition, the BLM has authorized thermal water well and associated pond under the R&PP Act in the Salt Creek area for year-round scuba diving use. In 1970, Congress passed the Geothermal Steam Act (Pub. L. 91-581, as amended [30 U.S.C. section (§) 1001 et seq.]). Since that time, several studies have been conducted to assess geothermal resources in Wyoming. The draft RFD (BLM 2005a) document for geothermal development contains more information on these studies. None of the studies identified geothermal resources within the Casper Field Office with sufficiently high temperatures to produce steam to generate electricity. Some studies identified several areas of anomalously high geothermal gradients with the potential for producing hot water for direct use.

Other Solid Leasables

The United States Bureau of Mines (USBM) recognized the occurrence of sodium and phosphate-bearing rocks in small parts of the Casper Field Office (U.S. Bureau of Mines 1993). Production of sodium has occurred in the past but is not being produced at this time.

The USBM recognized the occurrence of oil shale, tar sands, and relatively large areas of uranium-, bentonite-, gypsum-, and limestone-bearing rocks and also identified smaller areas of other "hardrock minerals" (U.S. Bureau of Mines 1993). In the past, the BLM has issued leases for uranium and bentonite on acquired lands. At present, there are no active leases. Recent uranium price increases now cause producers to pay severance tax. Increasing prices could lead to additional future uranium leasing. *In-situ* mining is the most likely method of recovering uranium. If water quality is affected by any mining that generates tailings piles, the BLM requires remediation. Although bentonite-, gypsum-, and limestone-bearing rocks cover relatively large areas, their intersection with acquired lands (which cover relatively small isolated areas) is limited and, thus, potential future leasing will occur only infrequently. The BLM also expects that future leasing of other "hardrock minerals" on acquired lands will be infrequent. There are currently a total of 9,457 active claims in the field office.

Locatable Minerals

The 12 permitted mining operations on federal mineral estate include uranium (five mines in Natrona and Converse counties), chemical-grade limestone (Bass and Brush Creek quarries in Platte County), marble (White Marble and Silvergreen quarries in Platte County), bentonite (two mines in Natrona County), and jade (Lone Tree Mine in Natrona County). Converse County, with 3,954 claims, has most of the 5,766 active claims (as of February 2006). Natrona County has 1,972, Platte County has 45, and Goshen County has 16. In fiscal year (FY) 2004, claimants filed six notices and 18 plans of operation to work on their claims.

The discovery of uranium in Wyoming was first made in 1949. Mining of uranium found in sedimentary rocks of the Powder River, Wind River, and Shirley basins began in the 1950s. In the 1980s *in-situ* leaching began to take the place of conventional mining as the preferred method for recovering uranium. The last conventional mine or mill operation closed in 1992. There are two active in-situ leaching operations (CAMECO's Highland/Morton Ranch and Smith Ranch Operations) that had a combined production of 1,323,530 pounds of uranium oxide (yellowcake) in 2004. Numerous mining claims for uranium recently have been staked due to the threefold increase in the price of yellowcake.

Bentonite, a sodium montmorillonite clay, is a major component of drilling mud. It has numerous other uses and can be found in foundry molds, pet litter, and geotextile liners for landfills and water impoundments. Most bentonite production in the field office is from east central Natrona County. Reported production in 2002 was 653,738 tons of bentonite, almost 20% of the 3,454,582 tons produced in Wyoming that year (BLM 2004f).

Gold deposits have been identified in the Rattlesnake Hills portion of the Casper Field Office. Historically, copper deposits have been mined in the Hartville Uplift near Geurnsey, Casper Mountain, South Bighorn Mountains, and the Deer Creek Copper District and La Prele in Converse County. Chromite was mined in the northern Laramie Mountains, and iron was mined in the Hartville Uplift. All of these operations are now abandoned (BLM 2004f).

Salable Minerals

In terms of volume produced and value, borrow material was the most important mineral material in the Casper Field Office in FY 2003, followed by sand and gravel, leonardite, and specialty stone. Table 3-34 shows the number of active permits, volumes produced, and values of materials in FY 2003 (BLM 2004f). Other salable minerals produced include riprap and shale (clay).

Table 3-34. Salable Mineral Production in the Casper Field Office for Fiscal Year 2003

Resource	Number of Active Permits	Cubic Yards Produced	Production Value
Borrow material	3	289,170	$71,124
Sand, gravel, limestone aggregate, and riprap	41	45,390	$31,898
Leonardite	1	25,000	$22,500
Specialty stone	10	120	$2,105

Source: BLM 2004f

Borrow material is used primarily for remediation cleanup. Sand, gravel, limestone aggregate, and riprap are used as construction materials. Leonardite is used as an additive to drilling mud. Specialty stone can include flagstone, moss rock, and landscape boulders. Riprap is used in soil stabilization projects.

Two community pits are open to the public to obtain mineral materials at a reasonable price. There is a sand site and a moss rock site. These sites remain a convenient source of material but are only sporadically used by the public. At the moss rock site, no mechanical equipment is allowed to harvest the rock, and, as a result, disturbance is minimal. The sand site totals approximately one acre of disturbance.

Kemmerer Field Office

Leasable Minerals

Oil and Gas

Oil and gas reserves in the Kemmerer Field Office have been the focus of industry attention since commercial discoveries began around the year 1900 (BLM 2003c). Oil and gas production in the Green River Basin, as a whole, began with the 1916 discovery of Lost Soldier Field (Law 1995). Oil and gas exploration of the Overthrust Belt dates back to the 1890s. This area has been the focus of intense exploration, including seismic and drilling programs, since the mid-1970s (BLM 2003c).

In the Kemmerer Field Office portion of the Green River Basin, concentrations of hydrocarbons are associated with the Moxa Arch. Production in the Green River Basin portion of the Kemmerer Field Office is mainly from fields located in, and adjacent to, the LaBarge Platform-Moxa Arch trend (Law 1995) in eastern Lincoln and Uinta counties and western Sweetwater County. Productive reservoirs range from Paleozoic through Tertiary in age and are predominantly sandstone. The faulted and folded strata of the Overthrust Belt contain many structural traps for hydrocarbons in the subsurface. Twenty-nine oil and gas fields occur in the Thrust Belt Province in traps found in three of the major thrust systems (Powers 1995). In the Overthrust portion of the field office, oil and gas production occurs in the area of Evanston and to the north, primarily in Uinta County; however, some production occurs in Lincoln County as well.

The BLM predicts that there will be approximately 1,010 future oil and gas wells in the Kemmerer Field Office within the next 20 years (BLM 2008a). Of the approximately 1.6 million acres of oil and gas mineral estate managed by the Kemmerer Field Office, approximately 1,070,000 acres are currently leased for oil and gas development. The majority of federal mineral estate in the Kemmerer Field Office (1,118,600 acres or 71%) is considered by the BLM to have low development potential for oil and gas resources. Approximately 315,650 acres (20%) of federal mineral estate are classified as moderate and 112,160 (7%) are classified as high development potential for oil and gas. An area of moderate oil and gas potential is located in the eastern part of the field office in Uinta, Lincoln, and Sweetwater counties. A smaller area of moderate potential is in Uinta and Lincoln counties in the southwestern part of the field office. The areas of moderate potential are bordered by locations considered to have low potential.

The majority of technically recoverable federal natural gas resources are either administratively unavailable for leasing or available subject to constraints. About 7% of the potential federal resources are administratively unavailable, with about 2% administratively unavailable by statute. All leases issued have some restrictions (i.e., standard lease stipulations); however, some leases may be issued with additional restrictions (i.e., major or moderate constraints).

Another mode of occurrence for natural gas is CBNG. CBNG has become an economically important source of gas production, particularly in the San Juan basin of New Mexico and Powder River basin of Wyoming. The 2006 RFD contains a more detailed explanation of these processes (BLM 2006b) and also identifies important oil- and gas-producing formations.

The 2006 RFD addressed CBNG, but potential is relatively low (BLM 2006b). Areas with low potential for CBNG resources are concentrated in the central portion of the Kemmerer Field Office along the eastern edge of the Overthrust Belt. Two additional low-potential areas occur in the southwestern Wyoming Province portion of the field office. The remainder of the area is considered to have no potential for CBNG.

Exploration activity for CBNG in the southwestern Wyoming Province has been low to moderate. Drilling activity has focused outside the field office in the Rock Springs Formation and at other locations (Law 1995). The high water content of the coal has been an obstacle to economic gas production.

Several CBNG wells have been drilled on fee or state lands and one well on federal mineral estate. Additional CBNG well development may occur in the Kemmerer Field Office if pilot-scale testing is successful.

As of 2003, 58 oil and gas fields were named and producing within the field office. The RFD Scenario for the Kemmerer Field Office contains production information for the 58 oil and gas fields that have occurred wholly or partially within the Kemmerer Field Office as of 2003 (BLM 2006b).

The baseline unconstrained RFD scenario for oil and gas projects approximately 2,040 wells (947 federal and 1,093 state and fee) to 640 wells (274 federal and 366 state and fee) will be drilled for CBNG in the Kemmerer Field Office by 2020 (BLM 2006f).

Coal

Primary coal reserves occur in the Adaville, Evanston, and Frontier formations of Cretaceous age. Outcrops of coal-bearing formations are confined to the Overthrust portion of the area and occur mainly in three north-south-trending belts. The reserves in the Adaville Formation are estimated at 1 billion tons, based on 13 of the formation's coal seams. One seam in the Adaville Formation exceeds 100 feet in thickness; another 17 seams appear to be greater than six feet thick. Adaville Formation coal currently is being mined at Chevron Mining, Inc.'s surface mine near Kemmerer.

Frontier Formation coals, not presently being mined, have a higher British Thermal Unit (BTU) value than the Adaville coals and contain beds up to 20 feet thick (Glass 1976). The Frontier Formation was extensively mined using underground methods up until the 1950s. Coal reserves in the Kemmerer Field Office occur in two major regional coal fields: the Hams Fork Coal Field and the western portion of the Green River Coal Field. Coal production currently is occurring only in the Hams Fork Coal Field at the Kemmerer Mine. The Green River Coal Field covers the largest area in Wyoming, with 16,800-square miles containing more than 1.46 trillion tons of coal (BLM 2004g). The far western edge of this coal region overlaps the eastern portion of the field office; however, most coal deposits in the Green River coal region portion of the field office are deeply buried by younger formations, and no surface or underground mining of those coalbeds has occurred. The only named coal field in the western portion of the Green River Basin is the LaBarge Ridge field in portions of Lincoln and Sublette counties, located outside the Kemmerer Field Office.

The Hams Fork Coal Field is Wyoming's fifth largest coal region. The field extends from southwestern Teton County into Lincoln County, western Sublette County, and the western half of Uinta County. It is a narrow elongate field within the Overthrust Belt of western Wyoming (Salt River and Wyoming Ranges) (University of Wyoming 2003). The Hams Fork Coal Field contains sub-bituminous and bituminous coals suitable for mining using both surface and underground methods. The Hams Fork coal region includes the Salt River Range, Greys River Coal Field, Wyoming Range, the McDougal Coal Field, and the Kemmerer Coal Field.

Open-pit mining in the Kemmerer Field Office began in 1963 (University of Wyoming 2003). Current federal coal production is centered in Lincoln County west of Kemmerer. The only production from the Hams Fork Coal Region is within the field office. The fields are characterized by coal reserves ranging from 9,000 to 11,000 BTU/pound and 0.4% to 0.9% sulfur. The reserves are characterized by steeply dipping seams that have been mined by underground methods in the past but are currently mined using surface methods only. The relatively thin and divided nature of the seams and the steep dip results in higher mining costs for these seams. The only major surface mining company at this time is Chevron Mining, Inc., which operates a mine west of Kemmerer. Chevron Mining, Inc. has 8,680 acres of federal coal leases and produced roughly 3,500,000 short tons of coal from these leases for the years 2005-2009 from multiple seams in the Adaville formation.

The Kemmerer Mine is the largest and deepest open-pit coal mine in the nation. FMC Corporation's Skull Point Mine was located next to the Kemmerer Mine. The Skull Point Mine was later acquired by Pittsburg and Midway (P&M) (Union Pacific Railroad 2003). Chevron Texaco acquired P&M in 2003 (City of Kemmerer 2003). In general, the coal at this mine has a heat content of BTU of 9,889 per pound, a sulfur content of 0.95%, a moisture content of 22%, a volatile material content of 34%, and a fixed carbon content of 39.5%; these values vary throughout the mine area. Table 3-35 lists coal production at the Kemmerer Mine from 2001 through 2005.

Table 3-35. Kemmerer Mine Production, 2001 - 2005

Year	2001	2002	2003	2004	2005
Coal Produced (million tons)	4.5	4.2	4.1	4.5	4.6

Source: SIM 2005

Table 3-36 summarizes leasable coal areas by type. Lands that are nominated for coal leasing, which is done under a process called LBA, are subject to a review known as the coal-screening process which is described in 43 CFR 3420.1-4. Results of the coal-screening process for the Kemmerer Field Office are in the *Coal Screening Summary Report* available at www.blm.gov/rmp/kemmerer.

Table 3-36. Mined and Unmined Coal Leases and Lease by Applications as of 2003 (acres)

	Unmined	Mined
Federal Coal Leases	8,430	250
Lease By Application	3,960	0
State/Private Coal Leases	-	2,180
Total	**-**	**2,430**

Source: Clawson 2003
– Data not available

Sodium (Trona)

The world's largest known trona deposit is located in southwestern Wyoming and extends into the eastern portion of the Kemmerer Field Office (BLM 2004g). All trona in the Kemmerer Field Office is mined underground. Trona is a hydrous sodium carbonate mineral refined into soda ash, sodium bicarbonate, sodium sulfite, sodium tripolyphosphate, and chemical caustic soda (WSGS 2002). Soda ash is the trade name for sodium carbonate, a chemical obtained from trona and sodium-carbonate-bearing brines (USGS 2003).

Trona resources found on federal lands are considered leasable minerals. The area where trona is known to exceed four feet in thickness is part of the Known Sodium Leasing Area (KSLA), which covers about 1,100 square miles, half of which is in the eastern portion of the Kemmerer Field office.

All public lands within the KSLA are open to leasing and development. Sodium leases are subject to renewal every ten years after the initial 20-year term. Prospecting permits outside of the KSLA are considered and modified when necessary to ensure consistency with the objectives of protecting other resources. Prospecting permits may be denied if it is determined that exploration or development impacts are inconsistent with other resource management objectives. In addition to prospecting permits for sodium, exploration licenses may be issued within the KSLA for sodium lands that are not currently leased.

The trona is found in the Green River Formation of Eocene age. The Wilkins Peak Member of the Green River Formation includes at least 42 trona beds, occurring from 400 to 3,500 feet below the surface. In the trona deposition area, which extends outside the Kemmerer Field Office, there are about 36 billion tons of halite-free trona and 25 billion tons of mixed trona and halite that occur in beds more than 1.8 meters in thickness (USGS 2007).

Ninety percent of the Nation's trona production and 30% of the world's soda ash production comes from southwestern Wyoming, with four of the five underground mines in the Kemmerer Field Office. Trona mining began in southwestern Wyoming in 1947. Wyoming production of trona in 2005 totaled more than 13 million short tons. About 1.8 tons of trona are required to produce 1 ton of soda ash.

Within the Kemmerer Field Office, OCI (Rock Springs Field Office), FMC (split between Rock Springs and Kemmerer Field Offices), Solvay, and Tata (both solely in Kemmerer Field Office) produce trona from four underground mines. The FMC Granger operation (one of the two FMC mines and processing plants) is currently shut down due to market conditions. Two operations also have solution mining facilities for trona. One facility is currently shut down, and another is scheduled for removal and reclamation. Table 3-37 shows trona production by mine in 2005.

Table 3-37. Trona Production by Mine, 2005

Mine Name	County	Facilities Operated	Production (estimated tons)
Granger Mine/FMC Wyoming Corporation	Sweetwater	Underground Mine Processing	130,000
Westvaco Mine/FMC Wyoming Corporation	Sweetwater	Underground Mine Processing	4.7 million
Alchem Mine/General Chemical Corporation	Sweetwater	Underground Mine Processing	4.7 million
Solvay Trona Mine/ Solvay Chemicals, Inc.	Sweetwater	Underground Mine Processing	4.0 million
Total, Underground mines			**13.53 million tons**

Source: State Inspector of Mines 2005

Other Solid Leasables

Other than coal and trona, solid leasable minerals in the Kemmerer Field Office include oil shale and phosphate. Access to BLM-administered leasable minerals is at the BLM's discretion.

The Green River Basin, which covers a large area in southwest Wyoming, northwest Colorado, and northeast Utah, contains an estimated 244 billion barrels of shale oil in the Tipton Shale Member, Wilkins Peak Member, and Laney Member of the Green River Formation. This estimate is based on oil shale that yields at least 15 gallons of oil per ton of rock. Oil shale occurs throughout most of the Green River Basin and in thin beds (less than 4 feet thick) in Fossil basin. The most notable oil shale resources in the Kemmerer Field Office are located toward the southeastern boundary of the area around Flaming Gorge Reservoir. The beds in the upper part of the Tipton Shale are up to 75 feet thick and yield up to 24 gallons of oil per ton. Overburden is 2,000 to 3,000 feet thick. Other important oil shale beds in the Wilkins Peak Member and the Laney Member are slightly to the east of the southeast border of the Kemmerer Field Office.

Phosphate rock and associated vanadium occurs at the surface in north-south trending outcrops of the Phosphoria Formation. Mining has occurred in the past in various surface and underground mines, beginning with an underground mine near Cokeville in 1906, which had the first production in Wyoming. The last federal phosphate leases in the Kemmerer Field Office area, relinquished in 1995, were located in the Sublette Range north of Cokeville, Wyoming. Currently, most phosphate rock production in the U.S. is from Florida, North Carolina, Utah, and Idaho.

Hot springs (geothermal resources) occur at Auburn in the Star Valley portion of the Kemmerer Field Office. Auburn Hot Springs contains numerous vents producing carbon dioxide and hydrogen sulfide gas and saline water ranging from about 68 to 140 °F. Several pools contain native sulfur, which was mined from 1947 to 1949. The location of the springs is controlled by northwest-trending high angle faults. No other areas in the Kemmerer Field Office are known to have geothermal potential.

Locatable Minerals

Locatable minerals that occur in various geologic formations in the Kemmerer Field Office include metals (e.g., gold, silver, titanium, copper, chromium, and uranium) and commodities such as fire clay and bentonite. Precious gems known to occur or having the potential to occur within the Kemmerer Field Office include diamond, pyrope garnet, and chromium diopside.

Fire clay, considered to be locatable, is actively mined in Uinta County, north of Evanston, Wyoming. Fire clay (also known as refractory clay) is one of six types of clay mined in the United States. Fire clay occurs in scattered areas within the Overthrust Belt portion of the field office. Specifically, it is known to occur in outcrops within the Evanston Formation (north of the town of Evanston in Uinta County) and in outcrops within the Frontier Formation. Occurrences are also within the Adaville Formation in Lincoln County near Elkol, Wyoming (south of Kemmerer) (Harris and King 1986). A large proportion of the total clay production in Wyoming, other than bentonite, occurs in Uinta County.

Currently, there are two companies producing fire clay in the Kemmerer Field Office. Interpace Industries, Inc. produces refractory clay on private land from one of the Evanston Formation locations (Harris and King 1986). Interstate Brick Company produces clay from the Evanston Formation in a pit northeast of the Interpace Industries pit. In 1985, Interstate Brick Company filed for a clay patent maintaining that its clay deposit was locatable under the *Mining Law of 1872*. The patent examination concluded that some portions of the application area did in fact contain a marketable and valuable clay deposit, thus making it a locatable deposit.

Bentonite is sodium montmorillonite clay used as a binder in foundry molds, pet litter, drilling mud, and iron ore pelletizing, and is considered a locatable commodity (WSGS 2005a). It is increasingly used to form impermeable liners for waste disposal ponds. Although bentonite is known to occur in the Kemmerer Field Office, there has been no commercial production. Dipping beds, coal withdrawals preventing location of mining claims for bentonite, and other factors (e.g., the abundance of economically mineable bentonite elsewhere in Wyoming) have resulted in a low probability of development of bentonite.

The Kemmerer Field Office has seen little development of gemstones, and minimal production is expected in the future. Mining claims and associated exploration for diamonds occurred recently in the southeast portions of the Kemmerer Field Office; however, no major discoveries are known to have occurred. Although there are small deposits of various metals, none is economically significant, and very little activity is anticipated. There are currently a total of 19 active claims in the field office.

Salable Minerals

Salable minerals, also known as mineral materials, include common variety materials (e.g., sand, stone, gravel, pumice, pumicite, cinders, clay, and petrified wood). The Kemmerer Field Office administers the permits for salable minerals. The office maintains two community pits and one common use area, which provide relatively small amounts of mineral materials to the public using nonexclusive contracts. Those contracts generally are for sand and gravel, shale, moss rock, and boulders. The Kemmerer Field Office also issues exclusive use permits when the request is to obtain mineral materials from a specific location as an exclusive permittee. This is done as a Free Use Permit (usually for government entities such as city, county, or state) or as a commercial sale.

Table 3-38 shows the number of active sales, quantity produced, and values of mineral materials produced in FY 2010. Table 3-39 displays the production statistics of salable minerals according to type of disposal for FY 2010.

Table 3-38. Mineral Material Disposal Types and Commodities for Fiscal Year 2010

Type of Disposal	Number of Sites	Total Amount Authorized	Commodity	Comments
Negotiated Sales (active cases)	1	3,321 tons	Riprap	-
Competitive Sales (active cases)	0	0	N/A	-
BLM Common Use Area	1	230 tons	Mostly moss rock, some boulders	-
Material Sites ROWs	19	Unknown	Sand, gravel and limestone	Issued to Wyoming Department of Transportation
BLM Giraffe Creek Community Pit	1	700 cubic yards	Limestone	Talus
BLM Cokeville Community Pit	1	300 cubic yards from 1998 through 2003	Limestone	Talus
Free Use Permit (active cases)	4	305,000 cubic yards	Sand and gravel	One permit to City of Kemmerer

Source: McNaughton 2011

Table 3-39. Salable Mineral Production in the Kemmerer Field Office for Fiscal Year 2010

Type of Disposal	Number of Permits	Quantity Produced	Value
Community Pit Sales	1	100 cubic yards	$25
Common Use Area Sales	7	230 tons	$4,032
Negotiated Sales	1	3,321 tons	0
Competitive Sales	0	0	0
Free Use Permits	3	51,220 cubic yards	$48,659

Source: McNaughton 2011

Aggregate (sand and gravel) demand is expected to remain high. Aggregate is one of the most widely used salable resources in Wyoming and in the Kemmerer Field Office (WSGS 2005b). The four types of sand and gravel deposits in the Kemmerer Field Office include alluvial sand and gravel from recent stream deposits, glacial sand and gravel in the southern portion of the field office, Quaternary terrace gravels, and older sand and gravel deposits from the Late Cretaceous to Pleistocene ages.

The primary sand and gravel deposits are in the Star Valley (Salt River drainage) and along other major drainages, including the Bear River, Blacks Fork, Smiths Fork, Hams Fork, and Green River. There are four free-use permit areas for county and city governments and numerous Material Site ROWs issued to the WYDOT. Material sites can be authorized as part of the ROW for federal aid highway projects. Numerous older gravel pits occur throughout the area, many of which were originally issued to the WYDOT.

Decorative stone is defined as "any type of rock product exclusive of aggregate that is used for its color or appearance" (Harris 1993). Currently, building stone and moss rock is being produced, though other varieties of decorative stone have been produced in the past. An active market has developed for moss rock, or lichen-covered sandstone, which is mainly found on hogback ridges in the Overthrust Belt portion of the Kemmerer Field Office, as well as for flagstone of varying thickness. Current production and demand for building stone and moss rock are expected to continue at their current rates. However, this is dependent on the growth rate in the building industry as well as other economic factors. About 1,000 tons of moss rock have been sold from public land since 1998. This demand continues, especially from the Jackson Hole area and the Wasatch Front area in Northern Utah.

Substantial commercial limestone or sandstone production (other than decorative stone) is not expected within the field office. Salable limestone is an abundant resource within the field office; however, there is currently minimal production. Other than relatively small amounts of limestone produced from the Giraffe Creek Community Pit, there are no commercial sales of limestone in the field office. The WYDOT does, however, have a limestone quarry on public land under a Material Site ROW.

Newcastle Field Office

Leasable Minerals

Oil and Gas

The Newcastle Field Office covers the eastern Powder River Basin, which is the most prolific oil-producing basin in the Rocky Mountains. The United States owns 2.12 million acres of oil and gas land in the Newcastle Field Office. There are 0.29 million acres of BLM-administered public lands. Other federal agencies administer 0.42 million surface acres.

In May of 2010, 4,445 oil and gas leases covering 839,490 acres were in effect in the Newcastle Field Office. From 2000 to 2009, an average of 28 federal wells per year were drilled in the area, and 15.4 federal wells per year were abandoned. In 2009, oil production from the area produced about 2.9 million barrels. This represented about 5.75% of the state's oil production.

Coal

Coal leasing and development activities are not currently being conducted in the Newcastle Field Office. However, coal mining was an important part of Weston County's economy between 1889 and 1928. There has been no recorded production since 1935. Coal production has shifted to the center of the Powder River Basin in Campbell County where production is from beds of high-quality, low sulfur sub-bituminous coal in Tertiary strata (Wasatch and Fort Union formations). It is not anticipated that coal leasing activities will occur in the Newcastle Field Office as long as abundant supplies of high quality sub-bituminous coal are available in nearby Campbell County.

Locatable Minerals

Locatable minerals are valuable mineral deposits that are not included under the mineral leasing acts and do not include common varieties of sand, stone, gravel, cinders, pumice, and clay (Knechtel 1962; Maley 1985). Mining claims, either placer or lode, are staked for locatable minerals. Public lands are open to exploration for locatable minerals except those withdrawn to protect other resource values and uses or those lands with acquired minerals status. A list of areas withdrawn is included in the Lands and Realty section.

There are approximately 1,800 active placer mining claims in the area, with bentonite, uranium, and gypsum being the principal locatable minerals. The bentonite and gypsum deposits are found along the eastern Powder River Basin margins in Weston and Crook counties. The uranium deposits are found in Crook County. Presently, only bentonite and uranium are being mined. Management of the locatable minerals programs in the Newcastle Field Office planning area is conducted in conformance with the existing RMP, which was approved and signed on August 25, 2000. Newcastle Field Office currently has ten active Plans of Operation (Table 3-40). All active mining claims in Niobrara, Weston, and Crook Counties are shown in Table 3-41.

Table 3-40. Current Authorized Mine Plans of Development within the Newcastle Field Office

Operator	Legal Description
American Colloid Company (8)	T 52 N – T 55 N and R 61 W – R 65 W
BPM (1)	T 51 N – T 52 N and R 61 W – R 64 W
Black Hill Bentonite (1)	T 47 N – T 51 N and R 62 W – R 64 W

Table 3-41. Active Mining Claims in Niobrara, Weston, and Crook Counties

Locatable Mineral	Number of Claims
Bentonite	99
Gold	4
Gypsum	2
Uranium	1,148
Two or more minerals (mineral not defined on location notice)	2,393
Total	**3,646***

*Based on exploration interest and production, it is assumed that the majority of the claims were located for bentonite and uranium.

Bentonite

In the Newcastle Field Office, there are two principle bentonite mining areas: the northern Black Hills, or Colony Mining District, and the Clay Spur Mining District. The northern Black Hills bentonite mining district comprises an irregularly shaped area of about 980 square miles extending about 60 miles along the north side of the Black Hills of Wyoming and South Dakota into Montana. Within this district, many beds of bentonite occur interspersed with sedimentary strata of Cretaceous age, have an average thickness of about 3,000 feet, and consist chiefly of marine shale, marl, and argillaceous sandstone (Knechtel and Patterson 1962). In the northern Black Hills mining district, the important commercial beds are the Clay Spur bed at the top of the Mowry Shale and the E and F beds in the lower part of the Belle Fourche Shale. These beds average two and one-half to three feet thick.

The Clay Spur District is located in the south-central part of Crook County and the north-central part of Weston County, extending from Keyhole Reservoir on the Belle Fourche River south to Osage, Wyoming. The mining area is a narrow sinuous belt approximately 30 miles long encompassing about 100 square miles, which is mostly confined to the outcrop area of the Upper Cretaceous Belle Fourche Shale. It is five miles across at its widest point north of Upton, Wyoming. Outcropping Cretaceous formations dip gently southwestward at two to three degrees throughout the district. At the northern and southern ends of the district, the dip abruptly increases to 20 degrees or more, making mining unfeasible. Nearly all bentonite production in the Clay Spur District comes from the Clay Spur bed of the Mowry Shale. Another bentonite bed in the lower part of the Belle Fourche Shale (bed E) has produced a small quantity of bentonite. A very minor amount of bentonite also has been mined from the Newcastle Formation, but none of the operations were commercially successful (Davis 1965). Some bentonite mining out of the Belle Fourche and Mowry shales has also occurred in the extreme southeast corner of Weston County and the extreme northeast corner of Niobrara County.

The Black Hills region, which includes both of these districts, accounts for about 45% of total United States sodium bentonite production (Allison 1988). Exploration for and development of new bentonite reserves is a continuing process in Crook and Weston counties. Exploration activities are scattered throughout Crook County with the exception of the southeastern quarter. In Weston County, most exploration activity is primarily in the north-central part of the county, with a little occurring in the southeastern corner near the South Dakota border. Bentonite deposits in the Newcastle Field Office generally occur at depth but often can crop out in the area.

Active claims for bentonite are spread throughout Crook, Weston, and Niobrara counties. A detailed listing of these claims with respect to location, type, and claimant name is contained on microfiche on the Geographic Index in the Newcastle Field Office and is updated quarterly. The primary bentonite claimants in the area are American Colloid Company and Bentonite Corporation (formerly NL Baroid Company). Active mining of bentonite is occurring mainly on private surface and private minerals in Crook and Weston counties. There is one mining operation (by American Colloid Company) near Upton, which is on public land with acquired mineral status administered under a mining lease by the BLM's Casper Field Office. American Colloid Company and Bentonite Corporation both have bentonite mills at Upton and Colony. All bentonite is transported to Colony and Upton, Wyoming, for processing.

About half of the bentonite produced in Wyoming is sold to the drilling mud industry. Therefore, bentonite production is dependent on oil and gas exploration activity. Pelletizing and foundry sandbonding make up the bulk of the remainder of uses.

It is estimated that there is at least 100 million tons of bentonite reserves in the Black Hills region (Allison 1988). Total bentonite production out of Crook and Weston counties in 2007 was 548,066 tons (Table 3-42). Under current management conditions, activity in the bentonite segment of the locatable minerals program can be expected to remain about the same in the foreseeable future. Another boom in the oil and gas industry in the future could cause a significant increase in activity.

Table 3-42. Annual Bentonite Production, 2000-2007

Year	Bentonite (tons)
2000	312,482
2001	400,309
2002	338,507
2003	431,718
2004	458,770

Year	Bentonite (tons)
2005	492,368
2006	491,188
2007	548,066

Source: Annual Report of the State Inspector of Mines of Wyoming 2000-2007

Uranium

Uranium exploration has been cyclical since the last RMP was completed. In the past several years, the uranium price increased; with the price increase, exploration and development increased in Weston and Crook Counties. The exploration and development increase will probably continue, provided that price remains stable and alternative energy sources are feasible. Past commercial uranium mining has occurred in Crook and Niobrara counties. Powder River Basin uranium companies have staked and are currently staking lode mining claims at an accelerated pace; the claims should provide these companies with sufficient uranium deposits through the next planning cycle if the markets stabilize enough to maintain a suitable profit margin.

Metallic Minerals

Three metallic mineral districts, consisting of Tertiary alkalic igneous complexes, are located in Crook County. The Bear Lodge Mountains contain low-grade gold and Rare Earth deposits. The Black Buttes complex contains deposits of galena, silver, lead, zinc, and traces of gold. Mineral Hill contains anomalous amounts of gold, cassiterite, magnetite, and columbite-tantalite (Hausel and Sutherland 1988). There is a Rare Earth Element mining proposal (Bear Lodge Mountains) on the Forest Service near Sundance, Wyoming.

Salable Minerals

Salable minerals include, but are not limited to, common varieties of sand, stone, gravel, building stone, and other common variety minerals. Historically, salable minerals have been used in the Newcastle Field Office for building materials, road surfaces, and tools. Today, mineral materials are used primarily for building and maintaining roads and activities associated with the oil and gas industry. Crook, Weston and Niobrara Counties are currently available for the disposal of mineral materials unless closed by the BLM or designated by the BLM for free use by city, county, and state entities.

In the Newcastle area, there are several different forms of stone aggregate materials that are used for construction projects: sand and gravel, sandstone, shale, limestone and dolomite, and igneous and metamorphic rocks (granitic gneiss). The various types of mineral materials that are available for disposal under a sales contract or free use permit from the BLM include the following:

- sand
- gravel
- scoria
- clinker
- building stone
- decorative stone
- fill dirt on BLM-administered surface
- common clay
- non-metallurgical grade limestone or dolomite
- petrified wood for commercial purposes and in excess of private collecting standards (25 lbs/day plus one piece not to exceed 250 lbs/year)

- any other common variety mineral as demand occurs

Newcastle Field Office has mineral materials scattered across Crook, Weston and Niobrara Counties. These include scoria, sand, and gravel through both sales contracts and free use permits. Sources of mineral materials for aggregate use are more readily available in Weston and Crook counties than in Niobrara County. Deposits of sand and gravel, limestone, and shale are scattered throughout Weston and Crook counties and are used primarily as aggregate materials for road surfacing by state and county agencies. A few gravel deposits are present in terraces along drainage and in some sandstone outcrops in the northern part of Niobrara County. In the southern part of the county, a large amount of limestone is present, which could be quarried and crushed for aggregate use. A granite outcrop at Bald Butte in southern Niobrara County contains material that could be used as railroad ballast.

It is the field office's policy to provide sand, gravel, and stone from federal mineral deposits as necessary to meet the needs for construction and maintenance projects (BLM 1981). Although demand for mineral material in Crook, Weston, and Niobrara counties is low, the maintenance and construction of roadways are necessary to create and maintain a viable economic base for the resource area.

The primary uses of federal minerals are in the form of free use permits (FUP) issued to county road and bridge departments. The majority of the FUPs issued are in Crook and Weston counties. The Newcastle Field Office maintains one common use area designated to pick up flagstone by hand only. This was established by the BLM to serve the needs of the local communities, while reducing the amount of surface disturbance. Common use areas are typically located close to communities and are easily accessible. Collection is by hand tools only and no mechanized equipment is allowed.

Mineral materials permit activity for the three counties, as of February 1991, is shown in Table 3-43. Total production from active case files is shown in Table 3-44.

Table 3-43. Free Use Permit Activity

County	Permits	Free Use Sales	Sand and Gravel	Shales	Limestone
Crook	2	0	0	2	0
Weston	2	1	1	1	1
Niobrara	1	0	1	0	0

Table 3-44. Total Production from Free Use Permits

Mineral	Production (cubic yards)	Acres (disturbed)
Sand and gravel	2,700	10
Shale	113,299	24
Limestone	1,405,274	30

Pinedale Field Office

The Pinedale Field Office contains approximately 1,199,280 acres of federal mineral estate underlying 922,880 acres of federally owned surface and 276,400 acres of private and state lands. As part of the Pinedale RMP revision effort, the Pinedale Mineral Occurrence and Development Potential Report (Mineral

Report) was prepared (ENSR and Booz Allen Hamilton 2002a). That report confirms that hydrocarbons are the most important mineral resources in the Pinedale Field Office. Gas from geologic formations other than coalbeds has the greatest development potential; gas from coalbeds, also referred to as CBNG, is of lesser importance.

Leasable Minerals

Oil and Gas
Based on the Mineral Report for the Pinedale Field Office, 287,230 acres were nominated and offered for lease between 1996 and 2001. As of June 2004, approximately 1,174 BLM-administered federal oil and gas leases covered 734,020 acres, or approximately 61%, of the federal mineral estate in the Pinedale Field Office.

The Pinedale Field Office currently has several large areas not available for oil and gas leasing, for a total of 455,340 acres. Areas unavailable for leasing include the Scab Creek (7,710 acres) and Lake Mountain (13,490 acres) WSAs, the Trapper's Point ACEC (9,540 acres), the Ross Butte Management Area (35,670 acres), Wind River Front Management area (201,240 acres), and areas generally known as the Bench Corral, Ryegrass, Upper Green River, and west flank of the Anticline.

Based on statistical data in the Mineral Report, the hydrocarbon resources within the Pinedale Field Office may be placed within one of the following categories for potential development: very high, high, moderate, low, very low, and no potential for development. The potential within each of these categories is determined by the following criteria:

- Very high potential for hydrocarbon development indicates areas in which average well density is anticipated to be more than 500 wells per township (36 square miles) (34,630 acres are currently leased within these areas).
- High potential for hydrocarbon development indicates areas in which average well density is anticipated to be more than 100 wells per township (84,080 acres are currently leased within these areas).
- Moderate potential for hydrocarbon development indicates areas in which average well density is anticipated to be 20 to 100 wells per township (349,040 acres are currently leased within these areas).
- Low potential for hydrocarbon development indicates areas in which average well density is anticipated to be less than 20 wells per township (181,260 acres are currently leased within these areas).
- Very low potential for hydrocarbon development indicates areas in which average well density is anticipated to be less than two wells per township.
- No potential for hydrocarbon developments indicates areas in which no wells are anticipated (1,670 acres are currently leased within these areas).

Oil and gas drilling activity in the Pinedale Field Office is concentrated in three main areas: the Greater Big Piney-LaBarge, Jonah Field, and Pinedale Anticline (ENSR and Booz Allen Hamilton 2002). Oil and gas drilling activity in the Pinedale Field Office is shown in Table 3-45. In addition, a new gas field has been proposed in the Normally Pressured Lance area west and south of the Jonah Field (141,000 acres), and an infill of an existing field is being analyzed in the LaBarge Platform area.

Table 3-45. Oil and Gas Drilling Activity in the Pinedale Field Office

Area	Producing Oil Wells	Producing Gas Wells	Abandoned Wells[1]	Temporarily Abandoned Wells[2]	Drilling[3]	Shut In[4]	Location Built[5]	Other[6]	AAPD[7]	APD[8]
Jonah	-	1398	32	6	99	16	9	3	61	105
Pinedale Anticline	-	1276	32	4	332	14	31	4	513	241
LaBarge Platform	466	1479	324	55	26	60	8	108	101	38
Other	-	-	3	-	-	1	-	-	1	8

Source: Automated Fluids Minerals Support System, May 2010

[1] Well out of service, but surface restoration/revegetation not yet deemed sufficient to release operator from responsibility for well.
[2] Well out of service, subject to permanent abandonment or a return to producing status, depending on engineering, economic or other factors.
[3] Well spud has occurred, but production has not. May or may not be actively drilling at this time.
[4] Well is functional but has been effectively "turned off" for some reason. May return to production or be abandoned in future.
[5] Surface disturbance (pad construction) has occurred, but well spud has not.
[6] Water injection wells, disposal wells, reservoir monitoring wells, etc.
[7] Approved APD, no action initiated by operator.
[8] APD filed by operator, not yet approved by BLM.

Development of CBNG in the Pinedale Field Office is at a very early stage. To date, nine CBNG wells have been drilled into coalbeds (five in federal minerals and four in fee minerals). These wells, in the Riley Ridge Field area of T29 and 30N, R114W, are between 3,400 and 4,100 feet deep. The CBNG well pads are slightly smaller, but they are otherwise very similar to pads constructed for deeper wells. The coal depths for CBNG development in the field office are typically deeper than those in the Powder River Basin, thus requiring larger drilling equipment (e.g., conventional truck-in and assemble drill rigs or large Ellenberg-style mobile drill rigs) to reach the deeper coal depths. To support this type of equipment, a constructed and leveled pad is needed. A reserve pit is typically included on the pad for the drilling water, drill cuttings, and mud disposal.

A significant percentage of non-hydrocarbon gas is produced from the Madison Limestone. Carbon dioxide, nitrogen, hydrogen sulfide, and helium are separated from the hydrocarbon gas during processing at the Shute Creek Gas Plant.

Directional drilling or drilling multiple gas wells from a single, larger pad is taking place in the Jonah and Anticline fields and to a lesser extent in the Big Piney-LaBarge area. Directional drilling can reduce impacts on surface resources, such as vegetation, soil, livestock grazing, wildlife habitat, and visual and recreational values. Depending on the subsurface geology, as many as 64 wells have been drilled from a single pad in the Pinedale Field Office. Centralizing the surface locations reduces fragmentation of wildlife habitat and disturbance of surface vegetation and soils. Fewer miles of roads and pipelines are necessary, and in some cases, facilities such as reserve pits have been shared among multiple well pads. Directional drilling can substantially increase the costs required to develop wells because of increased drilling time, sticking of casing at the bends in the well-bore, and loss of a percentage of wells (when sticking or other drilling problems cannot be remedied). In addition, seasonal restrictions may be a deterrent to or may completely preclude directional drilling in cases where drilling one or more directional wells from a single pad would take longer than the seasonal drilling window allows. Directional drilling is also limited by the horizontal reach possible for each site. Factors that typically limit the horizontal reach include the total well depth and the thickness of the target formation. Generally, the horizontal reach for most directional wells in the Pinedale Field Office has been about 0.25 mile or less. However, wells with horizontal offsets of 2,500 feet or greater have been drilled.

Coal

The coal development potential for the Pinedale Field Office is low. Factors contributing to the low potential include the poor quality of the coal and the depth to and thickness of the coal seams. Coal seams in the Pinedale Field Office are usually less than three feet thick. There are currently no federal coal leases within the field office and no interest has been expressed by anyone to obtain new leases.

Other Leasables

Phosphate

The Pinedale Field Office has a modest reserve of phosphate rock. No production of the phosphate resource has taken place, and development of the phosphate deposits is not likely to occur in the foreseeable future.

Oil Shale

The Eocene Green River Formation contains a few deposits of thin, low-grade oil shale in the extreme south-central part of the Pinedale Field Office. There are three named units within the Green River Formation: the Fontenelle Tongue, the Middle Tongue (Wilkins Peak Member), and the Upper Tongue. The richest oil shale beds are found in the lower part of the Middle Tongue (Oriel 1969). Numerous excellent exposures of the Middle Tongue occur within the Fort Hill Quadrangle along Muddy Creek near the Facinelli Ranch, in cliff exposures around the Fontenelle Reservoir, and along the Green River near LaBarge. There has been no known commercial production of shale oil from oil shale occurrences within the Pinedale Field Office. The nature of the oil shale deposits, in conjunction with the status of oil shale development in general, suggests that there is low to no potential for commercial exploitation of these oil shale deposits in the foreseeable future.

Locatable Minerals

Locatable minerals, such as copper and gold, have been found only in very small, noncommercial concentrations. No activity related to the extraction of these minerals currently exists, and none is anticipated in the future. There are currently no producing mines, and there has been little mining historically in the Pinedale Field Office. The potential for mining of any locatable mineral is low because the geologic environment in the field office is not favorable for such deposits. There are currently a total of 82 active claims in the field office.

Salable Minerals

Salable minerals known to occur within the Pinedale Field Office are limited to aggregates (e.g., sand and gravel, common-variety limestone) and decorative stone (moss rock and boulders). These commodities are classified as common variety aggregates and have a low per-unit valuation. As long as the development potential remains limited and the unit valuation remains low, salable minerals are not expected to be significant contributors to the economic minerals sector of the local economy.

Extensive deposits of sand and gravel are found along major drainages. Past use of aggregate has been for highway construction and surfacing of drill roads and pads in the rapidly developing gas fields in the area.

Decorative building stone is found in the foothills on both sides of the Pinedale Field Office. The most extensive production has come from lichen-covered granite boulders in glacial moraines on the east side and from platy sandstone of the Nuggett Sandstone in the Miller Mountain/LaBarge Creek area on the west side. "Moss rock" located in the Lake Mountain WSA is currently unavailable for sale under the Interim Management Policy (IMP) for lands under wilderness review.

Rawlins Field Office

Leasable Minerals

Oil and Gas

The majority of the oil and gas fields are located in the western portion of the Rawlins Field Office. Based on production figures through the year 2000, three of Wyoming's top 25 gas-producing fields are within or partially within the Rawlins Field Office. These fields and the associated year 2000 production rank within Wyoming are as follows: Standard Draw (10), Wild Rose (14), and Wamsutter (16) (WOGCC 2002). In addition, the Rawlins Field Office contains two of the top 25 oil fields in the state: Lost Soldier (3) and Standard Draw (24).

Records indicate that before 1910 only one well had been drilled in the Rawlins Field Office. Since that time, there has been a pronounced upward trend in the number of wells drilled (ENSR and Booz Allen 2002b). As the number of wells drilled has increased during this period, the depth of the wells also has increased. Since 1990, 74% of the wells drilled have been between 8,000 and 12,000 feet deep. The average total depth was 9,249 feet.

As of October 2003, the Rawlins Field Office contained 2,690 wells (WOGCC 2003). Since 1980, 37% of the total number of drilled wells were abandoned. Abandoned wells are either unproductive (dry holes) or have become depleted and are no longer economical.

Drilling activity has been concentrated in three regions. The first and most heavily drilled region is in the eastern Greater Green River Basin, including the Great Divide Basin, the Wamsutter Arch, and the Washakie Basin. This region is located in the westernmost part of the Rawlins Field Office. Despite the heavy drilling in parts of these areas, some townships in this region have been only lightly tested. The primary objectives in these areas are stratigraphic traps within the Upper Cretaceous.

The two other regions of concentrated activity lie in the eastern part of the Rawlins Field Office and in a region across its center. These regions have been less heavily explored and developed than the region in the west. Many townships within these two regions have been only lightly tested. The primary objectives in the eastern region are stratigraphic traps in the Lower Cretaceous and fractured reservoirs in the Upper Cretaceous. The central region is mainly developed in structural traps that may include production from the Precambrian to the Upper Cretaceous. The central region is very mature and, unless stratigraphic traps are discovered, it will not be very active in the future. Outside of these three drilling activity regions, many townships have not been tested.

Gas production was flat beginning as early as 1974, but it began a steady increase in 1978 that carried through 1981 (ENSR and Booz Allen 2002b). After a period of fluctuation from 1982 to1985, production increases resumed. From 1986 to 1997, production increased at a nominal annual rate of 4.2%. Gas production was 7.5 times higher in 2001 than in 1974. A decline in production during 2000 was mostly caused by a decline in production from private wells. Gas production from the Rawlins Field Office in 2001 represented 11% of Wyoming's total gas production, based on data from WOGCC.

From 1978 to 1990, oil production fluctuated around an annual rate of eight million barrels. Beginning in 1990, annual production declined, and it has continued to decline at a nominal rate of 2.8% annually through 2001. About half the oil produced in the Rawlins Field Office during 2000 and 2001 was from the Lost Soldier-Wertz Fields near Bairoil. This field complex is in a tertiary phase of oil recovery via CO_2 injection, and it is expected that no future oil production enhancement can be accomplished. In 2001, only 7% of Wyoming's total oil production came from the Rawlins Field Office.

Although there is increased interest in exploration for and development of gas resources in coalbeds, there has been little production. Only 0.179 Bcf of gas and 10.3 million barrels of water had been produced in the Rawlins Field Office as of January 2002 (WOGCC 2002). Exploration for gas reserves in coalbeds is progressing in Atlantic Rim, along Seminoe Road, and in Hanna Draw. In Atlantic Rim, testing of Upper Cretaceous-aged coals of the Mesaverde Group began in 2002. Initial wells for the pilot tests have already been tested and, surprisingly, have produced gas from the start. Although the overall success of finding economic methane resources in the Atlantic Rim area is still unknown, recent exploratory activity suggests that gas production from coal reservoirs will be successful at least in some portions of the area. Exploration is active along the crest of the Wamsutter Arch between the Great Divide and Washakie Basins and on the east flank of the Washakie Basin (between Townships 13 and 20 north and Ranges 89 and 92 west). In the vicinity of Seminoe Road, initial wells for the pilot tests have already been drilled west of Seminoe Reservoir in coals of the Mesaverde Group. In Hanna Draw, the coal tested is in the Tertiary-aged Hanna Formation. Testing was terminated in April 2002 to reevaluate the economics of the project. However, interest in the project has recently revived and drilling may occur to the north of the last project area.

An ongoing issue is how produced water from coalbeds (as well as other formations) should be disposed. Options considered include dumping the water in drainages that do not contact the Colorado River system, treating the produced water to adjust its chemical ratios, and injecting the water into formations that contain water of poorer quality. Despite these concerns, there is sufficient confidence in the coalbed reservoirs' economic viability and major proposals have been made.

The large structures in the central portion of the Rawlins Field Office may have applicability for carbon dioxide sequestration. With disposal of the greenhouse gas, this is a positive environmental factor. In the case of productive structures, carbon dioxide sequestration could increase oil recovery. Coal is also known to allow carbon dioxide sequestration and to have the added benefit of enhancing coalbed natural gas

(CBNG) recovery because the coal preferentially replaces methane from the coal structure with carbon dioxide. Studies show that low-rank coals have the highest replacement factor. Carbon dioxide is readily available from large reserves to the west of the Rawlins Field Office, and a carbon dioxide pipeline is already in place.

Coal

There are six identified coalfields within the Rawlins Field Office. Of these, the Hanna Field has been the most significant in terms of both historic and projected coal production. Most activity within the remaining fields typically has been of small scale, and, in some cases, the coal resource has yet to be economically exploited. Approximately 27 million tons of federal coal have been recovered using strip mining. An additional 16 million tons of federal coal have been extracted using underground mining methods.

Recently, there has been a contraction of the coal sector within the Hanna Field. As of 1979, five mining companies were still active in the Hanna Field, but by the year 2000, there were only three active coal mines (two surface mines and one underground mine) (Glass and Roberts 1979). Two companies operated these mines. As of mid-2002, only one company, Arch of Wyoming, Inc. (a subsidiary of Arch Western Resources, LLC), was still active. This company operated the Seminoe No. II Mine (a combination dragline and shovel/truck operation) and the Medicine Bow Mine. Remaining economic/strippable reserves in both mines have been indicated as sufficient to sustain operations for fewer than two years. As of 2004, all coal mining had ceased, and only reclamation activities currently occur.

Coal is classified by rank in accordance with standard specifications of the American Society for Testing and Materials (ASTM). ASTM D-388 provides detailed information concerning coal classification specifications and considerations. Within the Rawlins Field Office, there are six significant coalfields containing coal resources of sub-bituminous to bituminous rank: Hanna Basin, Carbon Basin, Great Divide Basin, Rock Creek, Kindt Basin, and Little Snake River (Berryhill et al. 1950).

Locatable Minerals

Wyoming is a uranium province. Uranium was discovered in the Powder River and Wind River Basins during the 1950s, and continued exploration for uranium resulted in discovery of additional sedimentary uranium deposits in the major basins of central and southern Wyoming. The Rawlins Field Office contains sedimentary uranium deposits in the Shirley Basin, the Great Divide Basin, the Red Desert area, and around Baggs in the Poison Buttes area. There is currently one uranium in situ recovery (ISR) project in the early development stage (one ISR development NEPA document currently being completed).

Drilling activity is also in the Red Desert Basin, specifically on properties where claims have been located by Lost Creek ISR. Other companies involved in exploration drilling in the area (i.e., Black Range Minerals, Wildhorse Energy, and Tournigan) have terminated their notices and DN's issued by the state and are requesting bond release.

Lost Creek ISR began construction of the in situ uranium mine in October 2012 following approval of their plan of operations. On August 2, 2013 the facility was placed into operation. All primary access roads, office, plant, holding ponds, power lines and other infrastructure required to begin production are in place.

Exploration and delineation drilling are tentatively planned for Lost Creek East for 2013 or 2014. An amended Plan of Operations (received in Oct. 2014) would be required as it is connected to an existing operation; this would update the existing approved operations and would undergo additional NEPA.

In addition to uranium, the area contains deposits of titaniferous magnetite, stratabound gold, copper-gold deposits, and diamonds hosted in kimberlite pipes. Commercial development of the sedimentary uranium and titaniferous magnetite deposits has occurred over the past 50 years. The other locatable mineral deposits have seen only limited production and sporadic exploration. Locatable mineral deposits are summarized in Table 3-46. There are currently a total of 10,912 active claims in the field office with approximately 9,137 located within identified sage-grouse core habitat. Located on private land in the field office, the Sweetwater Mill is one of the only three remaining conventional uranium mills in the United States. This mill has an operating Nuclear Regulatory Commission (NRC) license. Associated with this mill are six State of Wyoming mining leases and 2,962 unpatented lode mining claims.

Table 3-46. Known Locatable Mineral Deposits in the Rawlins Field Office

Commodity	Location	Geologic Description	Deposit Type	Production History	Future Potential
Sedimentary Uranium					
Shirley Basin Deposits	T27-28N, R77-80W Shirley Basin 30 x 60	Sandstone uranium deposits hosted in the Tertiary Wind River Formation.	Epigenetic redox/roll front uranium deposits.	Major mines: Petrotomics, Pathfinder, Jenkins. Est. production about 10 to 20 million pounds of U3O8.	Major district with considerable future potential for uranium. Estimated resource of 50 million pounds.
Red Desert Deposits	T18-21N, R99-101W Red Desert 30 x 60	Lignite coal uranium. Low-grade uranium mineralization in lignite beds of the Wasatch and Green River Formations.	Disseminated uranium in lignite beds. Grades range from 0.003% to 0.007% U3O8.	No production of uranium. Estimated resources are 24,000 tons of uranium in coal. Coal estimated at 20% strippable.	Grades too low for future production except as byproduct of lignite coal production.
	T24N, R93W Red Desert 30 x 60	Roll type uranium deposits formed by flow of ore bearing solutions through the host rock.	Roll type uranium deposits.	1,307,529 pounds of uranium. Produced from 1978 to1983. No production from 1983 to present.	Development possible using in situ methods at current uranium prices.
Great Divide Basin	T24-26N, R93096W Red Desert 30 x 60	Sandstone and evaporative uranium prospects hosted in Tertiary Battle Spring and Bridger Formations.	Epigenetic redox/roll front uranium deposits. Also, evaporative uranium deposits near Lost Creek Mine.	Lost Creek Schroeckinite Deposit (T26N, R94W). Grades are 0.013% about 0.28% U3O8.	Moderate potential for future development, known mineable uranium deposits.
Poison Buttes (Baggs)	T12-13N, R92W Baggs area Saratoga 30 x 60	Sandstone uranium deposits hosted in Tertiary Browns Park Formation.	Disseminated and epigenetic redox/roll front uranium deposits.	Urangesellschaft proposed mine at 2,000 tons per day production.	Considerable future potential at higher uranium prices. Estimated resource of 8 to 15 million pounds.
Ketchum Buttes	T15N, R89W Northeast of Encampment Saratoga 30 x 60	Sandstone uranium prospects hosted in Tertiary Browns Park Formation.	Disseminated and epigenetic redox/roll front uranium deposits.	Prospects only.	

Commodity	Location	Geologic Description	Deposit Type	Production History	Future Potential
Desert Rose area (USGS PP 538) (USGS MR-21)	T13N, R76W Southwest of Laramie Laramie 30 x 60	Sandstone uranium prospects hosted in Cretaceous Cloverly Formation.	Disseminated and epigenetic redox/roll front uranium deposits.	Prospects only.	
Miller Hill area	T18N, R88W Rawlins 30 x 60	Sandstone uranium prospects hosted in Tertiary Browns Park Formation.	Disseminated and epigenetic redox/roll front uranium deposits.	Prospects only.	-
Encampment/Riverside	T15-16N, R84-85W Saratoga 30 x 60	Sandstone uranium prospects hosted in Tertiary Browns Park Formation.	Disseminated and epigenetic redox/roll front uranium deposits.	Prospects only.	
Magmatic Uranium					
Pedro Hills	T26N, R81W West side of Shirley Basin Shirley Basin 30 x 60	Veins in Precambrian rocks.	Magmatic-hydrothermal uranium veins along fissures.	Little Man Mine—No production history.	Limited future potential. This type of deposit is difficult to develop.
Titaniferous Magnetite					
Iron Mountain District	T18-19N, R71W Rock River 30 x 60	Lenses, masses, and beds of titaniferous magnetite and ilmenite with spinel in Precambrian Laramie Anorthosite.	Magmatic segregations and/or possible replacements within layered mass of feldspar and olivine called Laramie Anorthosite. Deposits follow anticlinal axis of anorthosite.	Main mines are Shanton, Iron Mountain, and Sybille Pit. Past production was about 1.1 million tons to 1968. Past operators were UP Railroad and Anaconda.	Estimated 30 million tons of massive ore at 45% Fe and 20% TiO_2. Disseminated ore estimated at 148 million tons at 20% Fe and 9.7% TiO_2.
Sheep Mountain	T15N, R77W Medicine Bow 30 x 60	Titaniferous magnetite black sand deposit in the Mesaverde Formation.	Paleo-beach sand deposit 4,300 feet long and about 50 feet by 17 feet. Grades are 15.6% TiO_2. No identified resource.	No production.	Uncertain.

Commodity	Location	Geologic Description	Deposit Type	Production History	Future Potential
Rare Earths and Yttrium, Including Columbite and Tantalite					
Big Creek District	T13N, R81-82W Saratoga 30 x 60	Veins and pegmatites in Precambrian granite intrusives.	Hydrothermal veins and pegmatites in granites.	Prospects only.	
Tie Siding Area	T12N, R71-72W Laramie 30 x 60	Pegmatites in Sherman granite.	Radioactive pegmatites.	Prospects only.	
Red Mountain Syenite	T22N, R71W Laramie 30 x 60	Disseminated allanite in Precambrian syenite intrusive mass.	Disseminated Rare Earth element (REE) deposit.	No production.	
Fox Creek Pegmatites	T13N, R78W Laramie 30 x 60	Pegmatites with columbite and tantalite.	High-grade pegmatites.	Past production of 85 pounds of columbite and tantalite.	
Stratabound Gold					
Ferris Mountains	T27N, R87-88W Bairoil 30 x 60	Vein-like deposits and beds in Precambrian metasediments and granites.	Exhalative iron-formation gold and copper deposits and associated intrusives with veins. Gold and copper associated with jasperoid beds.	Spanish Trail Mine. No recorded past production.	Deposit type known to host major gold deposits worldwide.
Seminoe Mountains	T25-26N, R84-86W Bairoil 30 x 60	Vein-like deposits and beds in Precambrian metasediments and granites.	Exhalative iron-formation gold and copper deposits and associated intrusives with veins. Gold and copper associated with jasperoid beds in hornblende schist.	Penn Mine at Bradley Peak. Three adits with limited production. Estimated past production of 530 oz. of gold (Au).	Estimated 100 million tons of Fe ore at 28% to 68% Fe. Gold values to 2.7 opt Au. Nephrite jade present in Seminoe area.
Copper-Gold Deposits					
Jelm Mountain District	T12-13N, R76-77W Laramie 30 x 60 Saratoga 30 x 60	Copper-gold-silver-arsenic-bismuth "veins" in Precambrian amphibolite schist.	Oxidized quartz veins and mineralized shears in Precambrian metasediments and associated with mineralized pegmatites.	Annie Mine has 3% to 30% Cu and 0.1 opt Au. Wyoming Queen has three shafts to depths of 250 feet. No data on past production histories.	Deposits similar to major gold deposits of Canada. Veins may be folded beds, as they are in Canada.

Commodity	Location	Geologic Description	Deposit Type	Production History	Future Potential
Cooper Hill District	T18N, R78W Medicine Bow 30 x 60	Copper and gold veins in Precambrian schist.	Vein and shear-zone sulfide mineralization in folded Precambrian schists.	Charlie, Emma G, and Albion Mines. Grades to 0.7 opt Au and 12.2 opt Ag. No recorded production history.	Deposits similar to major gold deposits of Canada. Veins may be folded beds, as they are in Canada.
Silver Crown District	T13-14N, R69-70W Laramie 30 x 60	Precambrian quartz monzonite intrusive related to Nash Fork–Mullen Creek Shear Zone.	Disseminated copper and gold deposit related to Precambrian island-arc volcanism and intrusive igneous rocks.	Copper King Deposit: 35 million tons at 0.2% copper and 0.02 opt gold.	Copper King is only drilled reserve in area. May become economic at higher copper and gold prices.
Kimberlite/Diamonds					
Iron Mountain District	T19-20N, R70W Rock River 30 x 60	Devonian kimberlite intrusives into Precambrian Laramie Anorthosite.	Kimberlite pipes with diamonds.	No production history.	Diamonds small and mainly of industrial quality.
Stateline District	T12N, R72W Laramie 30 x 60	Devonian kimberlite intrusives into Precambrian granites and metamorphics.	Kimberlite pipes with diamonds.	No past production. Diamond grades in range of 0.5 to 1.0 carat/100 tons. Industrial grade diamonds.	Diamonds small and mainly of industrial quality. Potential for more discoveries considered high.

Source: BLM 2003d.

Salable Minerals

The most significant salable or common variety minerals within the Rawlins Field Office include sand and gravel, limestone, clinker (scoria), and thin-layered building stone known as moss rock. Sand and gravel resources typically occur in one or more of the following forms: gravel deposits, alluvial sand and gravel deposits, terrace sand and gravel deposits, glacial gravels, older gravel deposits, and windblown deposits. Limestone typically occurs in bedded sedimentary deposits. Within the Rawlins Field Office, the aggregates resource base is generally present as windblown, terrace, and alluvial deposits; however, coarser, gravel-type materials are present to a somewhat lesser degree. Where gravel is present, it is generally an older gravel (conglomeratic) deposit, often situated beneath surficial deposits. The Wyoming Geologic Survey has identified aggregate deposits near Fort Steele (T21N, R85W), Elmo (T22-23N, R81W), and Creston Junction (T21N, R92W) and in the Red Desert Basin (T21-23N, R95-97W).

Rock Springs Field Office

Leasable Minerals

Oil and Gas

Many producing fields are aligned along two major anticlinal structures. These structures are the Moxa Arch in the Green River Basin and the Rock Springs Uplift. Fields are predominantly stratigraphically trapped in the Washakie Basin, Great Divide Basin, and on the low relief Wamsutter Arch separating these two basins. Other fields are being developed outside these major producing areas.

The amount of federal acres leased for oil and/or gas in the Rock Springs Field Office is 1,745,950. Currently, there are 729,360 acres within 937 leases in sage-grouse core area. The Rock Springs Field Office has 44 fluid units held by production and 18 units not held by production. There are 2,106 wells for inspection, 1,879 active wellbores, and 525 plugged and abandoned wells.

Oil wells produce from formations that are predominately buried at shallower depths than formations that produce gas. About 86% of oil wells produce from Mesaverde Group and younger rocks, while about 67% of all gas wells produce from rocks that are older and generally more deeply buried. About 82% of all oil wells produce from depths of less than 7,000 feet, while about 68% of all gas wells produce from greater depths.

The Rock Springs Field Office contains 14 lithostratigraphic units with the Almond, Lance, and Frontier formations. Natural gas wells in the Rock Springs Field Office are drilled as conventional wells; however, infill field development is typically directionally drilled from multi-well pads. Typically these wells range in depth from 7,000 to 13,000 feet in true vertical depth. There is a high success rate of 93% for spud to completed wells in the Rock Springs Field Office. It must be noted that the majority of these wells spudded in the last ten years are infill or drilled within existing fields.

The Rock Springs Field Office is not an important source of CBNG. The Rock Springs Field Office contains coal; however, there have been no successful projects that have produced CBNG in economically significant quantities. From 2002 to 2007, seven CBNG projects attempted to produce CBNG from several pods of wells located in the Rock Springs Field Office; however, five projects failed to be economical. One was never drilled, and the seventh project was drilled but never produced.

There are currently 85 operators producing oil and gas resources in the Rock Springs Field Office. As of October 2010, federal oil and gas leases cover about 1,722,310 acres, or 48% of the field office. The number of leases and total number of acres under lease in each county are presented in Table 3-47.

Table 3-47. Number of Oil and Gas Leases and Acreage by County in the Rock Springs Field Office

Portions of County in Rock Springs Field Office	Acres in County (acres)	Acres Available to Lease (acres)	Number of Leases	Acres Leased (acres)	% Leased
Sweetwater	2,866,280	2,270,490	1,780	1,411,790	62%
Sublette	451,260	399,770	296	200,560	50%
Fremont	172,240	103,850	4	5,120	5%
Uinta	74,980	68,730	128	62,760	91%
Lincoln	42,560	42,590	101	42,090	99%
TOTAL	**3,607,320**	**2,885,430**	**2,309**	**1,722,320**	**60%**

Source: BLM 2010 GIS Mapping as of October 25, 2010

Approximately 764 wells were completed in the Rock Springs Field Office from January 1, 1999, to December 31, 2009. Each well disturbed approximately four acres for initial drilling operations (accounting for approximately 3,060 acres of new disturbance). Upon completion of operations, interim reclamation has been implemented.

Since 1999, there has been a variable peak and fall in oil and gas well completions on federal oil and gas leases. In 1999, 39 wells were spudded in the Rock Springs Field Office, with the peak in 2006 of 102 well spuds. In 2010, the curve fell again to only 40 wells.

The most recent Reasonable Foreseeable Development from the Wyoming State Resource Management Group projected that between 446 conventional wells and 110 CBNG wells would be drilled from 2007-2011 in the Rock Springs Field Office. However, the Hiawatha EIS and the Normally Pressured Lance EIS are estimated to be signed in the next 1-3 years and have an estimated 4,200 and 3,500 wells each. Since these projects are only partially in the field office, it is assumed that 45% of the total wells would be drilled in the field office (approximately 3,500 wells in the next 10 years). There are also several other NEPA projects that are not yet completed that will allow drilling wells on additional leases currently in the Rock Springs Field Office.

There are 59 oil and gas units covering approximately 475,000 acres of state, fee and federal minerals in the Rock Springs Field Office. Of these 59 units, 76% are currently held by production (HBP). Two units are Enhanced Recovery units (Monell and Henry) and are not required to be HBP. The units with the more recent effective date are drilling and exploring for reserves to obtain HBP status. It is estimated that approximately 50% of the unproven units will locate sufficient hydrocarbons.

Of the 59 units, there are 14 oil and gas units entirely within and four partially within the sage-grouse core areas (Table 3-48). Five of these units have not been fully developed, and wells in these areas will continue to be added to fulfill their unit obligation. Four of the five will have additional analysis in the Hiawatha EIS and the Normally-Pressured Lance (NPL) Project EIS for Greater Sage-Grouse.

Table 3-48. Oil and Gas Units in the Rock Springs Field Office and Production Status

Oil and Gas Unit	Acres	Effective Date	Status
South Baxter Basin**	38,770	11/1/1942	HBP
Table Rock	12,690	9/19/1945	HBP
Salt Wells*	670	6/21/1949	HBP
East LaBarge	5,580	4/6/1951	HBP
Desert Springs	14,400	1/21/1958	HBP
Trail	6,760	5/14/1958	HBP
Arch	12,570	2/26/1959	HBP
Figure Four Canyon	1,280	6/9/1959	HBP
Playa	4,100	3/22/1960	HBP
Jackknife Spring	1,490	9/2/1960	HBP
Joyce Creek*	1,280	4/24/1962	HBP
Nitchie Gulch	5,960	10/1/1962	HBP
Monell	10,120	12/1/1964	
Brady Deep	5,980	10/18/1970	HBP
Kinney	2,470	6/5/1973	HBP
Fontenelle II	13,060	7/30/1974	HBP
Delaney Rim	1,660	3/17/1975	HBP
Higgins	4,840	8/3/1975	HBP
Leucite Hills	1,280	3/7/1976	HBP
Monument Butte IV	7,080	3/27/1978	HBP
Steamboat Mountain	640	4/18/1978	HBP
Butcher Knife Spring	2,200	9/25/1979	HBP
Henry*	5,950	4/30/1980	HBP
Jefferson	600	10/19/1980	HBP
Buccaneer*	680	11/13/1980	HBP
West Swan	870	11/28/1980	HBP
Blue Forest	9,720	12/13/1980	HBP
Bitter Creek II*	360	1/24/1983	HBP
Stead Canyon	1,360	2/28/1983	HBP
Little Monument II	2,680	3/15/1984	HBP
South Henry*	1,160	9/4/1984	HBP
Rim Rock	640	11/1/1984	HBP
Raptor	2,420	5/31/1985	HBP
Emigrant Trail	600	1/1/1986	HBP
Pine Canyon	1,400	1/1/1989	HBP
Taylor Ranch*	1,840	9/25/1990	HBP

Oil and Gas Unit	Acres	Effective Date	Status
Canyon Creek Dome	14,510	2/20/1991	HBP
Henry Enhanced*	7,830	4/1/1992	
Haven*	3,560	5/11/1993	HBP
Bravo	3,720	10/20/1993	HBP
Rattlesnake	2,240	7/23/1999	HBP
Stagecoach Draw*	3,860	6/1/2000	HBP
Laney Rim	20,300	12/13/2000	HBP
Hacienda**	21,110	2/28/2001	HBP
Horseshoe*	1,470	3/1/2002	HBP
Lodgepole Shallow	320	8/1/2002	
Copper Ridge (CBM)	3,580	12/24/2002	
North Copper Ridge (CBM)	3,000	1/7/2003	HBP
South Brady (Shallow)	280	1/16/2003	HBP
Chicken Springs (CBNG)*	19,780	7/30/2004	
Horseshoe Basin**	24,980	4/29/2005	
Crimson*	23,610	9/19/2005	
Whiskey Canyon**	14,730	1/12/2006	
Puma (Deep)	18,200	4/20/2006	
Eden Ranch*	12,570	5/21/2008	
Rubicon	40,080	6/30/2008	
Alkali Gulch	24,710	10/27/2008	
Airport	800	12/8/2008	
Desolation Road	24,960	12/22/2008	
Total	**475,360**		

GIS mapping 2010 Greater Sage-Grouse version 3 and WOGCC Oil and Gas Units
*Denotes unit is entirely in Greater Sage-Grouse Core Area version 3
**Denotes part of unit is in Greater Sage-Grouse Core Area version 3

Based on trends from 1990 to 2007, the number of wells drilled each year should remain between 40 and 60 wells per year until the NEPA process is completed for the Hiawatha and NPL Areas. Between 1997 and 2007, a total of 746 wells were completed, yielding an average of 62 wells per year. The formal RFD for the Rock Springs Field Office is not completed, but it is in progress.

Coal

Coal mines within the resource area include three active open pit surface mines, one active underground mine, and one inactive underground mine. The coal is used to supply local industry and power plant needs and is shipped to other eastern and western markets. Environmentally, these low sulfur coals are important locally and in eastern markets; however, projections for demand and supply of southwestern Wyoming coal is dependent upon world oil prices, transportation costs, availability of alternate fuels, and changes in federal laws and regulations. New low emission regulations are creating higher demand for Wyoming coals.

Table 3-49. Federal Coal Leases in the Rock Springs Field Office

Coal Mine		Federal Coal Lease Acreage
Black Butte	WYW6266	14,980
	WYW23411	610
	WYW160394	1,400
	Total	**16,990**
Bridger	W-0313558	4,280
	W-2727	3,440
	W-2728	1,440
	W-154595	2,240
	Total	**11,400**
Lion Coal	W-119606	**81**
Total Federal Coal Lease Acres		**56,861**

Coal production is expected to hold steady from the two surface mines and the single underground mine. No new coal mining operations are planned in the field office area. Current federal coal leasing efforts are in support of existing operations to maintain current production levels.

Other Leasables

Sodium/Trona

There are five active companies mining trona. One company processes sodium products only, and several companies and individuals hold undeveloped sodium leases within the Basin. Only Rhone-Poulenc (Stauffer), Texasgulf (TG), and FMC mining operations are within the Rock Springs Field Office.

Average annual combined trona production from the four mines within the resource area is about 16 million tons per year. Production is expected to hold steady from the four producing underground mining operations. One idle solution mine may be reactivated.

Oil Shale

Oil shale areas of interest in southwestern Wyoming lie within the Green River and Washakie Basins. These areas are presently withdrawn from locatable numeral entry to protect the oil shale resource. Although the oil shales within these basins are of lesser quality than Colorado oil shales, they are nevertheless as important as the Colorado oil shales: some of these oil shale beds contain several trillion barrels of oil per square mile (Trudell et al. 1973).

The Green River and Washakie Basins contain approximately 476 billion barrels of in-place oil within the shale. These oil shale deposits have not been leased, nor have they received major attention from industry, primarily due to high development costs of underground and surface mining methods. Several in situ research projects and tests were conducted west of Rock Springs over 30 years ago that provided marginal results concerning the future extraction of this mineral resource. Final federal regulations governing oil shale leasing and development were published in the Federal Register on November 18, 2008.

There are currently no federal oil shale leases in the Green River and the Washakie Basins. There are no expressions of industry interest to explore for or to develop oil shale resources in this area. No federal leases for commercial oil shale tract development (640 acres) will be issued until further notice.

Locatable Minerals

Mining claims have been located throughout the resource area for a variety of minerals locatable under the Mining Law of 1872, but no major commercial operation has been initiated. All lands with mineral entry rights are open to mining claim location unless the lands have been withdrawn from locatable mineral entry.

Known types of mining claims include claims for gold, jade, building stone, pumice, uranium, beryllium, barium, strontium, zeolite-bearing minerals, and diamonds; however, a mining claimant is not required to identify the mineral being prospected at the time of location. None of these claims are now under production. Minerals identified in the Rock Springs Field Office, which have not been produced in commercial quantities, are zeolite, gold, uranium, jade, building stone, pumice, barium/strontium, and titanium. The potential for the occurrence of diamonds exists, although no occurrence has yet been identified. Mineral types such as silver, platinum, copper, titanium, vanadium, bentonite, and fire clay are not known to occur in significant quantities within the Rock Springs Field Office. These varied mineral deposit types can occur in specific locations over a wide geographical area and within diverse geologic settings; these settings range from low-lying stream beds to high desert flats and plateaus, volcanic deposits, and granitic upland terrains.

Placer gold is the only locatable mineral that has achieved any significant interest within the Rock Springs Field Office. There is currently one very small gold recovery operation active on mining claims in the northern portion of the area. No new commercial gold mining operations are known to be proposed or planned for the future. Other locatable minerals that have shown at least some level of interest in the past include diamonds, semi-precious stones, zeolite, and uranium. There are currently no known or proposed plans for the development and production of any of these minerals. There are currently a total of 102 active claims in the field office.

Salable Minerals

The salable materials that are the most common in the Rock Springs Field Office include sand and gravel, decorative stone (moss rock), dimension stone (flagstone), and, to a lesser extent, topsoil, decorative boulders, and petrified wood. Most of the sand and gravel production that occurs in this area is used locally for road construction and maintenance, while the decorative and dimension stone has been used in the commercial and residential construction industry throughout the region and beyond.

It is anticipated that the demand for sand and gravel resources from this region will remain at current levels or show a slight increase in activity. The demand for this resource will be mostly dependent on new road construction and maintenance projects in the local area, particularly those that support the oil and gas industry. At this time, the oil and gas industry is in a down cycle, and, consequently area-wide sand and gravel production is also down. Currently, field office records indicate that limited gravel production for use in county road maintenance is occurring from pits operated by Sweetwater County on their free use permits; none of the other active sand and gravel permits are currently producing.

The common use areas established in the Rock Springs Field Office for decorative and dimension stone and topsoil continue to be used at a steady pace by the local residents as a source for landscaping material. The demand for these materials is expected to remain at current levels into the foreseeable future. There is not a demand to establish additional common use areas for these materials, since the currently available resource supply should be adequate to meet the demand. No community pits are currently established and none are proposed for the future.

3.8.2 Forest Service

General Planning Area Description

Mineral resources include the individual resources of leasable, locatable, and salable (common variety) minerals. Renewable energy includes wind, solar, and geothermal energy.

Leasable Minerals

Leasable minerals include energy and non-energy minerals regulated under the Mineral Leasing Act of 1920 (as amended) (MLA) and the Geothermal Steam Act of 1970. Such minerals include, but are not limited to, oil and gas, coal, and oil shale. Leasable minerals are available through a system of competitive and non-competitive leases administered by the BLM.

Oil and Gas

Wyoming is the number one producer of federal onshore oil and the number two producer of federal onshore gas in the United States. The oil and gas program can be broadly categorized into the following four functional areas: (1) lease operations, (2) inspection and enforcement of lease operations, (3) planning and policy related to oil and gas actions, and (4) geophysical exploration.

The BLM administers APDs for federal minerals, regardless of surface ownership. In the case of federal minerals underlying National Forest System land, the Forest Service is responsible for approving the Surface Use Plan of Operations (SUPO) portion of the APD. The BLM incorporates the approved Forest Service SUPO in the APD before granting final approval to drill a well. In the case of federal minerals under private surface ownership, the BLM alone administers the APD, and the lessee/operator must work with the private landowner on provisions for surface access.

The Forest Service is responsible for authorizing and administering geophysical exploration operations on all National Forest System lands within the planning area. Geophysical operations are authorized using guidance from Forest Service Manual 2860-96-3, Region 2 Supplement Manual 2800-2006-1, Region 4 Supplement Manual 2860-2005-1, and the applicable LRMP. Operators may apply for geophysical project using the standardized interagency form FS-2800-16/BLM 3150-4 (Notice of Intent/Authorization to Conduct Oil and Gas Geophysical Exploration Operations). Geophysical operations occur on leased and unleased lands and are authorized on a case-by-case basis. COAs are added to the project based on site-specific reviews in order to minimize the impacts to various resources.

Coal

The BLM manages coal leasing and other administrative duties related to coal production on federal coal lands throughout the United States. Wyoming has the largest federal coal program within the BLM. Wyoming is the nation's largest producer of coal, producing about 34% of the nation's coal. The majority of Wyoming coal is used for steam generation in the electrical utility industry. Coal production in Wyoming has increased dramatically since the early 1970s. The BLM is the lead agency responsible for leasing federal coal lands under the Minerals Leasing Act for Acquired Lands of 1947 as amended by the Federal Coal Leasing Amendments Act of 1976. The BLM is also responsible for preparation of this EIS to evaluate the potential environmental impacts of issuing a coal lease. The Forest Service has consent authority to the BLM leasing National Forest System lands for coal.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the Mining Law of 1872 (as amended). Examples include iron, gold, copper, silver, lead, and zinc. The public has the statutory right to explore for, claim, and mine mineral deposits found on federal public domain lands subject to the U.S. mining laws. Per 36 CFR 228, Subpart A, the Forest Service ensures mining operations are conducted to minimize adverse environmental impacts on National Forest System surface resources. The BLM is responsible for managing the mineral resources under National Forest System lands.

Salable (Common Variety) Minerals

Disposal of common variety minerals is discretionary and is addressed under the Materials Act of 1947, as amended by the Acts of 1955 and 1962. These acts authorize certain mineral materials to be disposed of either through a contract of sale or a Free Use Permit (FUP) to government agencies or eligible non-profit organizations. Salable minerals include common variety materials such as sand, gravel, stone, limestone aggregate, and borrow material. These materials are typically used in various construction, agriculture, and decorative building or landscaping applications.

Renewable Energy

Renewable energy is generally defined as energy derived from sources continuously replenished by natural processes. These sources include wind, solar, biomass, and geothermal energy. Wind energy refers to the kinetic energy generated from wind produced by power-generating turbines. Solar energy is the use of the sun's energy to produce electricity, often through the use of photovoltaic panels that convert sunlight directly into electricity using semiconductor materials. Biomass (also called bioenergy) is the process of converting forestry and agricultural crops, crop-processing wastes and residues, animal manures, and landfill methane gas into electricity. These waste products are either burned directly or converted into fuels that can be burned to produce energy. Geothermal energy is heat in the form of hot water, steam, or rocks near the surface of the Earth's crust used for direct heating and cooling or for the generation of electricity (Energy Atlas 2004).

Wyoming represents one of the strongest potential wind resources in the country and presently is an exporter of wind generated power to several surrounding states. The state also has some potential for solar, biomass, and geothermal energy; however, the demand for these renewable energy sources is not as strong as the demand for wind energy. The installed renewable energy capacity in Wyoming is 284.65 MWs of wind energy, 0.05 MW of solar energy, and 0 MW of biomass and geothermal energy (Energy Atlas 2004).

Bridger-Teton National Forest

Leasable Minerals

The Wyoming Range Legacy Act withdrew lands within the Wyoming Range on the BTNF from mineral leasing. The Act withdrew approximately 1.2 million acres to: (1) all forms of appropriation or disposal under the public land laws; (2) location, entry, and patent under the mining laws; and (3) disposition under laws relating to mineral and geothermal leasing. The withdrawal area does not affect existing rights and allows for oil and gas leasing within one mile of the withdrawal boundary. The withdrawal has no time limit, as it is a congressionally designated withdrawal, and the Act amended the BTNF LRMP. In addition, the BTNF LRMP identified other areas closed to leasing (e.g., wilderness, wilderness study areas, wild/scenic rivers, and other specific areas identified by management area). Currently, approximately 1,100 acres of mapped priority habitat and 113,910 acres of mapped general sage-grouse habitat on the BTNF are not available to mineral leasing and would not likely be affected by future mineral developments.

Oil and Gas

A small percentage of National Forest System lands are subject to present oil and gas operations or future oil and gas leasing (subject to valid existing rights). There are a limited number of oil and gas leases in a variety of dispositions and few areas available to future oil and gas leasing. Table 3-50 summarizes current oil and gas administration on the Forest.

Table 3-50. Current Availability of Oil and Gas, and Geothermal Leasing in the Bridger-Teton National Forest

Land Status w/Stipulation	Acres	Percent	Notes
Forest Total Area	3,465,000	100	
Closed (surface and subsurface estates)	2,566,000	74	Wilderness, wilderness study areas, wild rivers, special legislation, Secretarial Order, and LRMP by desired future condition (DFC)
Sage-grouse Core Area	2,000	<1	
Sage-grouse Occupied Area	116,000	5	
Open (surface estate only)	899,000	26	Per LRMP by DFC
w/Standard Lease Terms Only	0	0	
w/NSO	312,000	35	Includes NSO, Conditional NSO and Technical NSO (slopes >40%) stipulations
In Sage-grouse Core Areas	1000	<1	
In Sage-grouse Occupied Areas	60,000	19	
Outside Sage-grouse Areas	252,000	81	
w/CSU	587,000	65	Includes Technical NSO (unsuitable soils and landslides), timing-limitations, coordinated exploration, special stipulations, inventoried roadless areas, and specific resource protections
In Sage-grouse Core Areas	3,000	1	
In Sage-grouse Occupied Areas	170,000	29	
Outside Sage-grouse Areas	413,000	70	
Available for Leasing	692,000		
Existing Leases	184,000		

Leases held by production have authorized and ongoing activities. Numerous lease operations are currently held in suspension. Numerous leases will remain suspended by the BLM until additional NEPA analysis is completed by the Forest Service, such as the Oil and Gas Leasing in Portions of the Wyoming Range in the Bridger-Teton National Forest Supplemental EIS. Certain parcels under review in the Supplemental EIS will be available for future leasing if the Forest Service and BLM decide to not authorize leasing per the Omnibus Public Land Management Act of 2009 (P.L. 111-11; 123 Stat. 991 §3201-03). There are other pending lease parcels that may be available for future leasing if the Forest Service and BLM do not authorize leasing.

Of the remaining areas available to future leasing on the Forest, most areas are generally in the central portion of the Forest and on the front range of the Wind River Range outside the Bridger Wilderness.

There are currently 12 wells producing natural gas on separate pads in the Wyoming Range. Seven out of the 12 producing natural gas wells are located in occupied sage-grouse habitat.

Interest in oil and gas resources has increased during the past decade with the increase of natural gas prices. Natural gas demands and, consequently, supplies are expected to increase in the next decade due to the use of natural gas as a transition fuel from crude oil to greener energy technologies.

Solid Leasable Minerals

There are numerous areas throughout the entire forest that have experienced coal exploration and development in the past. There is no active coal lease or expressed interest. There are a few reported coal seams and/or past mines that may require mitigation and/or reclamation in the future. The Forest has numerous coal and phosphate withdrawals in areas currently available to mineral leasing. One sodium lease is in operation on the Forest and is located outside of designated sage-grouse habitat.

Locatable Minerals

There are 13 mining claims in the BTNF, and all are located outside of sage-grouse core and occupied habitats. Approximately 827,870 acres out of approximately 3,465,000 acres, or 24% in the Forest, are open to mineral location and entry, with the remaining approximate 2,637,000 acres withdrawn from mineral location and entry by acts of Congress (Wilderness Act, Wild and Scenic Rivers Act and the Omnibus Public Land Management Act of 2009 establishing the Wyoming Range Withdrawal Area) and the LRMP. Of the approximate 828,000 acres open to mineral location and entry, only approximately 4,000 acres are in sage-grouse core habitat, and approximately 232,000 acres are in sage-grouse occupied habitat areas. Small mining operations are regularly conducted in the Forest in streams in the sage-grouse occupied habitat and possibly in sage-grouse core habitat. Some of these small operations, such as suction dredging, are categorized as "[operations] which might cause significant disturbance of surface resources," may necessitate a Notice of Intent (NOI) per 36 CFR 228.4(a). Other small mining operations are exempted from a NOI per 36 CFR 228.4(a)(1), such as gold panning, metal detecting, and collecting mineral specimen using hand tools. Mining operations that will cause a significant disturbance of surface resources requiring an approved Plan of Operations may be conducted within the sage-grouse core and occupied habitats, but this has not been the case in the recent past.

Salable (Common Variety) Minerals

The Forest regularly sales or issues FUPs for common variety minerals to individuals, WYDOT, and the Federal Highways Administration. There are approximately eight gravel pits in existence on the Forest, with two in general and one in core sage-grouse habitat. Out of the 18 active mineral material sites on the Forest, one is located in designated core habitat, two in designated connectivity habitat, and three in designated general habitat.

Renewable Energy

There are numerous past geothermal exploration sites on the Forest. There are no renewable energy projects being conducted on the Forest, nor any foreseeable interest.

Medicine Bow National Forest

Leasable Minerals

Oil and Gas

The MBNF leasing decision is based on and closely tied to the Forest Plan. The completed oil and gas analysis for the 2003 Revised Forest Plan applied to 272,520 acres of federal minerals and 270,980 acres of federal surface estate. These areas have moderate and low oil and gas occurrence potential. The remaining 1,115,250 acres of the planning area were not included in the oil and gas leasing analysis for the following reasons:

- The federal government has no authority over privately held minerals regardless of surface ownership (193,990 acres), and
- Most of the Forest is located on uplifts of crystalline rocks, lacks sedimentary rocks, and has no known oil and gas occurrence potential (921,260 acres).

Table 3-51 shows the oil and gas leasing stipulations in Greater Sage-Grouse habitat in the MBNF.

Table 3-51. Oil and Gas Leasing Stipulations in Greater Sage-Grouse Habitat in the Medicine Bow National Forest

Greater Sage-Grouse Habitat Type	Oil and Gas Potential	Oil and Gas Leasing Stipulation	Acres
Core Area	Low or Medium Potential	Standard Lease Terms	530
		Controlled Surface Use	18
		Controlled Surface Use and Timing	15
	No Potential	Not Administratively Available (Closed)	88
		Private Surface with Private Minerals	5,250
		Site Specific Analysis required, no potential	5,170
General Habitat	Low or Medium Potential	Standard Lease Terms	170
		Controlled Surface Use	300
		Controlled Surface Use and Timing	1,620
		Timing Limitation	19
		No Surface Occupancy	1,150
		Private Surface with Private Minerals	140
	No Potential	Not Administratively Available (Closed)	0.2
		Federal Surface with Private Minerals	64
		Private Surface with Private Minerals	6,150
		Site Specific Analysis required, no potential	25,300

The Sierra Madre and Snowy Range portions of the MBNF have historic exploration for oil and gas resources. Eleven exploratory wells, all plugged and abandoned, were drilled on the Forest between 1954 and 1983. Between 1919 and 1987, 32 exploratory wells were drilled adjacent to the Forest in the western Sierra Madre area and northern and eastern Snowy Range area. These wells also are all plugged and abandoned. Production has been established in fields within five miles of the western Sierra Madre and eastern Snowy Range areas of the Forest. However, the reservoirs that produce in these fields do not extend onto the Forest. The reservoirs are too shallow to have significant potential for production or have been removed by erosion.

In 1995, the MBNF had 12 active oil and gas leases, all of which expired without drilling activity by the year 2000. There are presently no oil and gas leases on the MBNF or any requests for leases on the Forest. There has been limited seismic exploration.

Coal

There are no coal resources within the MBNF.

Locatable Minerals

The Forest has some areas with high to moderate potential for locatable minerals (Hausel and Sutherland 1999). The potential commercial production of these minerals is concentrated in a few areas. Much of the surface within the MBNF was prospected during the late 1800s and early 1900s. Many areas show an almost continuous coverage by historic prospects and mines. Most mines and prospects were not developed to any great extent; a few yielded attractive base and/or precious metal assays and were developed into commercial ventures. Mine operations ceased at most of these mines due to a variety of circumstances, including declining metal prices, ore complexity, outbreak of war, and other political or human-related factors.

Most of the current mining activity on the Forest has been considered recreational. Although the Forest Service does not acknowledge recreational mining, many state and federal agencies do. Recreational mining includes panning and suction dredging, with a suction diameter of three inches or less for short durations in specified timeframes. The U.S. Army Corps of Engineers considers the use of a three inch or smaller suction dredge for recreational mining and does not require a 404 permit for this activity. WDEQ-AQD issued Letters of Authorization for these activities in the past. The Forest now requests that individuals send the required information to them. The Forest Service then assumes responsibility for inspecting the mining operation to ensure it complies with spacing and other requirements of the Guideline. The state's guidelines are some of the most stringent in the nation.

There are between one and three bonded small mining operations on the Forest annually. These operations are seasonal, are covered by a Plan of Operations, and typically use a small backhoe to dig exploratory trenches.

There are exploratory core drilling operations on the MBNF about every third year. However, after the exploratory drilling is completed, there has historically been no further interest. Exploration, development, and production of locatable minerals will continue to depend on market prices and commodity supply and demand. As technological advances are made, the MBNF should expect an increase in exploration demands due to the conclusion of some geologists that this may be one of the more highly mineralized forests in the United States.

Locatable mineral withdrawals in the MBNF are listed in Table 3-52. The Forest Service may request withdrawal of areas from mineral activity if the activity potentially conflicts with other management objectives.

Table 3-52. Locatable Mineral Withdrawals in the Medicine Bow National Forest

Greater Sage-Grouse Habitat Type	Type of Withdrawal	Acres
Core habitat	Platte River Wilderness	82
General habitat	Encampment River Wilderness	0.18
General habitat	Battle Mountain Research Natural Area	720
	Total	**802.18**

Source: Data from Medicine Bow National Forest Management Area GIS layer in conjunction with Final EIS information

The areas with moderate to high geologic potential for discovery of locatable minerals include the Eagle Rock-Happy Jack area for Kimberlitic indicator minerals and the Mullen Creek, Lake Owen, and Puzzler Hill geologic complexes for platinum-palladium mineralization indicators. There have been exploratory core drilling operations in each of these complexes, but there has been no further interest in the complexes. Market prices, commodity supply and demand, and technological advances will influence future interest in exploration, development, and production. These areas are not located in core or general sage-grouse habitat.

Salable (Common Variety) Minerals

Several areas have the potential for building stone and decorative stone. The Forest Service has received several requests for information, but none with formal proposals to quarry or produce the materials.

Renewable Energy

While there has been some exploration of wind, solar, biomass, and geothermal resources, these activities have predominantly occurred in the Pole Mountain area. There is no core or general sage-grouse habitat in this area.

Thunder Basin National Grassland

Leasable Minerals

Oil and Gas

The TBNG has experienced relatively steady and moderate conventional oil and gas development over the past ten years. For the next ten years, there is still high potential development of conventional oil and gas wells, based on geologic potential, historical drilling trends, and favorable economic and technological conditions.

Table 3-53 lists the acres of oil and gas leasing stipulations in Greater Sage-Grouse habitat on TBNG. There are 41,290 acres of no surface occupancy in core habitat and 79,580 acres in general habitat.

Table 3-53. Oil and Gas Leasing Stipulations in Greater Sage-Grouse Habitat in Thunder Basin National Grassland

Oil and Gas Leasing Stipulation	Acres
Open to Oil and Gas Leasing	553,410
Closed to Oil and Gas Leasing	0
Controlled Surface Use	553,410
No Surface Occupancy	120,870

Source: Oil and Gas Leasing Stipulation Geospatial Layers

A small part of the TBNG west of the coal outcrop near Highway 59 has high potential for coalbed natural gas. This part of the grassland has experienced relatively high levels of development of CBNG resources on existing leases in the past five years. This part of the grassland is a small portion of a much larger area of the Powder River Basin that has high potential for coalbed natural gas.

Average production from wells on Forest Service surface/federal minerals is 4.6 barrels per day. Consequently, most oil wells on the grassland are marginally economical wells. These wells produce fewer than 15 barrels of oil per day. On a national basis, these types of wells produce 32% of the oil that comes from federal lands. This is an important component of national oil production and is significant to both local and national economies.

As of April 11, 2012, there were 315 active, producing conventional oil, natural gas, and CBNG wells and battery sites. In addition, there were approximately 168 wells that were in various stages of production from initial permitting to “shut in.” The “shut-in” wells vary from pending work-over maintenance to pending permanent plug and abandonment. There are many oil and gas leases with only one producing well and several other wells that are temporarily abandoned. Some wells have been shut-in for as long as ten years without being put back into production or being plugged and abandoned.

As of April 11, 2012, there have been a total of 1,251 processed APDs for wells on the TBNG. This total includes conventional oil and gas wells and CBNG wells.

Over the last three years, the Douglas Ranger District office has processed 1-2 large geophysical projects per year. This is anticipated to increase, at least for the next three to five years as the technology and the demand increases. This is then expected to decline as more companies move forward into lease nominations, lease acquisitions, and development.

Coal

Coal development potential for the planning area is very high and is located within the 8.4 Management Area, Hilight Bill Geographic Area. There are four coal mines on the TBNG, either in production or some phase of planning or construction. The mines that operate on and near the planning area are Black Thunder Mine (consolidated with Jacobs Ranch Mine in 2009), North Antelope Rochelle Mine, School Creek Mine, and Antelope Mine. The four mines have a collective footprint of over 120,000 acres within the planning area, of which approximately 44,500 acres is on National Forest System lands and produce around 300 million tons of coal per year (current from 2010 data).

The existing life of mining within the planning area will be dependent upon new leasing opportunities in the future. With the existing leases in place, the life of mining is between ten and 15 years and could be extended with additional leases. There are currently five leases pending sale in the planning area.

The planning area has approximately 18,000 acres of National Forest System lands that remain uncommitted for federal coal within the area of development potential. The suitability of these lands was covered in the land and resource planning effort for the TBNG in 2001. The Thunder Basin areas considered unsuitable for mining include buffers for State Highway 450, railroads, the utility line paralleling the railroad, 160 acres used by University of Wyoming for scientific study, and 400 acres of alluvial valley floors significant to farming. Areas with deferred suitability decisions include state highways, county roads, occupied dwellings, 480 acres of the University of Wyoming scientific site, areas of bald or golden eagle nests (these sites have buffer zones drawn around them), prairie falcon nest sites, habitat for migratory bird species, grouse leks, and the remaining alluvial floors not listed above (Coal Screening Process, 1997).

Locatable Minerals

Of the 553,410 acres of TBNG surface, 518,850 acres are available for locatable mineral development. Areas unavailable for locatable mineral development are NSO, SIAs, and research natural areas (RNA).

Bentonite

While bentonite can be also considered leasable under the Minerals Leasing Act for Acquired Lands of 1947, it is considered locatable on public domain lands and handled as such under the General Mining Law of 1872.

Bentonite material is a common occurrence on the grasslands throughout the Upton/Osage Geographic Area of the TBNG. Several bentonite strip mines existed in the Upton-Osage area; however after a depressed market, many operations ceased. There remains potential for new development in the Upton-Osage area as prices and markets once again strengthen. Over the last two years, there have been a small number of inquiries about new development. The only authorization to date has been to complete baseline survey work. American Colloid, based out of Upton, Wyoming, has bentonite claims on public domain lands within the TBNG.

Uranium

No active uranium mining occurs on the grassland. The Bear Creek Uranium Mine and Mill once operated about 18 miles west of Bill, Wyoming, on the TBNG. Bear Creek Uranium is in the final stages of reclamation and is being monitored by the Department of Energy (DOE). No lands within the planning area are leased for uranium mining. The development potential for uranium within the planning area is low.

Salable (Common Variety) Minerals

Salable minerals known to occur within the planning area are limited to aggregates (e.g., sand and gravel, shale, clinker/scoria). These commodities have a low per-unit valuation. As long as the development potential remains limited and the unit valuation remains low, non-fluid minerals are not expected to be significant contributors to the economic minerals sector of the local economy.

A small number of clinker mines are dispersed across the TBNG, both inside and outside of Mineral Production and Development Management Area 8.4. The mines are small community pits. Disposals are infrequent and generally small free-use quantities (less than 10 cubic yards per year). Existing pit haul roads, generally unpaved, are sufficient to support the existing traffic transporting small volumes of mineral materials. Potential future development of additional mineral materials pits may require the establishment of new pit haul roads. The mines are collectively permitted up to 2.0 million cubic yards of material but have been averaging 1.2 million cubic yards of clinker/year.

The TBNG has seen an increase in the amount of salable minerals sold and the number of contracts and request for contracts for salable minerals. Demand for salable minerals, particularly for scoria, sand, and gravel, is projected to increase in proportion to the increase in energy mineral exploration and development. These minerals are primarily used in the construction phase of energy mineral exploration and development activities. Exploration and production of salable minerals is increasing. Local demand and the ongoing needs for more mineral material from the public lands for various private and public projects have resulted in a large volume of mineral materials-related activity to be processed by the Douglas Ranger District.

3.9 PALEONTOLOGY

3.9.1 Bureau of Land Management

Paleontology is the study of fossils and related remains. A fossil is defined as any naturally occurring evidence of past life (generally 10,000 years or older). The term "paleontological resources" includes any fossilized remains, traces, or imprints of organisms that are preserved in or on the Earth's crust, are of scientific interest, and provide information about the history of life on Earth. Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on Earth. Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used to assess the occurrence potential of paleontological resources.

The BLM manages paleontological resources for scientific, educational, and recreational values and also to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data should be considered as early as possible in the decision-making process. Paleontological resources are managed according to the BLM Manual Section 8270, Paleontological Resource Management, BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management, and applicable BLM instructional memoranda and bulletins. Additional preservation measures have been enacted under the Omnibus Public Lands Act of 2009. In 2009, Congress passed the Paleontological Resources Preservation Act as part of the Omnibus Public Land Management Act (Public Law 111-11). The Act mandated that the Secretaries of the Interior and Agriculture manage and protect paleontological resources on federal land using scientific principles and expertise. It also stipulated that they develop appropriate plans for inventory, monitoring, and scientific and educational use of paleontological resources, in accordance with applicable agency laws, regulations, and policies. Lastly, it stipulated that these plans shall emphasize interagency coordination and collaborative efforts where possible with nonfederal partners, the scientific community, and the general public. The BLM is currently developing regulations to implement the requirements of this law.

The BLM is legally mandated to manage and protect paleontological resources for the benefit of the public, primarily under the auspices of the FLPMA. Scientifically significant fossils include all vertebrate fossil remains (body and trace fossils), and those plant and invertebrate fossils determined on a case-by-case basis to be scientifically unique. Management of fossils found on BLM-administered lands is restricted to public surfaces. Collecting fossils is allowed with some restrictions, depending on the significance of the fossils. Hobby collecting of common invertebrate or plant fossils for personal use by the public is allowed in reasonable quantities when only hand tools are used. Commercial collecting of fossils is not permitted. Collection of all vertebrate and any scientifically significant plant or invertebrate fossils may be done only under permits issued by the BLM to qualified researchers. The basic permit is the survey and limited surface collection permit issued for reconnaissance work and collection of surface finds with a 1-square-meter limit to surface disturbance. If the disturbance will exceed one square meter or require mechanized equipment, the researcher must apply for an excavation permit. Prior to authorization of an excavation permit (and, in some cases, for survey permits in Special Management Areas [SMA], the BLM must prepare an Environmental Assessment (EA) for the proposed location as per NEPA regulations. All fossils collected under a permit remain public property and must curate in an approved repository.

BLM guidance (BLM Instruction Memorandum 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands) defines a classification system to provide a more uniform tool to assess potential occurrences of paleontological resources and evaluate potential impacts. The Potential Fossil Yield Classification (PFYC) system is intended to be applied as a broad approach for planning efforts in evaluating specific projects. This is part of a larger effort to update BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management. Using the PFYC system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts. A higher class number indicates a higher potential for fossil yield. This classification is applied to the geologic formation, member, or other distinguishable unit, preferably at the most detailed mappable level. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally be found in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment. Five classes were developed: Class 1 has very low potential for containing fossils and Class 5 has very high potential.

The PFYC system class assignments are:

- Class 1-Very Low. Geologic units that are not likely to contain recognizable fossil remains. The land manager's concern for paleontological resources on Class 1 acres is negligible. Surface-disturbing activities will not require mitigation except in rare or isolated circumstances.
- Class 2-Low. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate or plant fossils. The land manager's concern for paleontological resources on Class 2 acres is low. Surface-disturbing activities are not likely to require mitigation except in rare or isolated circumstances.
- Class 3-Moderate or Unknown. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; sedimentary may also be of unknown fossil potential. The land manager's concern for paleontological resources on Class 3 acres are moderate or cannot be determined from existing data. Surface-disturbing activities often require field assessment to determine appropriate course of action.
- Class 4-High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources in many cases. The land manager's concern for paleontological resources on Class 4 acres is high (depending on proposed action). A field survey is usually required to assess local conditions. Mitigation will often be necessary before and/or during these actions.
- Class 5-Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils. Units are at risk of human-caused adverse impacts or natural degradation. The land manager's concern for paleontological resources on Class 4 acres is very high. A field survey is usually required to assess local conditions. Mitigation will often be necessary before and/or during these actions.

Existing Conditions

Conditions of the Planning Area

Some of the richest paleontological resources in the United States are in the planning area. The area contains one of the most complete records of continental deposition in North America. Vertebrate fossils are especially significant in the planning area. Paleontological research has been conducted in this part of Wyoming since 1856. More than 50 museums and universities have searched the planning area for vertebrate fossils and significant invertebrate and plant fossils. These fossils can be found in collections around the world. The rich paleontological resources present in the planning area can be attributed to the area's high elevation and continental climate, which hinder vegetative growth and soil development and support erosion and bedrock exposure. Most fossils are discovered as scattered finds in areas of exposed rocks. Paleontologists sometimes rely on the public-at-large, who can play a role in making significant fossil discoveries. Exposures that produce significant fossils, particularly vertebrates, are rare, and, consequently, the fossils are of considerable scientific value and interest wherever they are found. Some localities in the planning area have yielded the only fossil record of certain extinct animals.

The planning area, which includes high fossil yielding geological formations, contains extensive paleontological resources. While comprehensive paleontological inventories have not been completed for the planning area, many paleontological studies have been conducted on BLM lands within the decision area by various government, academic, and private industry personnel. Thousands of paleontological localities have been documented over the past 150 years, representing a diverse array of plants, invertebrates, and vertebrates and are managed for scientific and educational purposes. Numerous paleontological fossil sites have been discovered and continue to be surveyed and recorded. Interest in fossils and paleontology has been greatly stimulated in recent years, bringing new avocational and professional visitors to the known fossil locations; there has been increased exploration to discover new fossil localities. This has, in turn, increased agency concern for potential impacts on paleontological resources from vandalism and theft. The current trend of paleontological resource use permits and scientific activity is likely to continue and increase in the future. Clearances and monitoring of surface-disturbing activities, land tenure adjustments, and scientific research are anticipated to be the primary means of identifying paleontological localities.

In addition to the ACECs mentioned earlier, important paleontological resources in the planning area are found in areas designated as National Natural Landmarks (NNL). One of these is the Como Bluff National Natural Landmark (NNL) area, which encompasses 7,680 acres located about five miles east of Medicine Bow. Como Bluff is a westward-plunging anticline containing formations from the Triassic through the Cretaceous periods exposed in the face of the bluff. The “dinosaur graveyard fossil bed,” an uncommon concentration of well-preserved fossils in the Jurassic Morrison Formation, is exposed in the Como Bluff area. The fossils found in the Como Bluff area played a significant historic role in the development of paleontology as a scientific discipline. Within the Sand Creek NNL, late Pleistocene and more recent vertebrate fossil deposits were recovered within a feature known as the “animal trap.” This NNL is located about 20 miles southwest of Laramie and includes 4,800 acres, of which the BLM administers a 160-acre parcel of public land. Fossil deposits recovered from the animal trap include a large extinct lion, an eagle-like vulture, a marten, and other species no longer found in the area.

Management challenges for paleontological resources in the planning area include implementation of proper mitigation requirements, appropriate land use decisions and prescriptions, compilation of data about known or potential paleontological localities, compilation of data on geological formations that may contain fossils and their overall sensitivity for fragile or rare resources, methods of accessing data in a timely fashion, and development of recreation and interpretive opportunities. Issues of concern that could represent challenges to the management of paleontological resources include all surface-disturbing activities, such as oil and gas exploration and development, coal bed methane development, other mineral development (leasable, locatable, and salable), ROWs, and land-tenure adjustments. In addition, adequately trained staff and proper funding are needed. Management of paleontological resources aims to protect scientifically significant fossils for the benefit of the public. The current management direction and forecast for paleontological resources is to implement the PFYC throughout the decision area and to identify and record new findings. Another goal is to seek opportunities to identify areas with significant paleontological resources for special management. Preservation measures for paleontological resources enacted under the Omnibus Public Lands Act of 2009 would be implemented. Surface-disturbing activities create the greatest danger to paleontological resources. Development of oil, gas, coal and other minerals and the realty actions, road and pipeline construction, and other surface disturbing activities fragment the landscape; they may also cause outright destruction of sites as well as indirect impacts such as theft. The positive effect of energy and mineral development is the increased knowledge of paleontological resources that is gained by surveys, construction monitoring, and excavations. Paleontological resources are managed to protect their important scientific values and will continue in the future as the BLM continues to enact preservation measures via the Omnibus Public Lands Act of 2009 and other legislation.

Identified Paleontological Resources

Within the planning area, rocks as old as three billion years are exposed, but presently known noteworthy fossil deposits date back to about 540 million years. Nearly all major fossil-bearing formations identified within Wyoming have been found in the planning area. The major formations known to produce dinosaur or marine reptile remains in the planning area include the Chugwater, Sundance, Morrison, and Lance formations. The Ferris, Fort Union, Hanna, Wasatch, Wind River, Green River, Bridger, Washakie, and White River formations are the main units that produce mammal fossils and other small non-mammalian vertebrates.

Precambrian Era (4.6 billion to 570 million years ago)

The **Precambrian rocks (PFYC 2-3)** located within the planning area contain few paleontological resources, except for some unique 1.7 billion year-old stromatolites (traces of blue-green algae) found in the Medicine Bow Mountains.

Paleozoic Era (570 million to 245 million years ago)

The Paleozoic Era is divided into six periods: Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian.

Cambrian Period (570 million to 505 million years ago)

- **Flathead Sandstone (PFYC 2).** Invertebrate fossils have not been reported from the Middle Cambrian Flathead Sandstone. Brachiopods are known to occur in several localities throughout Wyoming.
- **Gros Ventre Formation (PFYC 2).** Invertebrate fossils are known to occur in this Middle-Upper Cambrian formation, including trilobites.
- **Gallatin Limestone (PFYC 2).** Invertebrate fossils are known to occur within this Upper Cambrian formation.

Ordovician Period (505 million to 440 million years ago)

- **Bighorn Dolomite (PFYC 2).** Invertebrate fossils are known to occur within this Upper Ordovician formation.

Silurian Period (440 million to 410 million years ago)

- **Laketown Dolomite (PFYC 2).** Invertebrate fossils are known to occur within this Middle-Upper Silurian formation.

Devonian Period (410 million to 360 million years ago)

- **Darby Formation (PFYC 2-3).** Fossils in this Upper Devonian formation include several invertebrate groups and conodonts.

Carboniferous Period (360 million to 285 million years ago)

- **Madison Limestone (PFYC 3).** This Lower Carboniferous (Mississippian) formation has produced abundant invertebrates, including mollusks, crinoids, brachiopods, and corals.

- **Amsden Formation (PFYC 3).** This Carboniferous (Mississippian/Pennsylvanian) formation has produced abundant invertebrate fossils.
- **Tensleep Sandstone Limestone (PFYC 2).** This Carboniferous (Pennsylvanian) Permian formation has produced invertebrate fossils.

Permian Period (285 million to 245 million years ago)

- **Casper Formation (PFYC 3).** This Carboniferous (Pennsylvanian)-Permian formation has produced abundant invertebrate fossils.
- **Phosphoria Sandstone Limestone (PFYC 3).** This Permian formation has produced abundant invertebrate fossils.

Mesozoic Era (245 million to 65 million years ago)

The Mesozoic Era is often referred to as the "Age of Dinosaurs." The Mesozoic Era is divided into three periods: Triassic, Jurassic, and Cretaceous.

Triassic Period (245 million to 210 million years ago)

- **Chugwater Formation/Group (PFYC 3-4).** Vertebrate remains and traces are sporadic from this formation. Much more work is required to assess its paleontological potential. The Upper Triassic Alcova Limestone Member of the Chugwater Formation contains the unique occurrence of the marine reptile *Corosaurus*.

Jurassic Period (210 million to 145 million years ago)

- **Stump Sandstone (PFYC 3).** Rare fossil vertebrates have been reported in this Middle to Upper Jurassic formation, and invertebrate and trace fossils have been reported in abundance.
- **Sundance Formation (PFYC 4-5).** The Redwater Shale Member of this Middle-Upper Jurassic unit contains many invertebrate fossils, including clams, crinoids (sea lilies), and belemnites (squid-like animals). Pterosaur tracks occur in this formation at various sites around the state. Ichthyosaur, mosasaur, and plesiosaur specimens occur in this formation.
- **Morrison Formation (PFYC 5).** This Upper Jurassic Formation is well known for producing a significant and highly diverse fauna and flora that include mollusks, fishes, amphibians, small reptiles and early mammals as well as various dinosaurs (e.g., *Diplodocus*, *Camarasaurus*, *Camptosaurus*, *Allosaurus*, *Brachiosaurus*, *Apatosaurus*, and *Stegosaurus*), in addition to numerous trace fossils (e.g., footprints). This formation is found throughout the Rocky Mountain area and is noted for fossil deposits at Dinosaur National Monument, Como Bluff, and other world-class sites

Cretaceous Period (145 million to 65 million years ago)

- **Cloverly Formation (PFYC 5).** This Lower Cretaceous formation has produced a diverse dinosaur fauna, including iguanodonts, theropods, and ankylosaurs, as well as other Mesozoic reptiles and early mammals.
- **Mowry Shale (PFYC 3).** This Lower Cretaceous formation commonly contains marine fish and invertebrate remains and various trace fossils.
- **Mesa Verde Formation/Group (PFYC 3-4).** Vertebrate remains and traces are sporadic from this formation. Much more work is required to assess the paleontological potential of this Upper Cretaceous unit.

- **Medicine Bow Formation (PFYC 3-4).** This Upper Cretaceous formation is known to produce vertebrate fossils of scientific significance, including the remains of marine and freshwater invertebrates, terrestrial plants, and terrestrial vertebrates. Microfossils (pollen) and megafossils (leaf and stem imprints and petrified and carbonized wood) have been found in the formation. Invertebrate fossils include marine foraminifers and brackish-water gastropods and bivalves. The formation has also produced dinosaur bones (e.g., ceratopsian *Triceratops*) and the remains of small reptiles and mammals from the Late Cretaceous Period.
- **Lance Formation (PFYC 5).** This Upper Cretaceous formation produces a diverse fauna and flora, including tyrannosaurs, ankylosaurs, hadrosaurs, ceratopsians, and pachycephalosaurs, as well as mammals, reptiles, amphibians, birds, and fish. It also contains various trace fossils (e.g., footprints).
- **Evanston Formation (PFYC 3).** This formation straddles the Cretaceous and Paleocene boundary, which is considered significant in terms of providing evidence for the extinction of dinosaurs and other species.

Cenozoic Era (65 million years ago to present)

The Cenozoic Era, also known as the "Age of Mammals," spans from 65 million years ago to the present day. The Cenozoic is broken into two periods, the Tertiary (Paleogene and Neogene) and the Quaternary. Because of a more complete fossil record, the Tertiary Period can be broken down further into five epochs: Paleocene, Eocene, Oligocene, Miocene, and Pliocene. The Quaternary Period is broken into two epochs: the Pleistocene and Holocene (or Recent, the current period of geologic time).

Tertiary Period (65 million to 1.8 million years ago)

- Paleocene Epoch (65 million to 54 million years ago).
- **Ferris Formation (PFYC 5)** produces fossils of particular significance, because the strata contain the Cretaceous-Tertiary boundary that dates to the time of the extinction of the dinosaurs and adaptive radiation of mammals. The formation has produced the remains of early Paleocene mammals as well as fossil leaves and shells of freshwater invertebrates and trace fossils.
- **Fort Union Formation (PFYC 3-4).** This Paleocene formation contains abundant vertebrate and invertebrate fossils as well as plant remains.
- **Hanna Formation (PFYC 5)** has produced the remains of terrestrial and aquatic vertebrates, invertebrates, and plants of Paleocene to possibly earliest Eocene age. These fossils are significant because the Paleocene-Eocene boundary dates to the transition from Archaic to Modern orders of mammals.
- Eocene Epoch (54 million to 38 million years ago).
- **Battle Springs Formation (PFYC 3).** This Upper Paleocene-Eocene Formation contains occasional vertebrate fossils.
- **Wasatch Formation (PFYC 5).** This Late Paleocene-Middle Eocene formation contains extensive mammal remains. At Fossil Butte National Monument, for example, the fossil assemblages contain at least eight species of reptiles and as many as 34 species of mammals. Reptiles include lizards, turtles, crocodiles, and alligators. Mammals include carnivores, perissodactyls, condylarths, artiodactyls, and primates. Aquatic reptiles dominate the lower two assemblages, while mammals and lizards dominate the upper assemblage.
- **Wind River Formation (PFYC 5).** This Lower Eocene Formation contains mammal, reptile, and fish fossils. The Lysitean and Lostcabinian subages of the Wasatchian North American Land Mammal Age are based on fossils recovered partly within the planning area near the communities

of Lysite and Lost Cabin. These age designations are used throughout North America to categorize mammal fossils from these time periods.

- **Green River Formation (PFYC 5).** This Lower to Middle Eocene formation represents one of the most important Cenozoic deposits in the world. This formation contains a spectacular assemblage of vertebrate and invertebrate fossils. It is famous for well-preserved mammal, fish, turtle, bird, snake, insect, and plant fossils. Fossil Butte National Monument was created to preserve, display, and interpret paleontological resources of the Green River and Wasatch formations.
- **Bridger Formation (PFYC 5).** This Middle Eocene formation has produced at least 25 families of fossil mammals and is world-renowned among paleontologists. Numerous invertebrate and plant localities also occur in this formation, including fossil mollusks, leaves, algae, pollen, spores, and insects.
- **Washakie Formations (PFYC 5).** This Upper Eocene Formation contains an abundant mammal fauna.

Oligocene, Miocene, or Pliocene Epochs (38 million to 1.8 million years ago)

- **White River Formation (PFYC 5).** Thousands of fossil invertebrate and vertebrates have been collected from this Eocene/Oligocene unit, including mammals, reptiles, fish, and birds. This formation is found throughout the Northern Great Plains and forms the landscape preserved at Badlands National Park in South Dakota.
- **Bishop Conglomerate (PFYC 2).** This Oligocene Formation contains a low fossil potential.
- **Brown's Park Formation and Miocene rocks undivided (PFYC 3).** Miocene units within the planning area contain occasional vertebrate fossils.

Quaternary Period (1.8 million to present)

The Quaternary is broken into two epochs: Pleistocene (the time of the "Ice Ages") and Holocene. Rare vertebrate fossils have been recorded from the alluvium and colluvium **(PFYC 1-2)** in the planning area.

3.9.2 Forest Service

In 2009, Congress passed the Paleontological Resources Preservation Act (PRPA) as part of the Omnibus Public Land Management Act (P.L. 111-11). The PRPA mandated that the "Secretary [of Agriculture] shall manage and protect paleontological resources on Federal land using scientific principles and expertise. The Secretary shall develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources, in accordance with applicable agency laws, regulations, and policies. These plans shall emphasize interagency coordination and collaborative efforts where possible with nonfederal partners, the scientific community, and the general public". As defined by the PRPA, paleontological resources are "any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust, that are of paleontological interest and that provide information about the history of life on Earth."

The Forest Service Rocky Mountain Region has developed a classification system of geologic units according to their probability of containing scientifically significant fossil resources (referred to as the FYPC). The FYPC is designed to provide Forest Service management a way of prioritizing protection of paleontological resources. Under this system, geologic formations are classified on a scale from 1 to 5 (with 5 as the highest paleontological sensitivity) to reflect the likelihood of containing scientifically significant fossils. A new classification system for categorizing paleontological resource potential occurrence is currently being developed by Forest Service paleontological resource specialists.

Medicine Bow National Forest

Overview

The Laramie Mountains are a northern extension of the Colorado Front Range of the Rocky Mountains. The range is characterized by a Precambrian granitic core, metamorphosed in areas to granitic gneiss. Erosion has resulted in a regolith of grus on the surface in upland areas. The mountains are flanked by Oligocene and Miocene sedimentary rocks.

Due to the age and nature of the geology of the portion of the MBNF that is within sage-grouse core area, the potential for preservation of paleontological resources is extremely low (FYPC = 1). There are no documented paleontological resource surveys and no known fossil localities in and around the sage-grouse core area. Stromatolites are known from Precambrian sediments elsewhere in the MBNF (Snowy Range).

Younger sedimentary units that have higher potential to yield scientifically significant fossils occur outside the sage-grouse core area and primarily outside the Forest boundary. Below is a description of the geologic unit that is within the MBNF boundary but outside the sage-grouse core area, and its corresponding potential for producing paleontological resources (i.e., FYPC).

White River Group (Late Eocene-Late Oligocene)

Late Eocene-Late Oligocene (Chadronian-Arikareean NALMAs) has an FYPC rating of 5. It contains tan to whitish fine-grained volcaniclastic siltstones and mudstones, with some local greenish conglomerate channel sandstones. Fossils include fish, frogs, lizards, turtles and snakes, tiny rodents, rabbits, insectivores, saber tooth cats, dogs, horses, camels, oreodonts, rhinoceroses, and Titanotheres.

Current Management Practices

The Forest Service recognizes multiple-use values for paleontological resources, including a legacy for present and future generations; scientific significance, education and interpretation; recognition of aesthetic qualities; and public participation. The PRPA set specific regulations for permission, collection, and curation of paleontological resources from federal lands. Furthermore, it is the policy of the Forest Service to complete a paleontological resources inventory for all National Forest System lands potentially impacted by agency and non-agency project proposals. For sites located during these inventories, it is policy to complete a paleontological resource site form.

Management Issues and Concerns

The protective measures taken for the benefit of the Greater Sage-Grouse will likely not result in any type of adverse effects to paleontological resources.

Thunder Basin National Grassland

Overview

The TBNG occurs in the southeast portion of the Powder River Basin, a northwest-southeast trending intraforeland sedimentary basin created during the Laramide Orogeny. The geologic units exposed across the eastern one-third of the TBNG represent marine and terrestrial sediments deposited within and along the western margin, respectively, of the Cretaceous Interior Seaway. Many of these formations are known to produce fossil vertebrates across Western Interior North America. One fossil vertebrate and several invertebrate localities have been reported from Cretaceous sediments within the sage-grouse core area in the northeast portion of the TBGN. None of the discoveries are considered scientifically significant. Many other localities are known outside the sage-grouse core area, including the Alkali Creek Paleontological Special Interest Area located in the southeast portion of the TBNG.

Sediments get progressively younger in age traveling west across the TBNG. The western two-thirds of the grassland consist of the Paleogene, non-marine Fort Union, and Wasatch formations. Equivalent rock units in sedimentary basins across the Rocky Mountain region are known for producing abundant and significant fossil assemblages. These units are far less fossiliferous in the Powder River Basin. However, numerous fossil localities have been reported in the TBNG, the majority in the Wasatch Formation; none are considered scientifically significant. Only a single plant locality is known within the sage-grouse core area in the central TBNG. Below are descriptions of the geologic units that are within the sage-grouse core area on the TBNG, and their corresponding potential for producing paleontological resources (i.e., FYPC).

Pierre Shale (Cretaceous)

Late Cretaceous (Santonian and Campanian) has an FYPC rating of 3. This unit consists of dark gray to black marine shale with stringers of bentonite and layers of nodules that are recognizable over long distances. This formation records the last major transgression of the epicontinental seaway. Fossils include ammonites, snails, clams, crabs, mosasaurs, plesiosaurs, fish, sharks, turtles, pterosaurs, and flightless birds.

Fox Hills Sandstone (Cretaceous)

Late Cretaceous (Maastrichtian) has an FYPC rating of 2. This unit consists of a nearshore marine sandstone that includes some localized terrestrial deposits. The depositional environment was the shoreline of the last major seaway to invade central North America. Fossils include invertebrates (including ammonites), plants, and rare vertebrates (fish, mammals, crocodiles, dinosaurs, and marine reptiles, such as mosasaurs).

Lance Formation (Cretaceous)

Late Cretaceous (Maastrichtian) has an FYPC rating of 5. This formation is composed of gray and tan mudstones, sandstones, and locally thick lignites. These fluvial sediments were deposited along the western margin of the retreating Western Interior Seaway. The Lance Formation is known for dinosaur fossils, the most common being *Triceratops* and *Anatosaurus,* as well as 19 other genera. Also found in the Lance Formation are sharks, bony fish, frogs, salamanders, turtles, crocodiles, lizards, birds, mammals, freshwater invertebrates, leaves, and pollen.

Fort Union Formation (Paleocene)

Late Paleocene has an FYPC rating of 3. It is well known for coal and gas production in the Powder River Basin. The non-marine Fort Union Formation is composed of three members, which are, from oldest to youngest, the Tullock, Lebo, and Tongue River. Fort Union sediments consist of fluvial and lacustrine sandstones, mudstones, and coal. In the Powder River Basin, the Fort Union Formation often cannot be distinguished lithologically from the overlying Wasatch Formation. In general, fossils associated with the Fort Union are plant fossils, including magnolia, sycamore, maple, oak, fig, and birch. Some vertebrate fossils are known from selected localities on private lands.

Wasatch Formation (Eocene)

Latest Paleocene – Early Eocene has an FYPC rating of 5. The Wasatch Formation of the Powder River Basin is generally understood to be coeval with other Early Eocene sediments in Wyoming (i.e., the Willwood Formation of the Bighorn Basin, Indian Meadows and Wind River formations of the Wind River Basin, and the Wasatch Formation of the Green River, Washakie, and Great Divide Basins). The Wasatch Formation is composed mainly of sandstones, mudstones, and some carbonaceous shale units. The carbonaceous shales of this formation are rarely of coal quality. Clinker (baked sediments as a result of underground coal fires, locally referred to as “scoria”) deposits are also present in this formation.

The Wasatch Formation of the Powder River Basin is much more likely to have fossil vertebrates than is the Fort Union Formation. This situation may be related to less acidic burial conditions of the sediments, as shown by the common, secondary, and euhedral gypsum crystals preserved in the carbonaceous shale units. Fossil invertebrates are rare, but they are sometimes discovered. Some vertebrate fossils are known from selected localities on private lands.

Quaternary Alluvium

This has an FYPC rating of 2. Quaternary alluvium occurs sporadically throughout the TBNG, typically within drainages. There are no reported Quaternary fossil localities on the TBNG.

Current Management Practices

The Forest Service recognizes multiple-use values for paleontological resources, including a legacy for present and future generations; scientific significance, education and interpretation; recognition of aesthetic qualities; and public participation. The PRPA set specific regulations for permitting, collection, and curation of paleontological resources from federal lands. Furthermore, it is the policy of the Forest Service to complete a paleontological resources inventory for all National Forest System lands potentially impacted by agency and non-agency project proposals. For sites located during these inventories, it is policy to complete a paleontological resource site form.

Management Issues and Concerns

The protective measures taken for the benefit of the Greater Sage-Grouse will likely not result in any type of adverse effects to paleontological resources.

3.10 Recreation Resources

3.10.1 Bureau of Land Management

General Planning Area Description

Outdoor recreation is recognized as an important land use providing social and economic benefits at national, regional and local levels, and is more and more frequently being considered the dominant use on many public lands (Driver 1996). The BLM provides opportunities for outdoor recreation and nature-based tourism under the concept of multiple-use management. The goal of the recreation program is to allow a diverse array of resource-dependent outdoor recreation opportunities while providing for visitor services, resource protection, and the health and safety of public land users.

Recreation activities on public lands in the planning area can be both consumptive and non-consumptive. These activities include, but are not limited to, sightseeing, touring, hiking, mountain biking, skiing, snowmobiling, OHV use, horse packing and riding, river rafting, boating, photography, rock collecting, wildlife viewing, camping, fishing, and hunting (with the latter two categories accounting for the majority of visitor days).

Most of the recreation within the planning area is dispersed. Dispersed recreation consists of activities of an unstructured type that are not confined to specific locations or dependent on recreation sites. Additionally, each of the six field offices in the planning area has one or more developed recreation sites (Map 3-14—Developed Recreation Sites). Developed recreation sites operated in the planning area range from minor improvements for parking to multisite hosted campground facilities.

Management prescriptions on public lands emphasize monitoring, education, and enforcement to reduce user conflicts and to provide resource protection. Monitoring and enforcement of dispersed recreation is limited, especially in areas with a small percentage of public lands or limited access. The BLM is dependent upon cooperation from public land users and other federal and state agencies for the successful management of these areas. Complaints are handled on a case-by-case basis, the majority of which involve illegal posting or otherwise restricting public access to federal lands, trespass onto private lands, and vandalism to vegetation and soils. In many Field Offices, the BLM places signs to identify public and private land boundaries, interpret resources, and provide regulatory and informational kiosks in high use areas. Detailed information is available to the public through informational pamphlets, land-ownership maps, and online websites. Moreover, the BLM promotes educational programs that inform the public and increase awareness. Examples of these programs include Tread Lightly, Leave No Trace, and Operation Respect.

Recreation use trends are expected to increase in the future (Wyoming State Office of Travel and Tourism 2006; Haas 2002; Cole 1996; Mueller et al. 2002) and the rising public demand for recreation opportunities will likely increase the complexity of managing dispersed recreation. Recreation use trends results are also derived from Visitor Satisfaction Surveys and statistics from Recreation Management Information System (RMIS). Statistics regarding visitors to public lands could be provided for a 10-year span (Table 3-54).

Table 3-54 Visitor Estimations Table for BLM

Field Office	SRMA	2002	2012
Casper	Muddy Mountain EEA	17, 442	34,875
	Goldeneye Wildlife and Recreation Area	680	2,000
	North Platte	13,120	201,748*
	Middle Fork	N/A	N/A

Field Office	SRMA	2002	2012
Kemmerer	Poison Spider	N/A	4,135
	National Historic Trails	84,847	73,987
	Pine Creek	N/A	3,000
	Raymond Mountain	N/A	1,000
	Dempsey Ridge	N/A	4,500
	National Historic Trails	N/A	N/A
Newcastle	Stateline	2,823	2,174
	Cedar Creek	Included	Included
	Cabin Creek	Included	Included
Pinedale	Scab Creek	8,300	11,925
	Boulder Lake	3,428	2,738
	Green and New Fork Rivers	15,748	16,540
	CCC Ponds	N/A	11,512
Rawlins	Continental Divide Scenic Trail	4,106	8,880
	North Platte River	34,228	53,123
	Shirley Mountains	6,500	25,915
Rock Springs	Greater Sand Dunes	8,934	77,531
	National Historic Trails	44,551	26,508

Extrapolated from BLM's Recreation Management Information System (RMIS)
Numbers highlighted in run show an increase in visitation. *Significant improvements and campgrounds have been constructed along the North Platte River over the past ten years. The North Platte River has also gained national attention due to being ranked as one of the top rivers for trout fishing.

Visual resources are relevant to recreation activities in several ways. Sightseeing is a recreation activity that depends on the quality of visual resources. Some recreation activities, such as river floating and hiking, are enhanced by a high degree of visual quality. This is especially true along several historic trails and National Scenic Byways which cross the planning area. Activities, such as road building, oil and gas development, OHV use, and other surface disturbing activities have an impact on visual resources and therefore on recreation opportunities and experiences.

Noise, as it affects recreation opportunities, is usually considered to be intrusive. As population growth and industrial development continue to increase, noise in rural and primitive areas becomes more evident.

Recreation Opportunity Spectrum

Three of the six field offices in the planning area, Pinedale, Rawlins, and Rock Springs, use the Recreation Opportunity Spectrum (ROS) to manage recreation resources. The ROS is a method widely used by the BLM and other land management institutions to characterize recreation opportunities in terms of setting, activity, and experience opportunities. The classification of opportunity experiences and settings range along a continuum from primitive to urban. The BLM uses this classification system as a tool to develop management actions that achieve desired recreation outcomes in terms of benefits, experiences, and activities. The goals of the ROS system are to (1) establish outdoor recreation management goals and objectives for specific areas, (2) allow for modification of recreation opportunities when other resource management actions are needed, and (3) establish standards for an area that would allow monitoring of the recreation experience and opportunity setting.

The ROS categories are generally described as follows:

- **Primitive-characterized.** Characterized by a roadless, essentially unmodified natural environment. Activities might include camping, hiking, enjoying scenery or natural features, photography, hunting, swimming, fishing, canoeing, sailing, and river running (nonmotorized craft).
- **Back country-characterized.** Characterized by a roadless, predominantly unmodified natural environment. Activities might include camping, hiking, enjoying scenery or natural features, photography, hunting, swimming, fishing, canoeing, sailing, and river running (nonmotorized craft).
- **Middle country-characterized.** Same as back country-characterized, except motorized use is permitted.
- **Front country-characterized.** Characterized by a generally natural environment, with evidence of resource modification and utilization harmonizing with the natural environment. Motorized travel is permitted.
- **Rural.** Characterized by a substantially modified natural environment. Activities might include camping, hiking, enjoying scenery or natural features, photography, swimming, fishing, canoeing, sailing, river running (motorized craft), power boating, picnicking, rock collecting, wood gathering, auto touring, water skiing and other water sports, interpretive services use, rustic resorts and organized camps, competitive games, spectator sports, bicycling, jogging, outdoor concerts, and modern resorts.
- **Urban.** Characterized by a substantially modified natural environment that can no longer be classified as "rural."

Special Recreation Permits

In addition to managing lands for general dispersed recreation activities, each field office within the planning area also administers Special Recreation Permits (SRPs) for specific nonexclusive commercial or competitive recreation activities. These permits are issued to protect natural and cultural resources while providing a mechanism to accommodate commercial recreation uses. Permits are processed on a case-by-case basis. The five general categories of SRPs are commercial, competitive, vending, individual or group use in special areas, and organized group activity and event use (BLM 2003a). Permit lengths depend on activities proposed in the area in question and the past record of the potential permittee. A large portion of SRPs issued within the planning area are for professional hunting outfitting and guiding services. Permits are also issued for competitive events, vending, and group activities. Numbers and types of SRPs can be found under the individual field office sections below.

Special Recreation Management Areas

In accordance with BLM's *Land Use Planning Handbook*, each BLM field office has identified Special Recreation Management Areas (SRMAs) to manage important recreation resources. The primary objective of establishing SRMAs is to direct recreation program priorities toward areas with high resource values, elevated public concern, or large amounts of recreation activity. There are 17 SRMAs in the planning area. Individual acreages and brief descriptions of SRMAs can be found under the individual field office sections below. Site-specific recreation area management plans have been developed or are currently being developed for many of these heavily used areas throughout the planning area.

Casper Field Office

Recreation opportunities in the Casper Field Office largely consist of hunting and fishing opportunities with a variety of other recreation uses taking place. Of the 27 SRPs administered by the Casper Field Office, 22 are for professional hunting outfitters and guide services.

There are two developed recreation sites managed by the Casper Field Office, consisting of BLM campgrounds and interpretive kiosks along the South Bighorn-Redwall Backcountry Byway. Developed recreation sites near the Seminoe to Alcova Backcountry Byway are managed by Natrona County and Wyoming State parks.

There are six SRMAs in the Casper Field Office:

- Muddy Mountain Environmental Education Area (EEA) (1,420 acres)
  - Managed for camping and hiking in wildlife habitat.
- Goldeneye Wildlife and Recreation Area (890 acres)
  - Managed for fishing opportunities in wetland habitat.
- North Platte River SRMA (3,560 acres)
  - Managed for historic sightseeing, river-based recreation, and fishing.
- Middle Fork SRMA (12,910 acres)
  - Managed for hunting and fishing.
- Poison Spider OHV Park (290 acres)
  - Managed to provide a venue for unlimited off-road all-terrain vehicles (ATV) and motorcycle riding.
- National Historic Trails (NHTs) (includes Oregon, California, Pony Express, and Mormon Pioneer NHTs)
  - Managed for historic preservation, education and interpretation.

Other recreation areas in the Casper Field Office include two backcountry byways (South Bighorn/Red Wall and Seminoe/Alcova), and other historic trails.

Kemmerer Field Office

Recreation opportunities in the Kemmerer Field Office, like other offices in the planning area, mostly revolve around fishing and hunting. Eight of the 13 SRPs are for commercial hunting outfitters. The others are for snowmobile riding and mountain bike races.

All four developed recreation sites in this area are organized camping areas; Fontenelle Creek, Slate Creek, Weeping Rock, and Tailrace campgrounds.

Four SRMAs are designated in the Kemmerer Field Office:

- Pine Creek Canyon SRMA
  - Managed for riparian, water, and wildlife values.
- Raymond Mountain SRMA
  - Managed to provide back country (non-motorized) dispersed recreation experiences.
- Class 1 portions of the Oregon-California National Historic Trail SRMA
  - Managed to provide an opportunity to visit and learn about trail history and use, while maintaining setting character and present condition of trails and associated historic sites.
- Dempsey Ridge SRMA
  - Managed for dispersed recreation opportunities in a natural setting.

Other recreation areas in the Kemmerer Field Office include National Historic Trails, a snowmobile trail system, a cross-country ski trail, and an OHV hill climb area.

Newcastle Field Office

The Newcastle Field Office recreation program is characterized by mostly undeveloped and unstructured dispersed recreation opportunities, with hunting primarily for mule deer and pronghorn antelope making up the bulk of the visitation. The 11 SRPs in the field office consist primarily of commercial hunting outfitting and guiding services.

There is only one developed recreation site within the field office; the Mallo Trail. Future developed recreation sites are being planned at the Meadow Draw Reservoir Recreation Area as well as other dispersed sites.

There are three SRMAs in the field office:

- Stateline SRMA
- Cedar Creek SRMA
- Cabin Creek SRMA.

Since 2005, visitation in the Newcastle Field Office has increased by approximately 23.6 percent, from 8,266 visitor days to 10,220 visitor days in FY 2009 (BLM 2010). Activities with the most notable increases in participation include camping, driving for pleasure, big game hunting, wildlife viewing, hiking, horseback riding and OHV use. Visitation is expected to remain relatively constant or slightly increase in the next five years, unless additional public access is acquired in the planning area.

Pinedale Field Office

The Pinedale Field Office recreation program is characterized by a variety of recreation uses along a major river system (the Upper Green River) and proximity to several major mountain ranges. The field office issues commercial permits to 43 operators serving clients associated with big game hunting, fishing, and competitive and group activities on public lands. There is a growing interest in other types of commercial recreation use in the field office. Examples of these activities include guided backcountry horse touring, touring historic features such as the Lander Trail, and viewing wildlife.

There are eight developed recreation sites in the Pinedale Field Office: Warren Bridge Campground, Warren Bridge River Access Area, Boulder Lake Campground, Boulder Lake Boat Access, Stokes Crossing Campground, New Fork Campground, Scab Creek Campground, and the CCC Pond Recreation Area.

There are four SRMAs in the Pinedale Field Office:

- Scab Creek (18,460 acres)
  - Managed for camping, horseback riding, rock climbing, hunting, and fishing.
- Boulder Lake (5,790 acres)
  - Managed for boating, fishing, hunting, and camping.
- Green and New Fork Rivers SRMA (32,560 acres)
  - Managed for scenic boating, fishing, and camping.
- CCC Ponds SRMA (1,040 acres)
  - Managed for quick access for area residents and visitors to enjoy open space and view spectacular lake and glacial scenery.

Other designated recreation areas include the Continental Divide Snowmobile Trail system and the National Historic Oregon Trail (Lander Trail). Interpretive sites along the Lander Trail and at other locations inform visitors about the fur trapping era, western explorers and area settlement. Trapper's Point and the DeSmet Monument are two interpretive sites on public lands that depict significant information relative to historic "rendezvous" of mountain men on the Upper Green River.

Rawlins Field Office

In the Rawlins Field Office, recreation opportunities consist of primarily dispersed recreation in middle and front-country settings, with some primitive opportunities. Approximately 55 SRPs are issued by the field office, 75% of which are for outfitting hunting, 20% are for floating/fishing, and 5% are for other recreational activities such as wild horse viewing and horseback riding.

There are 11 developed recreation sites in the Rawlins Field Office: Rim Lake Recreation Site, Teton Reservoir Recreation Site, Encampment River Campground (fee site), Bennett Peak Recreation Site (fee site), Corral Creek Campground, Dugway Recreation Site, Prior Flat Campground, Lake Hattie Reservoir, Twin Buttes Lake, Wheatland Reservoir #3, and East Allen Lake.

There are three SRMAs in the Rawlins Field Office:

- Continental Divide National Scenic Trail SRMA (82 miles of trail)
  - Managed for camping, hiking, mountain biking, and driving in proximity to the Continental Divide.
- North Platte River SRMA (5,060 acres)
  - Managed for water-related recreation activities, such as floating, picnicking, waterfowl hunting, camping, and wildlife viewing.
- Shirley Mountain SRMA (24,440 acres)
  - Managed for dispersed hunting, camping, caving, OHV use, and wildlife viewing.

Other designated recreation areas include the Jelm Mountain Area, the Pedro Mountains Area, the Laramie Plains Lakes Area, and the Rawlins Fishing Areas.

Rock Springs Field Office

The recreation resources of the Rock Springs Field Office are mostly dispersed. The major recreation boundaries of the field office include Flaming Gorge National Recreation Area, the Green River, and the Wind River Front. Major recreation locations include the Greater Sand Dunes Area, the Oregon Buttes, Little Mountain, Blucher Creek, Three Patches Picnic Area, Pine Mountain, Wild Horse Loop Tour, and the Oregon Trail and its variant routes. Approximately nine SRPs are issued/managed by the field office, 80% of which are for hunting outfitters. The remaining 20% activities include wild horse viewing and horseback riding tours.

The Rock Springs Field Office has two developed recreation sites, the 14 Mile Rest Area (which is currently closed) and Three Patches. There are 22 semi-developed recreation sites, eight sites in the field office that are managed by other entities, and 11 undeveloped (dispersed) sites. Plans are pending to develop the Sweetwater River Bridge Campground and Guard Station Campground as well as to expand the off road vehicle parking/camping area in the Sand Dunes.

There are two SRMAs in the Rock Springs Field Office:

- Greater Sand Dunes (41,640 acres)
  - Managed for OHV use and camping.

- Oregon Mormon Pioneer National Historic Trails (315 miles of trail)
  - Managed for cultural touring, driving, and hiking.

Other major recreation locations in the field office include the Oregon Buttes, and Little and Pine Mountains. There are five backcountry byways designated in the field office: Tri-Territory Loop, Lander Road, Red Desert, Fort LaClede Loop, and Firehole-Little Mountain Loop. The field office is also exploring opportunities for mountain biking.

3.10.2 Forest Service

General Planning Area Description

Outdoor recreation is recognized as an important land use that provides social and economic benefits on national, regional, and local levels and is more frequently being considered the dominant use on many public lands. The Forest Service provides opportunities for outdoor recreation and nature-based tourism under the concept of multiple-use management. Recreational activities on public lands are multi-faceted and are both consumptive and non-consumptive. Forest Service-administered lands provide a broad spectrum of outdoor recreation opportunities, affording visitors the freedom of recreational choice with minimal regulatory constraints. Dispersed recreation uses on Forest Service-administered lands includes, but is not limited to, sight-seeing, touring, hiking, mountain biking, fishing, photography, wildlife viewing, camping, OHV use, and hunting (with the latter two categories accounting for the majority of visitor days). These recreational opportunities are offered to the public on all Forest Service-administered lands where legal access is available.

Winter and summer recreation opportunities, both motorized and non-motorized, are being managed to provide experiences to meet the desires of forest visitors for scenery, solitude, setting, and continued accessibility. Recreationists continue to enjoy the scenery of both mountain forests and non-forested areas. A broad range of recreation opportunities, from primitive to developed, are available.

Developed recreation sites on National Forest System lands include, campgrounds, picnic grounds, day use areas, trailheads, cabin/lookout rentals, observation points, accessible fishing platforms, scenic overlooks, and other recreation facilities that provide universal access and services to the public.

In addition to managing lands for general dispersed recreation activities, the Forest Service administers a number of Recreation Special Use Permits for specific nonexclusive commercial or competitive recreational activities. These permits are issued to provide a mechanism to accommodate commercial recreational use while protecting natural and cultural resources.

It is important to note that recreation on all National Forest System lands is directly linked with its transportation systems. The Forest Service and State of Wyoming have taken steps to address the need for access while providing a safe and efficient travel management system as well as enhancing the motorized recreational opportunities. Transportation and Access Management, including OHV use is discussed in Section 3.15 of this Chapter.

The Forest Service uses the ROS to manage recreation resources. The ROS is a method widely used by the Forest Service and other land management institutions to characterize recreation opportunities in terms of setting, activity, and experience opportunities. The classification of opportunity experiences and settings range along a continuum from primitive to urban. The Forest Service uses this classification system as a tool to develop management actions that achieve desired recreation outcomes in terms of benefits, experiences, and activities. The goals of the ROS system are to (1) establish outdoor recreation management goals and objectives for specific areas, (2) allow for modification of recreation opportunities when other resource management actions are needed, and (3) establish standards for an area that would allow monitoring of the recreation experience and opportunity setting.

The ROS categories are generally described as follows:

- **Primitive:** The area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.
- **Semi-primitive Nonmotorized:** The area is characterized by a predominately natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but would be subtle. Motorized recreation is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impact on recreational opportunities.
- **Semi-primitive Motorized:** The area is characterized by a predominately natural or natural appearing environment of moderate to large size. The concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but would be subtle. Motorized use of local primitive or collector roads with predominately natural surfaces and trails suitable for motor bikes is permitted.
- **Roaded Natural:** The area is characterized by predominately natural-appearing environments with moderate evidence of the sights and sounds of people. Such evidence is usually harmonious with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident but compatible with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.
- **Rural:** The area is characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreational activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.
- **Urban:** The area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are often used to enhance specific recreational activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans are predominant on the site. Large numbers of users can be expected both on the site and in nearby areas. Facilities for highly intensified motor use and parking are available, with forms of mass transit often available to carry people throughout the site.

Bridger-Teton National Forest

The BTNF is a large part of the Greater Yellowstone region, containing some of its most pristine areas. Thirty-eight percent of the Forest is in designated wilderness; another 42% is included in undesignated backcountry, but that is every bit as wild. The remaining part of the Forest includes major recreation corridors, roads that give access to backcountry trailheads, scenic byways, and rivers that attract great numbers of visitors.

Resort and outfitter services serve a national and international forest visitor clientele, who are increasingly interested in learning about and appreciating the natural setting of the Forest. The Forest has numerous opportunities for wildlife viewing, hunting, fishing, and sites of unique geologic interest. Natural amenities of the Forest are vital to the economy of nearby communities.

The BTNF is known for:

- Outstanding scenery and opportunities for outdoor recreation.
- Diverse and healthy wildlife populations, including top predators.
- Diverse and healthy plant communities, especially those of interest to visitors for their recreation and scenic attributes—riparian areas, alpine zone, wildflower parks (tall forb), aspen, mixed forest, and mountain shrub lands.
- Clean water and clean air.
- Wild and Scenic Rivers.
- Healthy, functioning watersheds that drain into the West's main rivers (Snake/Columbia, Green/Colorado, Yellowstone/Missouri).
- Large backcountry and wilderness areas that offer opportunities for multi-day trips.
- Blue-ribbon trout fisheries and big game hunting.
- Winter sports, both in developed areas and backcountry.

Highlights of the BTNF recreation resources include:

- Over 3.4 million acres, most of it backcountry or wilderness.
- Snake River Headwaters Wild and Scenic River Designation, 12 river segments.
- Three alpine ski areas that offer year-round activities and eight other resorts.
- 50 campgrounds on the Forest, most of them small and on the primitive end of the scale, while developed sites include boat launches, trailheads, picnic sites, and small information sites.
- Over 2,600 miles of trail.
- Large backcountry areas; including two designated WSAs (Shoal Creek and Palisades) and other general backcountry managed for dispersed recreation and wildlife habitat.
- Over 200 outfitter-guide permits on the Forest.
- A Wyoming Centennial Scenic Byway.
- The Gros Ventre, Bridger, and Teton Wildernesses.

In the summer and fall, the BTNF offers a combination of large backcountry and roaded access to trailheads and dispersed camping. This emphasis on dispersed recreation and primitive backcountry is the core of the Forest's recreation 'niche'—a term used to describe the distinctive attributes of the Forest and how it fits into the overall context of outdoor recreation in the region. The niche encapsulates that which the Forest is most uniquely capable of providing, the particularities that contribute to the region as a whole and which make this particular National Forest stand out (Forest Service 2004).

In the winter, the range of settings changes greatly. Many forest roads become groomed snow trails, thus changing for the season from Roaded-Natural to Semi-primitive Motorized. Snowmobiles are used in nearly all parts of the unroaded backcountry and the winter setting is Semi-primitive Motorized for most of those areas as well. Non-motorized backcountry, plowed roads, and wilderness are similar to summer settings. In addition to recreation settings are those areas that are not managed for winter recreation, but are maintained as wildlife security areas. These correspond to those parts of the Forest that are covered by existing special orders restricting public use or closing them to human entry in winter.

Over 200 outfitters, resorts, and instructional entities provide services, including: backcountry recreation, hunting and fishing, winter sports, and activities associated with the "Old West" such as day rides and wagon rides. The bulk of recreation special use permits issued by the Forest are those that allow people without specialized equipment or skills to experience the vast backcountry and wilderness on the BTNF.

Recreation use has been affected by three primary trends: (1) The increasing human population in communities near the Forest and the Intermountain Region; (2) an overall increase in recreation use; and (3) changes in technology, specialization and the kinds of recreation people seek.

Visitor use monitoring completed in 2003 shows that nearly 2.7 million visitors came to the BTNF that year. It can be expected that recreation use will continue to grow as the regional population grows. Most recreation use within the BTNF comes from nearby communities.

Visitor use monitoring is intended to gather statistically sound estimates of recreation use and activities. It is to be repeated every five years; the BTNF conducted its first survey in 2002-2003. Though that year provided only a snapshot to indicate use and preferred activities, the results are consistent with other information gathered about visitor use in the Forest. Activities cited by visitors indicate they enjoy a broad mix of activities that require recreation settings from primitive backcountry to highly developed resorts.

The most frequently cited activities that visitors participated in include viewing natural features, viewing wildlife, hiking or walking, downhill skiing or snowboarding, and relaxing. The top primary activities cited in the survey were downhill skiing, hiking or walking, snowmobile travel, viewing natural features, and hunting.

Major recreational activities specifically in sagebrush habitats include hiking, camping and hunting, lek viewing, and OHV use on designated trails. Many of these activities are benign uses in sagebrush habitats; however, excessive use, such as repeated disturbance to leks for viewing that disrupts sage-grouse breeding activities, can have negative effects. In late spring (May 1st) areas that have been closed to human entry throughout the winter for wildlife habitat protection are opened and antler hunting begins. Sagebrush habitats are scoured for antlers for several weeks at this time of year, which overlaps with sage-grouse breeding season. Off-trail hikers can spread invasive plant species by distributing seeds or plant materials on their clothing or even the tread of their footwear.

Recreation activity will increasingly affect the Forest ecologically and socially, most significantly near fast-growing communities. Easily accessible recreation opportunities for day use will be in high demand in these areas, including the desire for hiking/walking, wildlife viewing, exercising with dogs, biking, and fishing.

There is increasing demand for OHV use in the Forest and more places where OHVs are capable of going. With that, there is more illegal use. This has had a negative effect on wildlife, non-motorized recreation opportunities, soil, and vegetation, effectively reducing the acreage of sagebrush in desired condition. Much of the existing system of motorized trails was not designed for this use and trails do not meet standards for protecting resources or visitor experience.

The increasing number, size, and deteriorating condition of established roadside camps is resulting in loss of native vegetation and soil, streambank and lakeshore damage, and introduction of weeds. Dispersed recreation in winter has been increasing, with more demand for potentially incompatible uses. Visitor conflicts have arisen where use levels have increased or snowmobiles have begun using areas that had been traditionally non-motorized, resulting in displacement of some recreationists. Increased recreation use and development of the wildland-urban interface is creating more pressure on big game winter ranges.

Medicine Bow National Forest

The MBNF lies in southeast Wyoming in the north-south oriented central Rocky Mountains. The Forest includes approximately 1.1 million acres and is the only National Forest in southeast Wyoming. Approximately 80% of the MBNF is forested. Elevations range from 5,050 feet in the Laramie Range to 12,013 feet at Medicine Bow Peak in the Snowy Range of the Medicine Bow Mountains.

The MBNF resources are being managed in such a way as to highlight the "niche" values of the Forest. Recreation is one of those values. The Forest Service provides many opportunities for visitors to appreciate the outstanding scenery and natural character of the land.

Motorized travel is allowed on designated roads and trails forest-wide. Winterized motorized travel is allocated on approximately 64% of the Forest. There are no developed recreation sites or trails in the core or general areas on the Laramie Peak Unit. Dispersed recreation is particularly high during hunting season with a considerable amount of use occurring in Elkhorn, Brumley Mountain, LaBonte Canyon, and in the sections just east of the south Ft. Fetterman Road (CR61). Brumley Mountain and LaBonte Canyon are the sites of more frequent summer recreational OHV use on existing roads. In the Deer Creek Range, the existing road system is closed as there is no legal public access. However, during hunting season, the area may be accessed by those carrying a Wyoming State Hunter Management Area hunting tag, which allows them to cross the private land and use the existing routes for their hunting purposes.

The MBNF Revised Land and Resource Management Plan (Forest Service 2003a) guides how the recreation resources are managed. The plan provides overarching guidance with forest-wide geographic management and project area direction. This guidance directs the management of all resources and proposed projects on National Forest System lands.

No campgrounds or developed recreation sites on the MBNF are located in Greater Sage-Grouse core or general areas. The Six-mile campground is located east of State Highway 230 approximately 24 miles south of Encampment Wyoming on the southern end of the Brush Creek/Hayden Ranger District. Core sage-grouse area is located in close proximity to this campground. This campground is the access point to launch commercial and public boaters onto the North Platte River. The main thrust of the rafting/boating season occurs early in the spring (typically June) when flows are high enough for floating. No new campgrounds are planned at present on the MBNF and any improvements on existing campgrounds or developed sites would be inside existing administrative sites and would have no affect to sage-grouse core areas. The area to the west of the Six-mile campground administrative site on the Forest is located in a portion of the core area and is an area where antler shed hunting occurs frequently in the spring. No other campgrounds or developed recreation site are in close proximity to core or general sage-grouse areas.

Dispersed camping occurs on many areas of the Forest, but is typically concentrated during the big game hunting seasons, beginning in September and running into November. The heaviest use begins with deer gun season on October 1st and starts declining after the October 15th start of elk season. Dispersed campsites are numerous with new sites being established yearly. A map with dispersed camp locations has not been completed at this time, but generally most sites are associated with forested areas with few scattered sites along the edge of the Forest boundary.

The Continental Divide National Scenic Trail (CDNST) traverses the MBNF from the Colorado state line northerly along the continental divide in the Sierra Madre range and exits the National Forest at approximately the northwest corner. The CDNST runs through portions of core sage-grouse area in T16N, R87W, Section 34 and T15N, R87W, section 6. The CDNST that runs through the MBNF is typically not accessible until May/June with many of the higher elevation portions of the trail not traversable until after mid-July. This portion of the trail is non-motorized and connects with the trail on BLM lands to the west. No other Forest Service trails are located in or adjacent to sage-grouse core or general areas.

Visitation Estimates

Forest Definition of Site Days

The population of site days for sampling was constructed from information provided by forest staff. For each site, each day of the year was given a rating of very high, high, medium, low, or none according to the expected volume of recreation visitors who would be leaving the site or area for the last time (last exiting recreation use). The stratum, a combination of site type and use level, was then used to construct the sampling frame. The results of the recreation site/area stratification and days sampled are displayed in Table 3-55.

Table 3-55. Site Days and Percentage of Days Sampled by Stratum on the Medicine Bow National Forest (FY 2008)

Stratum*		Site Days* in Stratum Population	Days Sampled	Sampling Rate (%)
Site Type*	Use Level[c] or Proxy Code*			
DUDS	Very High	15	7	46.67
DUDS	High	101	8	7.92
DUDS	Medium	524	10	1.91
DUDS	Low	1,462	12	0.82
DUDS	DUR5	42	4	9.52
DUDS	FR1	15	1	6.67
DUDS	SV1	101	6	5.94
GFA	Very High	35	6	17.14
GFA	High	1,772	19	1.07
GFA	Medium	3,700	24	0.65
GFA	Low	8,206	13	0.16
OUDS	Very High	1	1	100.00
OUDS	High	180	10	5.56
OUDS	Medium	602	6	1.00
OUDS	Low	1,932	12	0.62
OUDS	DUR4	1,424	4	0.28
OUDS	FE4	641	8	1.25
OUDS	RE2	130	2	1.54
OUDS	RE4	2,215	1	0.05
WILD	Medium	397	9	2.27
WILD	Low	1,367	12	0.88
Total		**24,862**	**175**	**0.70**

Stratum[a]		Site Days[e] in Stratum Population	Days Sampled	Sampling Rate (%)
Site Type[b]	Use Level[c] or Proxy Code[d]			

[a] Stratum is the combination of the site type and use level or proxy code. Sample days were independently drawn within each stratum.
[b] DUDS = Day Use Developed Site, GFA = General Forest Area ("Undeveloped Areas"), OUDS = Overnight Use Developed Site, WILD = Designated Wilderness
[c] Use level was defined independently by each forest by defining the expected number of recreation visitors that would be last-existing a site or area on a given day. The Forest developed the range for very high, high, medium, and low and then assigned each day of the year to one of the use levels.
[d] Proxy Code - If the site or area already had counts of use (such as fee envelopes or ski lift tickets) the site was called a proxy site and sampled independent of nonproxy sites.
[e] Site Days are days that a recreation site or area is open to the public for recreation purposes.

Visitation Estimates

Visitation estimates are available at the national, regional, and forest level. This document provides only forest level data. Other documents may be obtained through the National Visitor Use Monitoring web page: www.fs.fed.us/recreation/programs/nvum/. Table 3-56 displays the number of National Forest visits and site visits by site type for this National Forest.

Table 3-56. Annual Visitation Estimate (thousands) for Medicine Bow National Forest and Thunder Basin National Grassland (FY 2008)

Visit Type	Visits (thousands)	90% confidence interval width (%)[e]
Total Estimated Site Visits	1,129.6	26.3
Developed Day Use Sites	147.5	23.5
Developed Overnight Use Site	74.5	38.2
General Forest Areas	883.1	33.2
Wilderness	24.4	64.8
Special Events and Organizational Camp Use[c]	0	0
Total Estimated National Forest Visits	**990.3**	**26.4**

[c] Special events and organizational camp use are not included in the Site Visit estimate, only in the National Forest Visits estimate. Forests reported the total number of participants and observers so this number is not estimated; it is treated as 100% accurate.
[e] This value defines the upper and lower bounds of the visitation estimate at the 90% confidence level, for example if the visitation estimate is 100 +/-5%, one would say "at the 90% confidence level visitation is between 95 and 105 visits."

The quality of the use estimate is based in part on how many individuals were contacted during the sample day and how many complete interviews were obtained from which to estimate National Visitor Use Monitoring (NVUM) numbers and visitor descriptions. Table 3-55 and Table 3-56 display the number of visitor contacts, number of completed interviews by site type and survey form type. This information may be useful to managers when assessing how representative of all visitors the information in this report may be.

Thunder Basin National Grassland

The TBNG is used for recreation throughout the year, but most heavily during the big game hunting season from the beginning of September through November. There is rarely enough snow to keep people from accessing the grassland, so it is available for recreation year-round. Outside of hunting season when recreation users are there for a single purpose, the conditions are often too hot, too cold, or too windy to be a major recreation attraction; and therefore use is generally sporadic, occurring typically during the day only. The exceptions to this are Weston, in the Spring Creek Geographic Area (GA), the Upton Osage GA, and Rochelle Hills, which is found in the Broken Hills GA. Use in these areas is much higher, as they are the closest public lands to the residents of Gillette (Weston), Upton, Osage and Newcastle (Upton Osage), and Wright (Rochelle Hills). They are the backyard playgrounds for these communities.

Recreational activities in order of popularity are OHV use, hunting, driving for pleasure, viewing wildlife and scenery, camping (almost entirely during hunting season), trainspotting, mountain biking, horseback riding, and occasionally, hiking. Table 3-56 shows the annual visitation estimate for TBNG combined with MBNF.

The MBNF and TBNG Recreation Niche, developed during the Recreation Master Site Facility Planning Process in 2005, states,

> *The climb from the flatlands of the Midwest to the Snowy Ranges provides a true sense of arrival to the west. "Trails and tracks" are the essence of the Forests and Grassland – present, past, and future. They represent the historic railroad and migration routes, active wildlife, snow play, and present-day access through the Forests. Visitors experience history from trails to tracks. The long winter season and pleasant summer climate attract visitors and help create year-round recreation opportunities. Available experiences range from solitude to long lift lines. Access is extensive and allows for dispersal of large numbers of users as well as opportunities for all ages and abilities* (Forest Service 2005).

Developed Recreation

There are two newly-designated OHV trail systems in this part of the grassland. Both were identified in the Thunder Basin National Grassland Travel Management Analysis (Forest Service 2009a) from Level 2 National Forest System Roads (NFSR) to be converted into OHV trails limiting vehicle widths of 50" or less. One is located south of NFSR 942 (Steckley Road) just east of State Highway 59, comprising 6.8 miles of trail. The second is southeast of County Road 38 (Dull Center Road), west of Miller Hills. This trail system totals 16.9 miles; 4.8 of which is closed to motorized use from December 1 through June 30 to protect sage-grouse. No trailheads have been built for either system yet, but there are plans to do so in the future. Since these systems are so new, little use occurs, but it is anticipated that use will increase over time as they are discovered.

A mountain bike trail system was designated through the TBNG Travel Management Analysis (Forest Service 2009a). It was converted from two-track roads in the Duck Creek Breaks portion of the Spring Creek Unit. Duck Creek Breaks is an inventoried roadless area. There are no dedicated hiking trails on TBNG.

There are no developed recreation facilities on the main portion of the grassland; however, there are tentative plans to develop the Dorr Place (an historic homestead) into a fee rental facility. The east side of the Spring Creek GA has one developed recreation site, the Soda Well picnic shelter. The shelter is on a small parcel of National Forest System land, isolated from the rest but easily accessed by recreation users off of Highway 59 and County Road 49. It consists of a single table with a stone/wood shelter built in 1936 tucked inside a small, dead stand of cottonwoods. There is a medium-sized parking area and as the name suggests, a natural spring bubbles up through a pipe adjacent to the shelter. The shelter is rarely used through the majority of the year, but is a very popular campsite during hunting season.

There has not been a formal inventory of the dispersed camping sites on the main portion of the Grassland; however, observation by those patrolling during hunting season over many years has determined that there are upwards of 400 dispersed sites within the area. These sites are consistently used by the same groups every year and are well established.

The hot spots for dispersed camping are agreed to be Cow Creek Buttes with 30-50 sites, and Miller Hills and Red Hills with more than 50 sites each. These areas have established dispersed campsites along and at the end of nearly every two track. The remaining dispersed sites are scattered throughout. These are used almost exclusively during hunting season, mostly during opening week (October 1) and very rarely otherwise.

Weston (Spring Creek Geographic Area)
Spring Creek consists of two distinct areas of National Forest System lands approximately 35 miles north of Gillette, Wyoming on either side of State Highway 59. To the west is the smaller area which abuts and provides access to a significant portion of Bureau of Land Management land, hereafter known as Weston.

Weston is made up of approximately three full sections of National Forest System lands, a significant portion of BLM land, and two sections of Wyoming State land, and some private deeded land around the edges. It is amongst the northernmost portion of the TBNG; approximately 150 miles north of Douglas, Wyoming, where the ranger district is located, and the 35 miles south of the Montana border.

Weston is dominated by recreation use, with motorized use by far the largest use. This was validated in a recreation use survey conducted in July and August of 2004, where it was found that over 41% of the users were there for motorized use (Forest Service 2004). Since the time of the study, it appears that OHV use has grown, particularly during the spring and fall periods. Summer use appears to be consistent with the use found during the study. Spring and fall periods; however, have an enormous amount of use with as many as 50-200 vehicles during a weekend day.

Other recreation uses in the area include paintball and air-soft shooting (regular recreational target shooting is prohibited in the area under a special order), mountain biking, horseback riding, hiking (rarely) and camping (almost entirely during hunting season).

Weston is semi-developed as a recreation site. In 2003, a fishing pond was built approximately one mile west of Highway 59 and north of NFSR 1246 (the main road through Weston). To compliment this future use, the BLM, in cooperation with the Forest Service, rebuilt the road and developed three parking areas. These are all located on the south side of the gravel road and are all on National Forest land. The first is at the entrance from Highway 59 and has now grown to approximately 3-4 acres. The other two up the road are progressively smaller, with the last only accommodating up to five vehicles. A CXT toilet is located at the upper parking lot across from the pond.

There are approximately ten dispersed campsites in the area; all along the main gravel road. These campsites serve multiple purposes. They are actually rarely used for camping as the average amount of time spent by recreation users at Weston is 2.5 hours (Rose-Ritchie 2004), except during hunting season, when they are all occupied. Outside of hunting season they are used as over-flow parking and partying.

There are 12 miles of OHV trails in Weston, all newly designated via the TBNG Travel Management Analysis (Forest Service 2009a). These were all converted from either roads or user-created trails. Several parts of the system connect to motorized trails on BLM and state land, expanding the motorized experience, making this a very popular riding area for people from Gillette, who make up nearly 100% of the users. This demographic, although derived from the Weston Recreation Use Survey (Rose-Ritchie 2004), may still be considered valid as per observation and law enforcement statistics gathered from the site.

Upton Osage

This area is 150 miles northeast of Douglas. It is a patchwork of Forest Service, state, and private lands with State Highway 16 bisecting it. Upton sits at the northwest portion of the TBNG, with Osage holding the southeast end. Newcastle is just 17 miles southeast on State Highway 16 from Osage. Popular activities include OHV use, fishing, hunting, recreational shooting, day use, and snowmobiling when there is enough snow.

This portion of the grassland is the backyard of Upton, Douglas, Osage, and Newcastle, with recreation occurring more consistently than any other part of the grassland. One respondent to the most recent NVUM survey, conducted on November 9, 2007 at Turner Reservoir (Forest Service 2007), estimated that he had used the area 125 times in the past 12 months. He lived just seven miles from the survey location. This is probably not anomalous, as a known resident of Upton visits the area at least several times a week.

There are no campgrounds in this area; however, there is one developed fishing pond, Turner Reservoir, which has a fishing pier, toilet, informational kiosk, and parking lot. There are two other fishing ponds (Iron Creek Reservoir and Kellogg Reservoir), but there has been no development at either. Two other ponds are found south of Upton off of State Highway 116 on National Forest System lands and are used for swimming. There are perhaps 50 or more dispersed campsites in the area, which are used almost entirely during hunting season.

Perhaps the most important recreational feature in the Upton/Osage area is the 42 miles of single-track designated motorized trails. These are part of a larger trail system which is used for the Inyan Kara Enduro, a one-day annual motorcycle race, authorized to the Inyan Kara Riders. This group manages the trail system and the event. These trails are a popular yearlong riding experience, and the race is one of the most popular events on the circuit.

Rochelle Hills

This area has recently been discovered to be the playground for people from Wright, Wyoming. It is approximately 70 miles north of Douglas and lies just east of the largest coal mines on the grassland. There are no developed recreation facilities in the Rochelle Hills, but dispersed camping is a popular activity, with perhaps 20 or more dispersed campsites scattered throughout the area. Motorized use is very popular, with many two-tracks available for recreational riding. Illegal routes have also appeared, and have been signed "closed" as they are discovered. Unfortunately, the signs are persistently knocked down or simply disappear.

Other activities include camping, which is more popular here throughout the year than anywhere else on the grassland, as the dispersed campsites are placed in nicely shaded, protected groves of ponderosa. Hunting is also a big attraction; however, it appears that hunting numbers have gone down over the past several years. Only a few of the available campsites have been occupied in past years, when in other years all have been occupied.

Recreation Special Uses

To date, there are six outfitters and guides and one recreation event permitted on the TBNG. All of the outfitters operate during the big game hunting seasons from September through November and are scattered across the entire grassland. Few of the outfitters operate exclusively on National Forest System lands; using their authorizations for overflow onto public land from their private leases. All of the outfitters use existing roads and are not allowed to drive off-road for their operations.

The Inyan Kara Motorcycle Enduro is the sole recreation event permitted on the grassland at this time. As stated above, this event uses the single-track trail system in the Upton/Osage portion of the grassland. It is an annual one-day event which occurs the third Sunday in June and is part of a larger circuit of races that occur in the Rocky Mountain region. The permit limits the event to no more than 300 riders.

3.11 Socioeconomics

BLM and Forest Service LUP decisions may have economic and social impacts on stakeholders to BLM-administered lands and National Forest System lands, and to communities and the general public in and beyond the planning area. Appendix D of the *BLM Land Use Planning Handbook (H-1601-1)*, "Social Science Considerations in Land Use Planning Decisions," provides guidance on analysis of social and economic information in the BLM planning process. The purpose of such analysis is to contribute to informed, sustainable land use planning decisions.

Earlier in the planning process for the LUP Amendments, BLM prepared a Socioeconomic Baseline Report (BLM 2012a). The purpose of the baseline report, as described in Appendix D of the Handbook, is to "characterize existing conditions and trends in local communities and the wider region that may affect and be affected by land use planning decisions." The baseline report provides considerable detail on social conditions and trends, economic conditions and trends, and BLM and Forest Service public land uses and values. This section of Chapter 3 provides a summary of key information from the Socioeconomic Baseline Report.[1]

Socioeconomics is not a BLM or Forest Service management decision; it is a contextual element for planning. The baseline report and the summary provided here address social, cultural, and economic conditions and trends within the socioeconomic study area defined below. These conditions and trends will affect current and future uses of BLM and Forest Service public land resources. Conversely, decisions that the BLM and the Forest Service make in the current planning process may have social, cultural, and economic impacts. These impacts may be viewed as positive or negative, depending on conditions and the points of view of stakeholders to public lands. Baseline socioeconomic information can help inform the socioeconomic impacts analysis and engender public discussion throughout the planning process.

Socioeconomic impacts from the sage-grouse management planning effort are most likely to be related to the following potential decisions:

- Restrictions on oil and gas leasing; on the leasing of coal, trona, and other solid leasable minerals; and potentially on access to mineral materials.
- Restrictions on wind energy development.
- Changes to grazing management.
- Changes to recreation management; in particular, to some OHV open areas, limited areas, designated areas, or existing roads and trails.

Given the potential for impacts related to these types of decisions, characterization of the affected socioeconomic environment focuses on economic and social information relevant to minerals, renewable energy (particularly wind), grazing, and recreation/OHV use, along with basic socioeconomic data.

3.11.1 Socioeconomic Study Area Selection

Earlier sections of this document defined the planning area for this planning action. For the purposes of socioeconomic baselining and socioeconomic impact analysis, a socioeconomic study area also has been defined. The extent of the socioeconomic study area is determined by the economic and social relationships between communities in the region and the surface land and subsurface mineral estate that the BLM and the Forest Service manage. A socioeconomic study area commonly extends beyond the planning area

[1] *References to most of the data and information provided here are in the corresponding detailed discussions in the Socioeconomic Baseline Report.*

because the decisions agencies make can impact socioeconomic conditions in proximate lands and communities based on economic flows in the public and private sectors, how and where services and goods are obtained, and the cultural relationships of communities and resource users to BLM public lands and National Forest System lands. A socioeconomic study area may also be larger than the planning area in cases where key socioeconomic data is only available for geographies (e.g., counties) that extend beyond the planning area.

The socioeconomic study area for this planning action has been defined to include 18 counties within, or in proximity to, the boundaries of the six field offices and three Forest Service planning units addressed in this planning action. The 18 counties are: Albany, Campbell, Carbon, Converse, Crook, Fremont, Goshen, Laramie, Lincoln, Natrona, Niobrara, Park, Platte, Sublette, Sweetwater, Teton, Uinta, and Weston counties. Most of Campbell, Fremont, and Park counties fall outside of the planning area but are included in the socioeconomic study area because they have significant population centers within reasonable proximity to the planning area (e.g., Cody, Gillette, Lander, and Riverton). For this reason, there may be significant economic interactions between the planning area and these counties.

Figure 3-46 shows the location of the planning area and the socioeconomic study area, along with land tenure (ownership/management) of surface land throughout Wyoming.

3.11.2 Socioeconomic Characteristics

The following material summarizes key findings from the Socioeconomic Baseline Report (see also Appendix N). In most cases, this material discusses statistics for the socioeconomic study area as a whole or for counties within the study area. In some cases, statewide statistics serve as a proxy for study area conditions. In many cases, statistics for Wyoming and the nation are provided for comparative purposes.

Overview of the Socioeconomic Study Area

Some basic but important characteristics of the socioeconomic study area are as follows:

- Spanning over 53 million acres, the socioeconomic study area represents nearly 86% of the total land area of Wyoming (just over 62 million acres).
- Of the total land in the 18-county socioeconomic study area, nearly half is federally owned (49.7 percent). The BLM manages 27.0 percent, the Forest Service manages 14.4%, and other federal agencies manage 8.3%. Private landowners hold the next largest amount of land (44.1%). State and local government own 5.7% of the land. Water covers 0.4% of the socioeconomic study area.
- The total population of the socioeconomic study area was estimated to be just below 501,000 in 2010, representing 88.7% of Wyoming's population. Laramie County and Natrona County were the most populous counties with 91,738 and 75,450 people, respectively. Niobrara County had the smallest population, with 2,484 people.
- The socioeconomic study area has few urban areas; it is predominantly rural and sparsely populated. In 2010, the overall population density of the socioeconomic study area averaged 6.0 people per square mile. Laramie County was the most densely populated at 34.2 people per square mile, and Niobrara County was the least densely populated at 0.9 persons per square mile. Wyoming as a whole is sparsely populated at 5.8 people per square mile, compared to the U.S. population density of 87.4 persons per square mile.
- Much of the socioeconomic study area is located at considerable distance from any large urban areas.

Social and Cultural Conditions

Some important demographic and social conditions and trends in the socioeconomic study area include the following:

- The study area counties and communities have rich social and economic histories. The study area consists of predominantly rural communities and relatively small urban population centers. As part of one of the least populated states in the nation, the study area offers a unique way of life for its residents.
- Every county within the socioeconomic study area saw positive population growth between 1970 and 2010, with the exception of Niobrara County, the smallest county by population in the socioeconomic study area. Seven counties saw population growth of over 100 percent: Campbell, Converse, Lincoln, Sublette, Sweetwater, Teton, and Uinta. In terms of absolute growth, the largest increases were in Laramie County (increase of 35,378 persons), Campbell County (33,176), Sweetwater County (25,415), and Natrona County (24,186). Growth in Campbell, Sublette, and Sweetwater counties is largely explained by increased mineral development (coal, oil, and gas, predominantly). Mineral development also explains significant portions of the growth in Converse, Lincoln, Natrona, and Uinta counties. Laramie and Natrona counties had significant growth associated with Cheyenne and Casper (respectively) as important regional centers. Teton County's growth and some of Lincoln County's growth is explained by the development of Jackson and surrounding areas as a popular resort.
- Population growth projections between 2010 and 2020, prepared by the state government, anticipate continued growth of 10.7% for the socioeconomic study area as a whole. At the county level, Campbell (23.3%) and Sublette (35.5%) counties are projected to have the highest percentage population growth, driven by ongoing oil and gas development. In the same period, four other counties are projected to have greater than 10% population growth (Converse, Crook, and Fremont counties). The 12 remaining counties of the study area are projected to have less than 10% population growth.
- Albany, Campbell, Sublette, Sweetwater, Teton, and Uinta counties have a lower percentage of age 65 and older residents than the state or nation, ranging from 5.7% to 10.1% (compared to 12.4% for Wyoming and 13.0% for the U.S.). This reflects a university population (Albany County), a strong mining industry that attracts younger workers (Campbell, Sublette, and Sweetwater counties and to some degree Uinta County), or a dominant resort economy (Teton County). In contrast, Crook, Goshen, Niobrara, Park, Platte, and Weston counties each have an over 65 population that is higher than the national or state average, ranging from 15.9% to 21.0%. Except for Park County, these counties are all on the plains on the eastern edge of the state and lack larger communities. This factor may result in outmigration of younger persons from these counties, which would increase the percentage of older people.
- The percentage of Wyoming residents born in Wyoming (42.0%) is lower than the percentage of people in the United States for whom their birth state is also their state of residence (59.0%). This statistic indicates strong migration into the state by persons born outside of Wyoming. This strong migratory draw is consistent with the effects of strong mining and construction industries, low unemployment in recent years, and affordable housing in most (but not all) of the study area. These factors generally lure residents from other states.
- The vast majority of the socioeconomic study area population is of white race. The minority population throughout the socioeconomic study area is very low. Hispanics make up the largest minority population for all but one county: Fremont County has a relatively large population of American Indian/Alaska Native (21.2%), due to the Wind River Indian Reservation. The largest Hispanic population (16.8%) is in Carbon County; this figure is higher than the state figure (8.9%)

and closer to the national figure (13.5%) than the rest of the socioeconomic study area. Teton County also has a high Hispanic population (15.0%).

- The median family income for Wyoming is high relative to the United States ($63,545 for Wyoming versus $51,425 for the nation). Within the socioeconomic study area, median incomes range from a low in Platte County of $51,556 to a high in Teton County of $90,326. Eleven of the counties within the study area (Albany, Campbell, Carbon, Converse, Laramie, Lincoln, Natrona, Sublette, Sweetwater, Teton, and Uinta) have median family incomes above $60,000. Most of these counties have significant mining industries that provide strong wages. Albany and Laramie counties do not have as much mining, but do have strong professional occupational presence in the University of Wyoming and the City of Cheyenne, respectively. Teton County has a highly affluent resort economy.
- Mobile homes account for a much larger percentage of homes in Wyoming and the socioeconomic study area than in the nation as a whole. Campbell (26.3%), Crook (27.3%), Platte (22.5%), Sweetwater (23.8%), and Weston (23.1%) counties have high percentages of mobile homes compared to the state (13.4%) and the nation (6.6%). In most of these cases, this relatively high percentage of mobile homes is reflective of the fact that locally burgeoning construction and mining industries have new and/or transient workers who reside in mobile homes and other rapidly available or temporary housing.
- The largest net increases in total housing units from 2000 to 2010 were in Laramie County (an increase of 6,249 units, largely due to the economy of Cheyenne), and in Campbell County (an increase of 5,667 units, which is largely driven by the booming mineral development and production industry).
- Of all study area counties, Teton County had the highest average sales price for single-family homes in 2010 ($1,975,000); this very high figure reflects the affluence of the Jackson area. The next highest sales values were in Sublette and Lincoln counties ($258,000 and $247,000, respectively). The high value in Lincoln County probably reflects the proximity of parts of the county to Jackson. The high value in Sublette County may in part reflect this same factor, as well as the bidding up of housing values due to the recent oil and gas boom in that county. The lowest 2010 sales values in the socioeconomic study area were in Crook, Goshen, Niobrara, and Platte counties (ranging from $101,000 to $141,000). All of these counties are very sparsely populated and located on the plains on the eastern side of the state. All study area counties saw significant increases in values from 2004 to 2008 (ranging from 26.7% in Albany County to 99.3% in Weston County and 269.2% in Teton County), followed by considerable volatility in average values from 2008 to 2009 and 2009 to 2010.
- According to community surveys, many residents of the socioeconomic study area generally enjoy and appreciate a high quality of life. These surveys show that the area's communities want to grow in the way they choose, and preserve their unique history and culture. The surveys also show that the growth of the oil and gas industry has not benefited all communities in the same way and has created a number of challenges. The influx of new residents lured by the promise of oil and gas jobs has created tensions in some communities struggling to adapt to the newcomers.
- Many types of stakeholders to BLM-administered lands exist. At a high level, key types of stakeholders with respect to this planning action include Wildlife/Ecosystem Conservation Stakeholders, Mineral Development Stakeholders, Renewable Energy Development Stakeholders, Livestock Grazing Stakeholders, and Recreation Stakeholders. These categories are not mutually exclusive; many specific individuals or organizations have multiple interests and have views that place them in more than one stakeholder category.

- Stakeholders have distinct sets of attitudes, beliefs, values, opinions, and perceptions about public resources and the effects of various management policies and actions. These views reflect different cultural and economic linkages people have to public lands.
- Some counties in the socioeconomic study area have minority populations and/or populations in poverty that may qualify as environmental justice (EJ) populations. These counties are Fremont County, based on the population of American Indians/Alaska Natives; Albany County, based on the population of all ages living in poverty; and Niobrara County, based on the population of 65 years and older living in poverty. Further consideration of potential EJ impacts in these counties is provided in the impacts analysis. The need for further analysis of potential EJ impacts at the subcounty level is also addressed in the impacts analysis.

Economic Conditions

Some important economic conditions and trends in the socioeconomic study area include the following:

- The unemployment rate in Wyoming tracked closely with the unemployment rate of the nation from 1995 to 2000. From 2001 to 2009, the unemployment rate for the state was lower than the national rate, likely as a result of the boom in oil and gas development and production during this time. At the county level, Albany, Teton, and Sublette counties since 1995 have had the most consistently low unemployment rate. Albany County is helped by strong demand generated by or associated with the university, and Sublette County enjoys a strong mining industry. Teton County benefited from its strong resort economy until the recent recession. Beginning in 2001 through 2008, Campbell County maintained the generally lowest level of unemployment, no doubt due to a strong mining industry. Fremont County has consistently seen the highest rate of unemployment, which may be due in part to the problem of endemic unemployment in the American Indian population.
- *Government* was the largest employment sector in Wyoming between 1970 and 1990, and *Services* became the largest sector after 1990. *Retail Trade* was the third largest sector during the 1970 to 2000 period. All three industries showed strong growth through the period, albeit with some minor downturns and flat periods for both *Retail Trade* and *Government. Mining* (which includes oil and gas development and production) had very strong growth in jobs between 1970 and 1981, then experienced a sharp downturn between 1982 and 1987, followed by flat employment during the rest of the period to 2000.
- Total employment in Wyoming grew by 18.6% between 2001 and 2009. Industries that grew at substantially greater rates were *Finance and Insurance* (61.4%), *Mining* (61.0%), *Real Estate and Rental and Leasing* (59.5%), and *Educational Services* (39.5%).
- In 2007, throughout the socioeconomic study area, *Government and Government Enterprises* accounted for a large percentage of employment. The *Mining* industry accounted for a significant percentage of employment for Campbell (26.1%), Sublette (24.9%), Sweetwater (20%), Weston (14.4%), and Converse (12.4%) counties. Counties with significant percentages of employment in the *Construction* industry in 2007 were Lincoln (22.4%), Carbon (14.4%), Sublette (13.2%), Uinta (12.2%), Crook (11.1%), and Teton (11.0%) counties. *Accommodation and Food Services* was particularly important to employment in Teton (23.0%) and Park (10.6%) counties. *Healthcare and Social Assistance* provided over 10% of jobs in Natrona County (10.8%), while *Real Estate and Rental and Leasing* provided over 10% of jobs in Teton County (11.2%). *Retail Trade* provided over 10% of jobs (up to 12.6%) in multiple counties: Albany, Fremont, Goshen, Laramie, Natrona, Park, Platte, Uinta, and Weston counties. *Farming* was most important in Niobrara (15.0%), Goshen (11.9%), Crook (11.9%), and Platte (10.4%) counties.

- Between 2001 and 2009, statewide, the greatest total dollar increases in labor earnings were experienced in *Mining* ($1.598 billion) and *State and Local Government* ($1.432 billion). *Construction* ($0.599 billion) and *Health Care and Social Assistance* ($0.613 billion) also experienced large increases in earnings statewide.
- By a wide margin, in 2007 the *Natural Resources and Mining* industry provided the highest average annual wage ($50,228) across the socioeconomic study area, followed by the *Construction* industry ($41,039). The *Leisure and Hospitality* industry provided the lowest average annual wage ($12,031).
- Statewide, the majority of personal income in 2009 came from labor income (labor earnings). However, the percentage of income from labor has declined from 75.8% in 1970 to 59.1% as of 2009, a drop of 16.7%, while the percentage of income from nonlabor sources has increased. Throughout the state, the following changes have occurred in recent decades in the percentage share of total personal income: net earnings income has decreased; dividends, interest, and rent income has increased; and personal current transfer receipts income has increased. Within personal current transfer receipts income, income maintenance income (welfare) and unemployment insurance compensation income have remained relatively stable, while retirement and other income have increased. These trends are consistent with national trends that reflect an aging population.
- Within the socioeconomic study area, the decline in the net earnings share is consistent with statewide trends with a few exceptions. Campbell, Converse, Sublette, Sweetwater, and Uinta counties—all counties with strong mining industries—have seen no more than a 5 percentage point decline in net earnings as a percentage of personal income since 1970.
- Analysis of location quotients for industries in Wyoming in 2008 shows that the following industries are most important to the economic base (bringing in outside income): *Mining, Construction, Accommodation and Food Services,* and *Government and Government Enterprises*. These industries had both high location quotients and large shares (over 7%) of the state's employment or earnings. Several other industries—*Farming; Forestry, Fishing, and Related Activities; Utilities; Transportation and Warehousing*; and *Real Estate and Rental and Leasing*—have high location quotients but small shares (less than 7 percent) of employment or earnings. These industries bring meaningful outside income into the local economy, but their relative impact on the economy is smaller than other industries due to the lower levels of employment for each industry.
- The study area includes the top seven agricultural counties in the state. With respect to the livestock industry in particular, the following study area counties have over $100 million in livestock inventory value: Carbon, Fremont, Goshen, Laramie, and Platte. Each of the 18 counties has seen some variation in cattle production between 2004 and 2011. However, changes have neither been especially large, nor is there a consistent trend across the counties. Sheep production has also been variable, with a clear downward trend in production in several counties and across the state in the last few years.
- The socioeconomic study area provides most of the oil and gas produced in Wyoming. Gas production across the study area and the state has increased substantially since 2000. Sublette County had by far the largest volume of gas production in 2011 of all counties in the study area and state, and showed enormous growth (more than doubling) between 2000 and 2011. Sweetwater, Fremont, Campbell, and Uinta counties are the next largest gas producers; production has seen some increases and decreases in these counties over the period shown. Comparatively, oil production in the study area and state has been relatively steady through this period. The following counties were the top oil producers in 2011 (over 5 million barrels): Campbell, Natrona, Park, Sublette, and Sweetwater.

- According to a report for the Wyoming Heritage Foundation (2008), oil and gas activities within Wyoming in 2007 accounted for an estimated 32% of the state's total economic output or gross revenues, 20% of employment, 25% of total earnings, and 43% of Gross State Product. Furthermore, oil and gas accounted for 75% of severance taxes, 78% of mineral ad valorem levies, 55% of federal mineral royalties, and 65% of state mineral royalty revenues.
- A vibrant mining industry in Wyoming has numerous benefits throughout the state and is responsible for a substantial share of private income, government revenue, and private and public spending. However, Wyoming's economy is also more susceptible to national and global economic conditions that affect the demand for minerals, particularly energy minerals.
- Wyoming has long been recognized as an ideal location for wind energy development. The southern portion of the state, which includes the socioeconomic study area, is especially suited for wind development, with ample land area and consistent, high winds. Wind energy generation in Wyoming has seen strong growth—from 617 megawatt hours in 2004 to 3,247 megawatt hours in 2010.
- Wind energy development and production benefit local economies. Local landowners and residents benefit by opening up their land to wind developers, generating revenue through property taxes, sales taxes, and royalty payments to landowners.
- Within the study area, tourism and recreation make important contributions to the local economy and to local government revenues. According to an economic impact study prepared for the Wyoming Office of Tourism (2012), travelers spent $2.7 billion in the study area in 2011. This spending supported $674 million in direct earnings and 27,200 jobs. This spending also generated $48 million in local tax receipts and $63 million in state tax receipts. These figures do not include additional earnings, jobs, and tax receipts generated through the multiplier effect of the re-spending of earnings within the local economy.
- Hunting and fishing generate considerable recreational expenditures in Wyoming, and much of this recreation occurs on public lands.
- A growing component of recreation on BLM public lands and National Forest System lands and across the state is OHV use. Non-recreational use of ORVs is also significant. Sales of annual ORV permits in the socioeconomic study area increased over 800% from 2002–2011, to 40,759 permits sold.
- In 2011, the federal government collected $1.742 billion in royalties and $242 million in bonuses, rents, and other revenues from federal mineral leases in Wyoming. In 2010, the largest disbursements of the state's share of federal mineral revenues were to the Budget Reserve Account ($420 million), the Foundation Fund ($299 million), and the Highway Fund ($60.1 million). While the state passes some federal mineral revenues back to local government and schools in several ways, these payments are a relatively small portion of the total federal mineral revenues the state receives, amounting to 22.8% in 2009 and 8.6% in 2010.
- Payments in Lieu of Taxes (PILT) from the federal government help local governments compensate for lost property taxes resulting from tax exempt federal lands. In 2010, Sweetwater County and Fremont County received the largest PILT payments, $2.7 million and $2.5 million, respectively. Sublette County had the lowest PILT payment at $0.9 million. In all counties, PILT payments increased substantially between 2005 and 2010, due to an increase in Congressional funding for the program.
- Most state mineral severance tax revenue remains with the state, mostly in the General Fund, the Budget Reserve Account, and the Permanent Wyoming Mineral Trust Fund. Distributions to local governments in 2010 totaled $28.5 million, which was 3.1% of the total severance tax distributions.

While local governments benefit less directly from some of the other distributions, such as the highway fund, those amounts are also small.

- Ad valorem taxes from mineral production are another source of revenue derived from mineral production, one that accrues more locally. The state assesses the value of mineral production (the same value used for levies of the state's severance taxes). The counties then apply mill levies to 100% of the state-assessed value and collect the ad valorem tax. The total of $1.851 billion in ad valorem property taxes levied in 2009 in Wyoming, based on statewide assessed values of approximately $11.4 billion for minerals and $8.8 billion for other property, accrued as follows: 70.1% K–12 education, 18.3% counties, 7.1% special districts, 2.5% community colleges, and 1.2% cities and towns.
- Locally assessed taxes based on valuation of mining property and equipment on both private and public land provide additional revenues to local governments. For the socioeconomic study area, the total valuation of mineral-related properties increased from $0.802 billion to $1.554 billion, led by a large increase in the valuation of oil and gas properties.
- Other tax revenue sources that may be affected by management actions associated with BLM-managed lands include sales and use taxes, lodging taxes, and fuel taxes. In addition, Wyoming continues to refine its levy of a production tax on wind energy.
- Mineral royalties and taxes related to mineral production are not necessarily generated in proportion to needs for local or state government provision of infrastructure and services that are impacted by energy development and production. The same may be true for other public revenue-generating activities on BLM-administered lands and National Forest System lands.
- Management of BLM-administered land and National Forest System land may affect state and local expenditures in many ways. The types of state and local expenditures that may be affected include maintenance of state and local roads, law enforcement personnel and equipment, emergency medical services, search and rescue teams, conservation and wildlife management, fire management, solid waste collection and disposal, and public utilities.
- Federal government expenditures related to federal lands benefit the local economy because federal salaries for land management staff that reside in the socioeconomic study area and federal contracts to businesses located in or with employees residing in the socioeconomic study area provide inflows of money.

Public Land Uses and Values

The biological and physical characteristics of BLM-administered and National Forest System lands in the planning area, coupled with social and economic conditions and trends within the socioeconomic study area (e.g., mining industry trends, local recreation demand, broader tourism patterns), together strongly affect the many uses and values of BLM and Forest Service public resources. The Socioeconomic Baseline Report provides substantial information on BLM and Forest Service public land uses and values. Some notable aspects include:

- Livestock grazing has been an important economic activity in the socioeconomic study area and continues as an economic contributor locally and a livelihood for persons in the industry. It is also very significant to the cultural identity of the region and especially to certain communities and stakeholder groups. Ranching has a long history in the socioeconomic study area and has played a key role in the economic and social development of Wyoming. Use of BLM public lands and National Forest System lands for grazing livestock has been a vital component of that history and remains important today.

- Grazing on BLM public lands and National Forest System lands is very important to many livestock operators. Dependence on federal lands (versus other lands) varies by operator, but some almost entirely use public lands. Others may make substantial use of private lands, but may be very dependent on public lands for economical forage at certain times of the year. Many of the larger operators use public lands year-round.
- Actual use of BLM and National Forest System lands for grazing has varied from year to year, in part because the planning area has experienced drought conditions. These conditions have resulted in less forage being available for livestock use at some times and the need for permittees/lessees to take voluntary nonuse. During drought years, the livestock operators, BLM, and the Forest Service work closely to tailor the adjustments in livestock use to meet the needs of the land and the ranch operation. In addition, annual fluctuations in the AUMs used may develop from user demands, climatic conditions, and/or from the collection of monitoring information. All these factors, together with market conditions each year, combine to determine the total value of livestock production from BLM and National Forest System lands.
- Mineral exploration, development, and production on federal mineral estate have many socioeconomic implications.
- Mineral exploration and mineral production generate economic activity through payments to labor and to capital both inside and outside of the socioeconomic study area.
- Mineral production generates tax revenue to state and local governments.
- Some mineral production on federal mineral estate generates revenues to the federal government; for instance, federal mineral royalties and bonuses. Nearly half of these federal revenues are shared with the state, which may in turn share some of these revenues with local governments.
- Mineral exploration and production have social significance as livelihoods for persons in the industry and to the cultural identity of certain communities and stakeholder groups.
- Mineral exploration, development, and production may result in environmental impacts, demands on physical infrastructure, increased traffic, "boom and bust" economic cycles, and other impacts that have economic and social costs.
- Renewable energy development on public lands is tied to land availability, power line access, and reasonable access to utility markets.
- Wind energy is the form of renewable energy that has received the most interest for use of federal public lands in Wyoming in recent years. Many wind energy projects on BLM land are in various stages of development. Within the Forest Service units that are part of this planning action, there has been limited renewable energy activity.
- Of the various types of recreation on BLM public lands and National Forest System lands, OHV use is most likely to be impacted by management decisions resulting from this planning effort. Therefore, the recreation section of the Socioeconomic Baseline Report focuses on OHV use.
- The majority of OHV use on public lands occurs on unpaved roads and two-track trails. In the planning area, the most common vehicles used are 4-wheel drive trucks, ATVs, and sport utility vehicles. Snowmobile use is another popular OHV activity. Typical recreational OHV activities within the planning area include casual ATV and motorcycle trail riding, enduro races, trial competitions, and snowmobiling. OHV use, in itself, has become a popular method of exploring public lands. OHVs are used within the planning area for nonrecreational purposes as well.
- OHV access to public lands is important to economic activity and quality of life. For instance, access to ROWs, communication sites, mining sites, and other commercial sites may affect the commercial viability of the operations at these sites and thereby affect the contributions of these

sites to the local economy. Recreational use of OHVs also contributes to the local economy when OHV users make local expenditures for goods and services. These expenditures also generate tax revenues.

- OHV use can also have negative impacts that affect public land values. OHV damage includes driving off established roads and trails, pioneering unauthorized roads and trails, and associated damage to vegetation and soils. Certain environments are more susceptible to OHV damage, including crucial winter ranges, wildlife breeding areas, riparian habitats, and areas with steep slopes or sensitive soils.
- BLM-administered lands and National Forest System lands have many nonmarket values. This term refers to the benefits individuals attribute to experiences of the environment or uses of natural and cultural resources that do not involve market transactions and therefore lack prices. Examples include the benefits received from wildlife viewing, hiking in a wilderness, or hunting for recreation. Nevertheless, such values are important to consider because they help tell the entire economic story. Estimates of nonmarket values supplement estimates of income generated from commodity uses to provide a more complete picture of the economic implications of proposed resource management decisions.
- While there are difficulties associated with measurement of nonmarket values, it is well accepted that these values can be estimated in monetary terms, subject to certain caveats.
- Nonmarket values of open space and well-managed natural resources also include a broad range of human benefits resulting from healthy ecosystem conditions and functions. These benefits include potable water from groundwater recharge, flood control from intact wetlands, and carbon sequestration from healthy forests and certain agricultural lands. These human benefits from ecosystems are known as "ecosystem services" (Ruhl et al. 2007), and are receiving increasing attention from economists.

The various socioeconomic study area characteristics noted above are some of the drivers that affect management and use of BLM and Forest Service public land resources, and associated social and economic values. Many additional factors addressed in the Socioeconomic Baseline Report also impact public land uses and values. Analysis of the LUP management alternatives must take into account these many considerations in order to assess the potential social and economic impacts of the management alternatives.

3.12 SOILS

3.12.1 Bureau of Land Management

General Planning Area Description

Soils are affected by a variety of surface uses that loosen topsoil and damage or remove vegetation or other ground cover, which may result in accelerated erosion. Surface-disturbing activities include any authorized actions that disturb vegetation and (or) surface soil, thereby increasing erosion potential above normal site conditions. Surface-disturbing activities include construction of well pads and roads, pits and reservoirs, pipelines and power lines, mining, vegetation treatments, or concentrated OHV cross-country travels. Accelerated erosion, soil erosion at rates higher than natural erosion rates, and exceeding the rate at which soil-forming processes can create soil in place, may result from soil compaction or other surface-disturbing activities.

Management challenges identified for soils in the planning area result, in part, from historic activities and new resource conflicts. Historic activities include mineral development and other surface-disturbing activities; new resource conflicts include increased use of OHVs on public lands. Managing soils within the planning area emphasizes maintaining soil and landscape integrity through efforts to minimize accelerated erosion, avoiding or minimizing destruction of biological soil crusts, establishing successful site reclamation, and, in some cases, improving soil health through implementing grazing management plans. Reclamation of surface-disturbing activities and improving grazing management have been successful in sustaining soil productivity in most cases. Accelerated erosion within the planning area is mainly the result of soil compaction by vehicles, runoff from roads, and uncontrolled concentrated flow from poorly reclaimed or unreclaimed bare ground created by surface-disturbing activities.

The Wyoming Interim Reclamation policy has a long-term goal for reclamation "to prevent any long-term unnecessary and undue degradation and provide for the eventual ecosystem reconstruction" (BLM 2007c). This policy also provides short-term goals "to immediately stabilize disturbed areas and to provide the necessary conditions to achieve the long term reclamation goals" (BLM 2007c). The policy identifies seven objectives to meet these goals. In addition, Surface Operating Standards and Guidelines for Oil and Gas Exploration "The Gold Book" (BLM and Forest Service 2007) and Onshore Order No. 1 provide a number of goals related to oil and gas development reclamation activities. The Gold Book states the "Long term objective of final reclamation is to set the course of eventual ecosystem restoration, including the restoration of natural vegetation community, hydrology, and wildlife habitats." Soil health is an imperative means to reach this objective. In addition, Onshore Order No. 1 states: "Final abandonment shall not be approved until the surface reclamation work required by the approved drilling permit or approved abandonment notice has been completed to the satisfaction of the involved SMA" (BLM 2007a).

Soil resources are protected through the application of site-specific use restrictions, and Best Management Practices (BMPs) intended to limit soil erosion, maintain soil health and loss of productivity, and minimize overall disturbance of soil resources. Some restrictions are general, such as programmatic constraints applied to all surface-disturbing activities, including restricted access during periods of wet or frozen soils or limitations on operations on steep slopes. Specific restrictions include limiting OHV access to designated areas where no highly erodible soils occur. Typically, protection of soil resources is accomplished through the application of site-specific management practices, including installing water bars or diversion channels to control surface runoff around bare soil or off a road and developing specific seed mixtures or seeding techniques appropriate to the reclamation area.

Soil Types

Soils of the planning area have formed from a wide variety of geologic material, ranging from in situ geologic parent material rock (residuum) to material transported by wind (aeolian deposits), water (alluvium), gravity (colluvium), and ice (glacial till). These parent materials, along with variable climate, topography, vegetation, and management, produce soils with diverse characteristics. The soils in the planning area can be classified into the five groups summarized below.

Group 1. – Dominant parent materials include residuum formed over sediments; colluvium, including landslide and earth-flow deposits; and alluvium on footslopes and drainages. Red and brown colors of varying depths and textures characterize the soils on the ridges and steep slopes. Most red soils in this area are highly susceptible to water erosion when disturbed.

Group 2. – Low relief, bedrock ridges, erodible slopes, and alluvial fans dominate the broken landscape in this area. These soils generally have a clay-like texture. Poor infiltration and high levels of runoff create a strong potential for water erosion in this area. Many soils in this group formed from shales producing clayey textures with poor surface water infiltration, high runoff potential, and high carbonate levels that create a high potential for water erosion. Also common in this group are soils with surface textures that are highly susceptible to water erosion due to a high proportion of fine sands or silts with little binding material or silt-sized carbonates. Many soils in this group are susceptible to excessive wind erosion due to sandy surface textures, low organic matter, and high carbonate content. This soil group has a high proportion of saline soils, especially in low topographic areas, such as drainages and areas below marine shale outcrops.

Group 3. – Parent materials include sedimentary rock and glacial till, resulting in soils of various textures with various rock sizes within the soil profile. Mass wasting in the form of landslides and slumping occurs on the steeper, moister slopes.

Group 4. – This group is found on alluvial terraces, fans, and pediments. These landforms were created as a result of alluvial material flushing out of the canyons of nearby mountains. Soils in this position generally are deep, with rock and cobbles throughout the profile, which may affect some land uses.

Group 5. – Floodplain soils form a small minority of the soils within the planning area. However, because of their riparian location and productivity, they form an important part of the overall ecosystem. This group, located along major drainages, comprises a relatively small percentage of the planning area and includes riparian areas and areas of high soil productivity. Due to the influence of adjacent soils and geology, these soils are not uniform in character and can be subdivided into three groups:

- **Subgroup A:** These soils generally are found in intermittent drainages. Textures are dominated by silty clays and other clays, and are often saline.
- **Subgroup B:** These soils tend to have more rock, vary more in texture, and are less saline.
- **Subgroup C:** These soils are associated with the mountains and foothills and along perennial drainages. They have a variable texture and are not highly saline.

Soil Conditions and Characteristics

The soils in the planning area possess several limitations that reduce the potential for establishing vegetation following a disturbance. Soils with limitations include highly erodible, saline, sodic, and sandy soils. Soils considered susceptible to these limiting features are discussed in the following subsections.

Highly Erodible Soils

Highly erodible soils are characterized by the loss of valuable topsoil resulting from action by either wind or water. Erosion increases when the vegetative community is disturbed by intense grazing, fire, road construction, or any other use that reduces the amount of vegetative cover.

Saline Soils

Saline soils have calcium, magnesium, or other nonsodium salts dominating their ionic composition, although they might also contain some sodium salts. Soil salinity can have significant effects on soil erosion and reclamation potential. Because erosion of saline soils can also have significant effects on downstream water quality, saline soils are managed to minimize impacts in these areas and to promote the revegetation of previously disturbed areas to the greatest extent possible.

Sodic Soils

The ionic composition of sodic soils is dominated by sodium salts. Soils with sodium adsorption ratios (SAR) of 13 or greater are considered sodic. Infiltration of precipitation into these soils is reduced by the dispersion of soil particles caused by the higher levels of sodium. Reduced infiltration rates result in greater surface runoff rates and increased soil erosion and sediment yields. Many of these soils have a thin layer of less sodic soil above the sodic horizon; therefore, when this layer is disturbed or removed, the resulting impact can be irreversible.

Sandy Soils and Sand Dunes

Sandy soils are highly susceptible to wind erosion, and efforts are made to avoid disturbing these areas. Sandy soil series include Crestman, Eightyfive A-B-C, Koonich variant, LaMarsh, Littsan variant, Ryan Park, and Space City (BLM 1990a).

Sensitive Soils

The planning area contains numerous types of sensitive soils. The most sensitive and of highest importance are soil biological crusts. Soil biological crusts are a mosaic of bacteria, algae, lichens, mosses, and microfungi that weave through the top few centimeters of soil, gluing loose particles together and forming a matrix that stabilizes and protects soil surfaces from erosive forces. On rangelands, soil crusts function as living mulch by retaining moisture, discouraging annual weed growth, reducing water and wind erosion, fixing atmospheric nitrogen, and contributing to soil organic matter. These crusts, when undisturbed, tend to occupy the nutrient-poor zones between vegetation clumps (BLM 2001a). Crusts are well-adapted to severe growing conditions, but poorly adapted to compressional disturbances from vehicles, people, or animals. The introduction of livestock has affected soils crusts over vast areas of the West. Once soil crusts are damaged or destroyed, they recover very slowly, especially in arid climates. Recovery can be enhanced by limiting the size of disturbance so that contiguous crusts can act as a source to recolonize the disturbed area (BLM 2001a).

Physical soil crusts are different from biological crusts and generally form in coarse sandy soils with low organic matter content, high salinity, and high alkalinity. Physical crusts may form when exposed to raindrop splash on bare soil or as a result of compaction. Soils with physical crusting typically reduce water infiltration and can prevent seedling emergence (BLM 2001a).

Casper Field Office

Dominant soil textures are loams and sandy loams between 40 and 60 inches deep. These soils generally exhibit a low to moderate rate of runoff and wind erosion. In general, soils in the field office are in good condition and capable of producing forage for wildlife and livestock, maintaining watershed integrity, and recovering from impacts associated with surface-disturbing activities.

Soil landscape position, steepness of slope, physical properties (including texture and structure), and chemical properties contribute to susceptibility to wind and water erosion. Soils in the field office with a high wind or water erosion hazard have been identified where county soil survey data were available. On public surface within the field office, approximately 185,820 acres of soils are highly susceptible to water erosion and 70,430 acres are highly susceptible to wind erosion. Table 3-57 displays the acres of soils with high potential for erosion from wind and water.

Table 3-57. Soils with High Erosion Potential in the Casper Field Office

Erosion Type	BLM-Administered Surface		Federal Mineral Estate		All Land Ownership	
	Acres	Percent of BLM-Administered Surface	Acres	Percent of Federal Mineral Estate	Acres	Percent of Lands within Field Office
Wind	70,430	5	223,140	5	337,690	4
Water	185,820	14	352,640	8	459,680	5

There are designated sites in the field office where soils require special management practices to limit erosion and loss of productivity. Proposed surface-disturbing activities will be modified (located) to avoid areas of highly erosive soils to the greatest extent practicable. There are 575,790 acres of BLM federal mineral estate, of which 256,240 acres are BLM surface which are highly erosive soils; surface disturbance is to be minimized in those areas. Slopes greater than 25% are prohibited from surface disturbance or development, with some limited exceptions allowed.

Currently, there are limits on surface development on Cedar Ridge due to erosive soils and fragile watershed conditions. Surface development is not permitted from December 30 to June 1 in specific areas, such as the South Fork Powder River drainage, Coal Mountain-Twin Buttes area, and Pine Mountain. Other management practices help protect soils in specially designated areas, including the Casper Sand Dunes and Salt Creek.

Salt and sediment yield are concerns in the Colorado River basin, of which the Green River Basin is part. Salt and sediment yield are also concerns in the Bear River basin and Bear Lake. The Bear Lake Regional Committee was formed to address these concerns. Although they can inhibit vegetation growth, salts held deeper in the soil profile generally are not a substantial source of salinity to the Colorado River basin, except along drainages where bank erosion or subsurface leaching occurs. Salts in soils are a land use management challenge primarily when surface disturbance and reclamation of disturbed land occurs. Another challenge is the demand placed on soils in the field office due to the development of mineral resources. A concern for potential salt-loading to the Colorado River from increasing development of CBNG in the Green River Basin was expressed in the *2002 Review of Water Quality Standards for Salinity* by the interagency Colorado River Basin Salinity Control Forum (2002).

Kemmerer Field Office

Soils managed by the Kemmerer Field Office formed from a variety of parent materials, reflecting the influence of surficial geology and geomorphology. Within the field office, soils with a high amount of silt-sized carbonates or a reddish color tend to be particularly susceptible to water erosion due to poor cohesion qualities that tend to lose aggregate structure when wet.

Steep, sloping major ridges with narrow valleys trending north-south are found in association with the Overthrust Belt (Soil Group 1) that extends south of Evanston at the Utah State line to the western divide of the Muddy Creek drainages. This area narrows to the north and tapers in the Cokeville area. Most red soils along the upland ridges, such as along the Bear River Divide, are highly susceptible to water erosion when disturbed. Areas within the Overthrust Belt, especially low areas, are saline (high in soluble salts and sodium), which is a water quality concern in the Colorado River basin.

Soil Group 2 is the largest in the field office and contains the sedimentary uplands of the Green River Basin. It is bounded by Oyster Ridge on the west, extends beyond the Kemmerer Field Office to the east, becomes a narrow band along Fontenelle Creek in the north of the field office, and is bounded in the south by the foothill terraces of the Uinta Mountains. Included within this group are badlands, such as those found along Cottonwood Creek and the Moxa Arch field, and scattered clusters of sand dunes south of Shute Creek and in the Blacks Fork and Muddy Creek uplands.

Soil Group 3 occurs in the northern and extreme southern parts of the field office including Star Valley as an extension of the Wasatch and Uinta mountains in Utah.

Soil Group 4, located in the extreme south-central and northwestern parts of the field office, is found on old alluvial terraces, fans, and pediments. Glacial till (Bishop Conglomerate) occurs in the southern part of Uinta County and generally is found on high, relatively level outwash terraces, such as Leavitt Bench. Soils in this position generally are deep, with rock and cobbles throughout the profile, which may affect some land uses.

Soil Group 5, located along major drainages, comprises a relatively small percentage of the field office and includes riparian areas and areas of high soil productivity. Due to the influence of adjacent soils and geology, these soils are not uniform in character and can be subdivided into three groups:

- Subgroup A: These soils generally are found in the eastern part of the field office in intermittent drainages of the Green River Basin, such as Slate Creek, Muddy Creek, and the lower part of Blacks Fork River.
- Subgroup B: These soils are found along the perennial upper reaches of Blacks Fork River, Willow Creek, Bear River, and Hams Fork River in the Opal area.
- Subgroup C: These soils are associated with the mountains and foothills of the Overthrust Belt along the perennial drainages of Smiths Fork, Upper Hams Fork, LaBarge Creek, upper Fontenelle Creek, Salt River, and Greys River.

Newcastle Field Office

In the Newcastle Field Office, soils have many different characteristics based on climate, living organisms, parent material, topography, and time. The soils fall into two major groups, Soils of the Mountains and Valleys; and Soils of the Eastern Wyoming Plains. The plains can be divided into three broad groups: soils formed from transported materials, soils formed from residual material on the steep uplands, and soils on nearly level to rolling upland plains, terraces, and fans. Soils formed in transported materials are associated with the major drainages in northeastern Wyoming. The soils are nearly level to gently sloping (0 to 6% slopes) and are developing in alluvium on floodplains and terraces. The soils are generally deep to very deep and are well drained.

Soils formed from residual materials on steep uplands are forming in the residuum and alluvium from sandstones, shales, siltstones, and metasedimentary bedrock. These rolling to steep (5% to 40% slopes) soils are generally medium textured and range from shallow to deep. Most of these upland soils are well drained.

On the nearly level to rolling upland plains, terraces and fans, soils are developing in residuum and alluvium derived from shales, sandstone, sitltstone, and limestone bedrock. Soil depths range from shallow to very deep and are generally grass-shrub covered. Table 3-58 shows the general soil units in the field office from the Wyoming General Soil Map.

Table 3-58. Soil Types of the Newcastle Field Office

Soil Unit	Percentage of Field Office	Characteristics
Soils of the Mountains and Mountain Valleys		
MF-1	7.3	Eutroboralfs-Haploboralls Association. Dominantly dark colored soils developing in residuum and transported materials from igneous and sedimentary bedrocks.
Soils of the Eastern Wyoming Plains (soils formed from transported materials)		
P-3	5.3	Torrifluevents-Haplargids-Torriorthents Association. Nearly level to gently sloping soils in alluvium on floodplains terraces.
Soils of the Eastern Wyoming Plains (soils formed from residual materials on steep uplands)		
P-4	2.6	Torriorthents, shallow Association. Shallow and very deep soils developing in residuum and alluvium from interbedded sandstone and shales.
P-5	24.9	Torriorthents-Haplargids Association. Rolling to steep soils are developing in residuum and alluvium from interbedded sandstone and shales.
P-6	5.4	Torriorthents-Torriorthents, shallow Association. Rolling to steep soils developing in residuum from siltstones.
P-9	0.4	Argiustolls Association. Locate in the Hartville uplift area. Sloping to steep soils developing in residuum from metasedimentary bedrock.
P-10	6.0	Torriorthents, fine Association. Gently sloping soils are developing in residuum and alluvium from siltstones and limestones.
P-11	10.5	Torriorthents-Argiustolls Association. Located adjacent to the Black Hills. These gently sloping to steep soils are developing in residuum from interbedded shales and sandstone.
P-12	4.7	Torriorthents-Argiustolls-Haplustolls Association. Adjacent to the Black Hills. Gently sloping soils are developing in residuum and alluvium from siltstones and limestones.
P-13	2.8	Haplargids-Paleargids-Torriorthents Association. Located in the central part of Powder River Basin. Rolling soils are developing in residuum and alluvium from interbedded sandstones and shales.
P-16	7.5	Arigustolls-Haplustolls Association. Gently rolling and rolling soils developing in residuum from fine-grained sandstone.
P-21	22.7	Torriorthents, fine-Torrifluvents Association. Gently to moderately sloping soils are developing in alluvium and residuum from shales.

Source: University of Wyoming 1997

Pinedale Field Office

Group 1 soils are located in the northwest central and southwest central portions of the field office and make up 13% of the total area. Opportunities to mitigate adverse impacts on soils are limited by the dominance of shallow soils, low precipitation, and moderate to high landslide potential.

Group 2 soils dominate the central and southeast half of the field office. Upland soils make up 34% of the total area. The Yellow Point sand dune areas have sandy and loamy soils that are excessively drained and have little water-holding capacity. The combination of low precipitation, salinity, and excessively drained soils limits opportunities to mitigate impacts on soils.

Soils of Group 3 are located along the northeast and western borders of the field office and make up 20% of the total area. Glacial till occurs along the Wind River Front. Coniferous vegetation and aspen are often present on the north-facing slopes that receive greater effective precipitation, resulting in higher productivity and organic matter enrichment. The steep slopes, short growing season, and high landslide potentials limit management opportunities in these areas.

Group 4 soils are found in the central western portion and along the mountains on the northeast edge of the field office. The soils make up 19% of the total area. Limited management features include occasional steep slopes coupled with alkaline areas in alluvium and cobbly surfaces in glacial moraines.

Group 5 soils are associated with major drainages and are found throughout the central portion of the field office. These soils make up 14% of the total area. Although usually productive, areas of saline-alkaline-affected soils limit vegetation production (BLM 1997b).

Soil Conditions and Characteristics

The soils in the field office possess several limitations that reduce the potential for establishing vegetation following a disturbance. Soils with limitations include highly erodible, saline, sodic, and sandy soils. Soils considered susceptible to these limiting features are discussed in the following subsections.

Highly Erodible Soils

Highly erodible soils are characterized by the loss of valuable topsoil resulting from action by either wind or water. Several soils in the field office are red and have a history of erodibility when disturbed—Almy, Chedsey, Cundick, Eighteen, Iyers, Jerry, Kismet, Nineteen, Redhill, and Stovho soil series. The Forelle soil is not red, but it is considered highly erodible.

Saline Soils

Soil salinity can have significant effects on soil erosion and reclamation potential. Cambarge, Chrisman, Dines, Fluvents-saline, Laney, Mone-saline, Sandbranch, and Tresano variants are some of the soils in the area that have high salt contents (BLM 2002a, BLM 1990a).

Sodic Soils

Soils with sodium adsorption ratios (SAR) of 13 or greater are considered sodic. Soil series in the field office with SAR values in excess of 13 include Blazon, Bosler, Bodorumpe Charlos variant, Coalmount, Cora, Dinnen, Foxcreek, Gelkie, Edlin, Haterton, Heath, Laney, Littsan, Millerlake, Maurice, Paulson, Rickman, Tineman, and Westvaco (BLM 2002a,BLM 1990a).

Sandy Soils and Sand Dunes

Sandy soils are highly susceptible to wind erosion, and efforts are made to avoid disturbing these areas. Sandy soil series include Crestman, Eightyfive A-B-C, Koonich variant, LaMarsh, Littsan variant, Ryan Park, and Space City (BLM 1990a).

Limitations on Specific Activities

With the exception of hard-surface, all-weather roads, most roads in the field office are constructed from local soils or improved with gravel. Soil properties that are limiting to construction of roads in the area include sodium content, gypsum content, soluble salts, low strength, high shrink-swell potential, and susceptibility to frost action. The content of large stones, depth to hard bedrock, and slope are also important physical features that are considered when determining the suitability of soils for road construction. The fragile nature of native soil surface and biological crusts, especially in areas in which erosion control and revegetation are difficult, can limit the appropriateness of off-road uses, as can soil features such as clayey soils, salinity, sodium content, slope, water erosion, and depth to saturated soils.

Many soils within the field office have limiting features that make reclamation and revegetation difficult. These limiting features include salinity, sodium content, clayey and sandy textures, droughty conditions, alkalinity, low organic matter content, shallow depth to bedrock, stones and cobbles, and wind erosion. Sometimes the soil limitations are so severe that reclamation is very difficult after disturbance.

Rawlins Field Office

Soil data have been used by BLM as a basis for decisions concerning range sites, range improvements, and wildlife habitat sites and for determining reclamation practices to address surface disturbance due to mineral development. In addition, soil data have been used to locate sources of gravel and to determine the suitability of areas for use as water disposal pits for water produced from gas wells (BLM 1987). Order 3 soil surveys are not sufficiently detailed for many land management decisions and are in need of updating. In the sections below, the soil types found within the Rawlins Field Office are identified and discussed, along with specific conditions and trends. Watershed health standards are evaluated during Standards for Healthy Rangelands assessments.

Soil Conditions and Characteristics

Soils in the field office vary. They include shallow-to-deep and fine-to-coarse-textured soils. They vary in salt content, organic matter content, and parent material. General conditions found in soils within Map Units A through F on Map 3-15 are discussed in more detail in the following sections. These conditions collectively influence watershed function and the development of healthy vegetation, which together enable human uses and provide wildlife habitat.

Soil Productivity

Soil productivity is the most important soil value in the Rawlins Field Office because it determines stocking rates for livestock through the amount of vegetation produced, it dictates the kinds of plant communities on which wildlife habitat is based, and it determines reclamation potential in areas of surface disturbance. Most soils in the field office support vegetation that is used by livestock and that also serves as wildlife habitat. Soil characteristics and environmental factors that affect soil productivity include organic matter content, salt content, amount of precipitation, soil temperature, aspect, soil depth, and soil parent material.

Soil productivity is naturally low throughout the Rawlins Field Office, although it is higher around springs and along natural drainage ways (BLM 1987). Productivity varies depending on a number of factors, including soil depth, texture, topographic slope, slope aspect, and permeability. However, variability in the amount of precipitation is the main factor in variations in soil production within the Rawlins Field Office. Within the field office, Map Unit A receives the least precipitation, and Map Unit C receives the most. The more precipitation an area receives, the more vegetative cover is present. Vegetative cover contributes organic matter to the soil, which in turn provides nutrients for plants, stores more moisture, and improves soil structure—all of which promote vegetative growth.

Map Units C and F have soils with thicker and darker surface horizons, indicating higher organic matter content. The darker surface horizons are due to the higher amount of vegetation typically found within these areas, and to colder temperatures in the case of Map Unit C. Colder temperatures slow the decay of organic material, thus allowing more organic matter to accumulate. The warmer temperatures in Map Unit F create a longer growing season, thus allowing more vegetation to grow and plants to produce more vegetative material. Map Units B, D, and E contain more organic matter than does Map Unit A, although none of these units has the dark surface layer (BLM 1987).

Other factors that affect productivity are depth to bedrock, crusting, and nutrient content. Soils in the Rawlins Field Office are generally shallow, with a depth to bedrock of less than 20 inches occurring in all Map Units, and occurring most in Map Unit C and least in Map Unit D. This restricts root penetration and lowers water-holding capacity, because water tends to run off these areas faster than it infiltrates. Crusting, which results from a breakdown in soil structure caused by high sodium content and raindrop impact on bare areas, reduces water infiltration and thereby salt leaching and root penetration. This occurs particularly in Map Unit A but can also occur in Map Units B, C, E, and F. Nitrogen and potassium are adequate for plant growth throughout the field office, but phosphorus is limited.

As a result of all these factors, Map Unit A has the lowest overall soil productivity; Map Units B, D, and E are intermediate in production; and Map Units C and F have the highest soil productivity (BLM 1987). Bottomland and stream terrace soils are the most productive, but limitations include alkalinity, high clay content, low permeability, and flooding. Upland soils are moderately productive. Limitations include shallow depths, low permeability, and alkalinity. The productivity of dissected upland soil is unknown but is likely to be low. Playa productivity may be high if salinity is not a limiting factor.

Soil Permeability

The permeability of a soil affects its use for reservoirs, water disposal pits, sanitary landfills, and sewage lagoons. Such facilities require soils that are either impermeable or just sufficiently permeable to filter out impurities before the leached water reaches natural surface or ground water. The soils in Map Unit A are generally fine in texture and are either sufficiently impermeable to effectively hold or filter water or can be compacted to function as such. Map Units B, C, E, and F are less effective at holding or filtering water, but they can be aided in fulfilling this function through compaction. Map Unit D soils are very permeable, and even compaction does not enable them to hold water. For any of these soils, if the underlying bedrock (typically within 60 inches of the surface) is fractured, the ability of the soil to contain water is markedly diminished. Piping (formation of tubular cavities) may also reduce the containment capacity of Map Unit A, where gypsum seams have been dissolved or wet-dry cycles have produced cracks in clays. Finally, the containment capacity of Map Units A, B, C, E, and F may be diminished adjacent to major drainages where strata of coarser materials, which are permeable and typically not good filters, may be embedded with finer materials.

Soil Strength and Stability

Soil strength is an important consideration during construction of roads and facilities because low-strength soils are subject to deformation. In areas of low soil strength, building foundation stability is low, and roads and drill pads can become rutted and slippery when wet. Soils composed predominantly of one particle size exhibit low strength. Soils containing a variety of particle sizes exhibit the greatest strength because they better fill in voids of varying sizes, causing more friction among particles. In the field office, soils within Map Unit A have low strength. Map Units B, C, E, and F have moderate strength; these textures are typically loamy, and compaction may be possible to increase strength and reduce the potential for deformation under a load. Soils in Map Unit D and portions of Map Unit A are sandy; because these soils are loose, they are subject to displacement under dry conditions. In Map Unit A, many soils have clayey or silty textures, making compaction difficult and creating deformation upon wetting under a load (BLM 1987).

Soil stability problems occur in Map Units A, B, E, and F, but Map Unit C has the greatest stability problems. Map Unit C receives the greatest amount of precipitation, primarily in the form of snow. Soil becomes saturated from snowmelt, which increases soil weight. This can cause mass wasting, which is the downslope movement of rock and soil under the influence of gravity (BLM 1987).

Soil Erosion

Accelerated stream bank erosion has historically occurred within the field office in numerous locations, including the Muddy Creek, Sage Creek, Second Creek, and Third Sand Creek watersheds (BLM 1987).

Within the field office, the highest soil erosion rates occur within Map Unit A as a result of naturally low vegetative cover, soil crusting, low organic matter content, and soft shales that are susceptible to erosion. These characteristics are especially apparent in the Muddy Creek drainage. Because of greater vegetative cover and organic matter content and lower sodium content, rates of water erosion are lower in Map Units B, E, and F and lowest in Map Unit D. Map Unit D is susceptible to wind erosion; although it is protected by good vegetative cover, it could actively erode if vegetative cover were reduced. Wind erosion also occurs in Map Units A, B, C, E, and F, but at lower rates (BLM 1987).

In addition to the soil erosion that occurs in the generalized map units discussed above, stabilized intermittent sand dunes are present in hilly upland areas within the field office. For example, the field office contains the Sand Hills area, which is a unique and fragile dune area with diverse vegetation. BLM management objectives include protection of the unique vegetation complex and minimization of soil erosion. In addition, there is a band of frequently active sand dunes north of Seminoe Reservoir and stretching across the northern portion of the field office. Dune Ponds, also within the field office, is a 150-acre area consisting of large sand dunes. These scattered areas of sand dunes are easily eroded by wind when vegetation is removed.

Soil Salinity

Varying concentrations of soluble salt in soil occur throughout the field office. Leaching occurs the most in Map Units C, D, and F, and the least in Map Unit A. Map Units B and E have soils that are sufficiently leached to produce good vegetative cover (BLM 1987).

Rock Springs Field Office

Soils of the field office are generally light colored; textures and aggregate development vary. There is minimal leaching of soluble salts. Some darker colored soils, with greater amounts of organic matter, are found in areas of increased moisture due to such factors as aspect, elevation, and drainage.

Soil Salinity

Varying amounts of soluble salts occur in most of these soils. Soluble salt levels in some soils affect management potentials due to toxicity, reduced infiltration rates, limits on nutrient availability, and reduction of water available to plants. Salinity in the Colorado River Basin, which includes the field office, threatens the municipal and industrial needs of over 18 million people, along with the irrigation of 2.5 million acres of cropland. Major causes of increased salinity contribution from public lands are off-road vehicles and energy exploration and extraction. These activities cause compaction of the soil surface accompanied by a reduction of plant cover, which in turn leads to increased runoff carrying salt laden sediments into drainages. Controlling salinity from nonpoint sources is closely related to controlling sediment yield and runoff.

Moderately and strongly saline soils have the greatest potential for salt contribution to the Colorado River system. However, slightly saline soils which dominate the field office also contribute large volumes of salt due to their extensive acreage. Over 50% of total salt yield is derived from slightly saline soils. Within the field office, moderately saline soils are generally found along major drainages such as Bitter Creek, Big Sandy River, Green River, and Blacks Fork River.

Erosion

Soils in the field office are especially dependent on vegetative cover to prevent erosion. Vegetative cover is probably the most important management variable influencing runoff and sediment yield. Vegetation acts as a buffer between the soil surface and the surrounding environment. Ground cover and root systems anchor the soil, recycle elements, and add scarce organic matter. Soils especially susceptible to surface disturbing activities include unstable soils, sandy soils, and erosive soils.

3.12.2 Forest Service

General Planning Area Description

Soils are the products of natural processes and consist of minerals, organic matter, water, and air. Their character results from a combination of climate, organisms, landforms, the parent materials in which they develop, and time. Soils of the planning area have formed from a wide variety of geologic material, ranging from in situ geologic parent material rock (residuum) to material transported by wind (aeolian deposits), water (alluvium), gravity (colluvium), and ice (glacial till). These parent materials, along with variable climate, topography, vegetation, and management, produce soils with diverse characteristics.

The soils in the planning area possess several limitations that reduce the potential for establishing vegetation following a disturbance. Soils with limitations include highly erodible, saline, sodic, and sandy soils. Soils are affected by a variety of surface uses that loosen topsoil and damage or remove vegetation or other ground cover, which may result in accelerated erosion. Managing soils within the planning area emphasizes maintaining soil and landscape integrity through efforts to minimize accelerated erosion, avoiding or minimizing destruction of biological soil crusts, and establishing successful site reclamation.

Forest Service Manual 2500 Chapter 20 (Manual) defines watershed condition as, "The state of a watershed based upon physical and biological characteristics and processes affecting hydrologic and soil functions." The direction provided by the Manual is to evaluate watershed condition and assign one of the following three classes:

- **Class I Condition.** Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.
- **Class II Condition.** Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.
- **Class III Condition.** Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, riparian, and aquatic systems do not support beneficial uses.

Maintenance of organic ground cover in sage-grouse habitats is the most important means of maintaining soil productivity. Roads, trails (including user-made trails), fire (wildfire or prescribed fire), grazing, and other ground-disturbing activities can remove ground cover, exposing soil to direct mechanical impact from human or natural (e.g., raindrop) impacts that alter soil properties. These activities occur throughout sage-grouse habitat, with the exception of Wilderness areas where roads and prescribed fires do not occur.

Best Management Practices (BMPs) are measures to protect water quality via maintaining soil onsite (i.e., reducing erosion), but the measures are based in part on Soil and Water Conservation Practices described in FSH 2509.22 and other guidance, and together they also protect soil productivity. They are applied on vegetation management activities (timber sales, fuels treatments), road construction and management, grazing, and other activities. The use of prescribed fire is also improving vegetative conditions by restoring natural fire regimes.

Bridger-Teton National Forest

Soil Types and Characteristics

Of the ten soil orders, the four which cover most of the BTNF are Mollisols, Alfisols, Inceptisols, and Entisols. Greater Sage-Grouse habitat is roughly 6,260 acres spread across the Buffalo, Jackson and Pinedale Ranger Districts. On the Buffalo Ranger District the core Greater Sage-Grouse habitat occurs in the Spread Creek/Uhl Draw area. The dominant soils in the Spread Creek area are Cryofluvents and Cryoborolls that formed in alluvium and occur on bottomlands and terraces. In the Uhl Draw area the dominant soils are Cryoborolls and Torriorthents that formed in sandstone and shale and occur on mountain slopes with landslide deposits. On the Jackson Ranger District, the core Greater Sage-Grouse habitat occurs along the eastern edge of the National Elk Refuge along the western flanks of Table and Sheep Creek Mountains. The dominant soils formed are Torriorthents and Cryorthents that formed in sandstone, shale and siltstone occur on steep mountain slopes with landslide deposits. Slope gradient ranges from 30 to 75%. On the Pinedale Ranger District, the core sage-grouse habitat occurs south of New Fork Lake and in the Boulder and Soda Lake areas. The dominant soils are Cryoborolls that formed in glacial till derived from granite. Slopes are relatively gentle with gradients ranging from zero to 30%.

Soil Conditions

Within sage-grouse core habitat, grazing and recreation are the main uses on the Forest. Grazing by Elk occurs along the southern and western slopes adjacent to the National Elk Refuge during the fall and winter. Local ranchers commonly graze livestock on portions of the Pinedale Ranger District during the summer and then move the livestock to lower elevations in the winter. Management emphasis is on protecting the soil resource before excessive damage occurs.

Riparian areas support native grasses and shrubs grazed by cattle. To maintain soil quality and productivity Regional Soil Quality Soil Standards and Watershed Conservation Practices are followed. Livestock grazing is managed through control of time/timing, intensity, and duration/frequency of use in riparian areas and wetlands to maintain or improve long-term stream health. Livestock are excluded from riparian areas and wetlands that are not meeting or moving towards desired condition objectives where monitoring information shows continued livestock grazing would prevent attainment of those objectives.

Limiting Features

Within sage-grouse core habitat, the major soil resource concerns are erosion by wind and water and maintenance of the productivity of the soils. Minimizing the sediment that reaches watercourses also is a concern. Proper grazing use is a concern in areas of grazing land. The major resource concerns for riparian areas are soil erosion/sedimentation and compaction.

Medicine Bow National Forest

Soil Types and Characteristics

The soils in the Medicine Bow and Sierra Madres are dominantly Alfisols, Entisols, Inceptisols, and Mollisols. The dominant suborders are Ustepts, Ustolls, and Xerolls in valleys and on the lower mountain slopes and Cryalfs and Orthents on the upper mountain slopes and crests.

Core sage-grouse habitat within the MBNF equates to roughly 4,560 acres scattered across the entire Forest. The dominant soil order in core sage-grouse habitat areas, with the exception of those soils on the western side of the Sierra Madres, is Mollisols (Bowen, Rogert and Supervisor Families). Mollisols are formed from a granite parent material, and they are typically found on mountain slopes and have slopes ranging from 3% to 60%. Mollisols also have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. They are well drained and have ten inches of dark surface soils that formed under grasses and shrubs generally a sagebrush/Idaho Fescue habitat. They are productive, soil quality is generally very good, ground cover is usually very good and they are used for grazing and wildlife. Soils on the western side of the Sierra Madres formed in sedimentary rock but have the same characteristics of the Mollisols mentioned above.

Soils in the riparian areas formed from alluvium, and the dominant orders are Entisols and Mollisols. They generally have deep dark surface soils with high amounts of organic matter. These soils generally have a high water table and are also productive with very good soil quality.

Soil Conditions

Grazing, recreation, and watershed use are the main uses on the Forest. Local ranchers commonly graze livestock on the Forest during the summer, and then move the livestock to lower elevations in the winter. To maintain soil quality and productivity, these Regional Soil Quality Soil Standards are followed:

- Management activities will be conducted in such a way as to not exceed the Soil Quality Standards.
- The emphasis is on protecting the soil resource before excessive damage occurs.
- No more than 15% of an activity area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition.

To maintain soil quality and productivity in riparian areas, these Regional Soil Quality Soil Standards and Watershed Conservation Practices are followed.

- Livestock grazing is managed through control of time/timing, intensity, and duration/frequency of use in riparian areas and wetlands to maintain or improve long-term stream health.
- Livestock are excluded from riparian areas and wetlands that are not meeting or moving towards desired condition objectives where monitoring information shows continued livestock grazing would prevent attainment of those objectives.
- Stock tanks, salt supplements, and similar features are kept out of the 100 foot Water Influence Zone (WIZ) if practicable and out of riparian areas and wetlands always.
- Stock driveways are kept out of the WIZ except to cross at designated points.

Limiting Features

The major soil resource concerns are erosion by wind and water, maintenance of the productivity of the soils, and minimizing the sediment that reaches watercourses. Proper grazing use is a concern in areas of grazing land. The major resource concerns for riparian areas are soil erosion/sedimentation and compaction.

Thunder Basin National Grassland

Soil Types and Characteristics

The soils in the TBNG are dominantly Entisols and Aridisols. Other notable orders are Alfisols, Inceptisols, Mollisols and some Vertisols. The dominant suborders are Ustorthents, Torriorthents, Haplustolls, and Argiustolls, and other notable suborders are Haplargids, Haplustalfs, and Haplustepts.

The soils in the area dominantly have a mesic soil temperature regime, an aridic soil moisture regime that borders on ustic, and mixed or smectitic mineralogy. They are shallow to very deep, generally well drained, and loamy or clayey. Haplargids formed in alluvium (Cambria, Forkwood, and Ulm series) and in mixtures of alluvium, eolian sediments, and residuum (Bowbac, Cushman, and Hiland series). Torriorthents formed in alluvium on alluvial fan remnants, fan piedmonts, stream terraces, hills, and plateaus (Kishona series) and in residuum or colluvium on hills (Samday, Shingle, Tassel, and Theedle series). Mollisols and Alfisols occur in areas that have an ustic soil moisture regime that borders on aridic. They are all productive, and soil quality is generally good.

Soil Conditions

The TBNG supports native grasses and shrubs grazed by cattle and sheep. To maintain soil quality and productivity, these Regional Soil Quality Soil Standards are followed:

- Management activities will be conducted in such a way as to not exceed the Soil Quality Standards.
- The emphasis is on protecting the soil resource before excessive damage occurs.
- No more than 15% of an activity area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition.

Limiting Features

The major resource concern is soil quality. For example, livestock grazing conservation practices generally include those that minimize wind erosion and maximize the amount of soil moisture available for forage, and the establishment of early and late season pastures supplements forage production, and keeps livestock off the rangeland during critical growth periods. Other limiting features include shallow soils, low permeability, and highly erodible soils both by wind and water.

3.13 Special Designations and Management Areas

3.13.1 Bureau of Land Management

General Planning Area Description

The Special Designations and Management Areas (SD/MA) discussed in this section include Areas of Critical Environmental Concern (ACEC), Wilderness Study Areas (WSA), and other Field Office specific Management Area (MA) designations (for example, Bates Hole MA in the Casper FO). Areas managed under Special Designations are regulatory or congressionally mandated and are designed to protect or preserve certain resource qualities or uses. Locations of SD/MAs are included on Map 3-16. The environment in the SD/MAs is unique in some respects, and it is therefore desirable to apply different management prescriptions to these areas compared to surrounding areas.

Pursuant to the FLPMA of 1976, Section 103(a), an ACEC is defined as an area "within public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards." While an ACEC or MA may emphasize one or more unique resources, other existing multiple-use management can continue within an ACEC, provided the uses do not impair the values for which the ACEC or MA was established.

ACECs contain one or more resources that require special management and protection for maintaining the value of the resource and the area. Areas designated as ACECs may contain resources such as rare or sensitive archaeological resources; habitat for endangered, sensitive, or threatened species; or rare geologic features. ACEC designations indicate areas for which special management attention is necessary for protecting and preventing irreparable damage to important historic, cultural, and scenic values; for protecting fish or wildlife resources or other natural systems or processes; or for protecting human life and safety from natural hazards. Management is considered special if it is unique to the area and includes terms and conditions designed specifically to protect the values in the ACEC.

The BLM recognizes that an ACEC has significant values and establishes special management measures to protect those values. The designation is a reminder that significant values exist that must be accommodated when future management actions and land use proposals are considered in the ACEC. Designation may also support a funding priority. The designation of ACECs is achieved only through the resource management planning process, either in an RMP or in a plan amendment.

In 1964, the Congress passed the Wilderness Act, establishing a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. Until 1976, most land considered for and designated as wilderness was managed by the Forest Service and NPS. With the passage of FLPMA in 1976, the Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. In the interim, between the inventory that identifies suitable and eligible areas appropriate for wilderness designation and the actual congressional designation of a wilderness, the BLM must manage the potential wilderness. The BLM manages these potential wilderness areas as WSAs (BLM 1990b). During the time that the Congress considers an area for wilderness, which can be many years, designated WSAs require special management practices to preserve the wilderness characteristics that make the areas appropriate for designation. WSAs, established under the authority of Section 603(c) of FLPMA, are managed to preserve their wilderness values according to BLM Manual 6330 and will continue to be managed in that manner until the Congress either designates them as wilderness or releases them for other uses. Only the Congress can designate or release Section 603 WSAs, and their status will not change as a result of the LUP amendment process.

The National Trails System Act of 1968 provides for the designation of historic trails. National Historic Trails are extended trails that closely follow a historic trail or route of travel of national significance. Designation identifies and protects historic routes, historic remnants, and artifacts for public use and enjoyment. National Historic Trails are discussed in Cultural Resources, Section 3.3 under the Historic Trails headings.

The National Wild and Scenic River System (NWSRS) is a system of nationally designated rivers preserved in a free-flowing condition; their immediate environments are recognized for outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values. The system consists of three types of rivers: *Recreation* – rivers or sections of rivers that are readily accessible by road or railroad, that might have some development along their shorelines, and that might have undergone some impoundments or diversion in the past. *Scenic* – rivers or sections of rivers free of impoundments with shorelines or watersheds still largely undeveloped, but accessible in places by roads. *Wild* – rivers or sections of rivers free of impoundments and generally inaccessible, except by trails, with essentially primitive watersheds or shorelines, and unpolluted waters.

The BLM is responsible for evaluating all rivers on BLM-administered land to determine if they are appropriate for addition to the NWSRS. The BLM also makes, as appropriate, recommendations for legislative actions to accomplish such additions. Congress ultimately decides whether to include a waterway segment in the NWSRS.

These designations are part of the RMP revision process, it is not within the scope of this amendment to revisit the WSR classifications. These classifications can be found within their respective plans. Table 3-59 shows the existing WSR classifications within BLM field offices.

Table 3-59 Wild and Scenic River Segments

River/Stream	Eligible	Suitable	Length (miles)	Classification
Kemmerer Planning Area List of Eligible Waterways				
Huff Creek	Yes	Yes	T.27N., R.119W., Sec. 21, 22 T.27N., R.119W., Sec. 15 T.27N., R.119W., Sec. 3, 10 T.28N., R.119W., Sec. 27, 34 Miles: 6.02	Recreational
Raymond Creek Unit	Yes	Yes	Raymond Creek: T.26N., R.119W., Sec. 4, 5, 6 T.27N., R.119W., Sec. 28, 33 Miles: 4.10	Wild
Raymond Creek Unit	Yes	Yes	Raymond Creek South Fork: T.26N., R.119W., Sec. 4, 9 Miles: 2.33	Wild
Raymond Creek Unit	Yes	Yes	Cougar Hollow: T.27N., R.119W., Sec. 34, 35 Miles: 0.97	Wild
Raymond Creek Unit	Yes	Yes	Trail Creek: T.27N., R.119W., Sec. 33, 34 Miles: 1.43	Wild

River/Stream	Eligible	Suitable	Length (miles)	Classification
Raymond Creek Unit	Yes	Yes	Yellow Pine: T.26N., R.119W., Sec. 3, 4, T.27N., R.119W., Sec. 33 Miles: 1.39	Wild
	Yes	Yes	Green Canyon: T.26N., R.119W., Sec. 9 Miles: 1.04	Wild
Pinedale Planning Area List of Eligible Waterways				
East Fork Unit	Yes	Yes	T. 31 N., R. 105 W., Sec 8, 9	Wild
Scab Creek	Yes	Yes	Within Scab Creek WSA; T 33N., R. 106 W., Sec. 17, 19, 20 2.38 mi	Wild
Silver Creek	Yes	Yes	Within Scab Creek WSA; T 32N., R. 106 W., Sec. 5 1.00 mi	Wild
Green River	Yes	Yes	T 37 N., R. 111 W., Sec. 33 0.22 mi T 36 N., R. 111 W., Sec. 2 0.27 mi. T 36 N., R. 111 W., Sec. 2 0.53 mi T 36 N., R. 111 W., Sec. 11, 14 1.39 mi T 36 N., R. 111 W., Sec. 14, 23 1.04 mi T 36 N., R. 111 W., Sec.22, 27, 34; T. 35 N., R 111 W, Sec. 3, 4, 8, 9 5.33 mi T 34 N., R. 110 W., Sec. 36 0.13 mi T 34 N., R. 110 W., Sec. 36 0.12 mi T 34 N., R. 110 W., Sec. 33 0.27 mi T 34 N., R. 110 W., Sec. 33; T. 33 N., R. 110 W., Sec. 3 0.40 mi T 32 N., R. 110 W., Sec. 28 0.14 mi T 32 N., R. 110 W., Sec. 32 0.03 mi T 32 N., R. 110 W., Sec. 32 0.11 mi	Scenic
Green River	Yes	Yes	T 31 N., R. 110 W., Sec. 21 1.21 mi	Scenic

River/Stream	Eligible	Suitable	Length (miles)	Classification
			T 30 N., R. 110 W., Sec. 31 0.78 mi T 29 N., R. 111 W., Sec. 1,2 1.55 mi T 29 N., R. 111 W., Sec. 3 0.80 T 29 N., R. 111 W., Sec. 4 0.67 mi T 29 N., R. 111 W., Sec. 21, 28 1.37 mi T 29 N., R. 111 W., Sec. 28 0.28 mi T 28 N., R. 112 W., Sec. 1, 12 1.25 mi T 28 N., R. 112 W., Sec. 13, 23, 24 1.94 mi T 28 N., R. 112 W., Sec. 25, 26, 35 1.56 mi T 28 N., R. 112 W., Sec. 25 1.24 mi T 27 N., R. 112 W., Sec. 3, 9, 10, 15 2.42 mi T 27 N., R. 112 W., Sec. 21 0.47 mi T 27 N., R. 112 W., Sec. 20, 29, 30, 31 1.89	
Green River	Yes	Yes	T 27 N., R. 112 W., Sec. 31 0.28mi T 26 N., R. 112 W., Sec. 5, 8, 17 3.10 mi T 26 N., R. 112 W., Sec. 21, 28, 33; T 25 N., R. 112 W., Sec. 4, 5 3.41 mi	Scenic
Rawlins Planning Area List of Eligible Waterways				
Encampment River	Yes	Yes	2.51 miles	Wild
Green River (Rock Springs) Planning Area List of Eligible Waterways				
Sweetwater River	Yes	Yes	R102W, T30N 19 0.6 mi	Recreational
Sweetwater River	Yes	Yes	R102W, T30N 19 3.0mi	Wild
Sweetwater River	Yes	Yes	R102W, T29N 5 2.8 mi	Recreational

River/Stream	Eligible	Suitable	Length (miles)	Classification
Sweetwater River	Yes	Yes	R102W, T29N 27 0.6 mi	Wild
Sweetwater River	Yes	Yes	R102W, T28N 34 0.5 mi	Scenic
Sweetwater River	Yes	Yes	R102W, T28N 4 1.0 mi	Wild
Sweetwater River	Yes	Yes	T102 W, T28N 10 1.2 mi	Wild
Sweetwater River	Yes	Yes	R 101W, T28N, 19 0.6 mi	Scenic
Sweetwater River	Yes	Yes	R100W, T28N 29 2.5 mi	Scenic

Casper Field Office

The Casper Field Office manages three ACECs and eight MAs. There are no designated wild and scenic rivers within the field office. During the review of potential Wild and Scenic Rivers for preparation of the Casper Resource Management Plan Planning Area six segments were identified as eligible, none were determined to be suitable. Table 3-60 provides a summary of these special designations and their values of concern.

Table 3-60. Casper Field Office Existing Areas of Critical Environmental Concern and Management Areas

Area	Existing Designation	Value(s) of Concern
ACEC		
Jackson Canyon	ACEC	Bald eagle winter communal night roosts and scenic, cultural, and recreational values.
Alcova Fossil Area	ACEC	Rare pterodactyl trackways and additional dinosaur fossils from the Jurassic Period.
MA		
Bates Hole	MA	Sensitive watersheds, soils, and wildlife habitats.
North Platte River SRMA	MA	Fisheries, wildlife habitats, and cultural values within the North Platte River corridor.
Salt Creek	MA	Oil and gas development potential.
Sand Hills	MA	A variety of natural sand dune communities and sensitive soils.
South Bighorns/Red Wall	MA	Crucial wildlife habitats, cultural resources, intact vegetation communities, and outstanding scenery.
Wind River Basin	MA	Oil and gas development potential.
National Back Country Byways	MA	Unique scenic and historic opportunities on public land.

Area	Existing Designation	Value(s) of Concern
National Historic Trails (NHTs) and Other Historic Trails	MA	Historic trails.

ACEC – Area of Critical Environmental Concern; MA – Management Area; SRMA – Special Recreation Management Area

Areas of Critical Environmental Concern

Jackson Canyon

The Jackson Canyon ACEC is in south-central Natrona County at the western end of Casper Mountain. The ACEC encompasses 14,030 acres, of which 3,940 acres are public surface and 11,100 acres are federal mineral estate. Most private lands within the ACEC are subject to easements held by The Nature Conservancy, generally designed to preserve resources in a natural state and limit development.

The ACEC includes mountainous topography with steep, partially wooded slopes, escarpments, and deeply incised drainages and canyons. The ACEC was established in 1992 to protect bald eagle habitats and two winter roost sites, one in Jackson Canyon and the other in Little Red Creek. Given the sensitive habitats for which the Jackson Canyon ACEC was established, specific decisions were made in the existing plan to restrict uses that were not compatible with bald eagle use. Bald eagle management prescriptions are described in detail in the Bald Eagle Habitat Management Plan for the Platte River Resource Area and Jackson Canyon ACEC (BLM 1992b). Management challenges identified for the Jackson Canyon ACEC are forest management issues related to mountain pine beetle infestations, fire management, and OHV use.

Alcova Fossil Area

The Alcova Fossil Area near Alcova Reservoir in southwest Natrona County was designated an ACEC based on the paleontological resources known to exist within the boundaries. Values associated with the site include the Alcova Pterodactyl Trackway locality, which contains some of the first documented and most important pterodactyl track localities in the world. Numerous Jurassic pterodactyl (pterosaur) tracks and trackways are located in this area. The individual tracks in the ACEC are larger than any others found in North America and suggest the animals had a wingspan of ten feet. Recent research has revealed the presence of many additional trackways in the area. In addition, exposed outcrops of the Morrison formations in the area contain numerous fossilized remains of well-known dinosaurs like *Allosaurus* and *Camarasaurus*. The Sundance Formation in the area contains remains of reptiles like plesiosaurs and ichthyosaurs. The potential for discovery of additional paleontological resources in the area is high. The USBR has developed the Cottonwood Creek Dinosaur Trail, a hiking trail with interpretive signs explaining the geology and paleontology, on adjacent lands.

Several instances of theft and vandalism of the paleontological resources in this area have occurred in the past, including theft of the flagstone-type rock preserving pterodactyl tracks. Numerous mining claims also exist in the area. Recreationalists heavily use the Alcova Reservoir area.

Management Areas

Bates Hole

Bates Hole is a collective term for the area with boundaries of the Bates Creek and North Platte River-Bolton Creek watersheds. The area is located in southwestern Natrona County and extends into northern Carbon County beyond the planning area. Approximately 288,500 acres of public land, including 158,020 public surface acres, fall within the MA boundary.

Highly erosive soils, fragile watersheds, and crucial wildlife habitats occur within the boundaries of the MA. Approximately 26,920 acres of highly erosive soils occur on public lands within the MA, which represent approximately 14% of all the high-water erosion potential soils on BLM-administered surface in the field office. Soils with a high wind-erosion potential within the MA are not a significant feature (1,330 acres) and comprise less than 1% of the high wind erosion potential soils on public land in the field office. The dominant vegetation types in the area include sagebrush, forests, woodlands, and shrublands. Sagebrush complexes comprise nearly 40% of the area and represent the best quality Greater Sage-Grouse habitats in the field office. There are 30 identified Greater Sage-Grouse leks, 111 identified raptor nests, and 122,800 acres of crucial wildlife habitats present on public land within the MA boundary. Crucial wildlife habitats occupy approximately 43% of all public land within the MA. Some lands within the MA have been converted to agriculture, urban, and industrial uses.

Portions of the North Platte River also fall within the boundary and include some of the highest quality recreation and fishing opportunities in the field office, including 17 miles of Class I and 88 miles of Class II waters. The MA encompasses portions of the Jackson Canyon ACEC and Alcova Fossil ACECs.

Ninety-six percent of the MA is located in a very low oil and gas development potential area, with the other 4% rated as having no development potential. Oil and gas leases on 3,480 acres of federal mineral estate (approximately 1% of the MA) are held by production at Government Bridge, Schrader Flats, and Bates Creek oil and gas fields. An additional 13,170 acres (approximately 3.5% of the MA) are presently leased. The remaining portion of the MA is presently unleased. These three fields combined produced 17,241 barrels of oil and 2,265 thousand metric feet of natural gas during 2004 and appear to be fully developed. This production represents less than 1% of oil and gas production in the Casper Field Office during 2004.

The Bates Hole MA has high potential for locatable minerals, such as uranium, bentonite, limestone, and jade. Numerous mining claims exist in the area, as well as numerous active mineral material pits.

Salt Creek

The Salt Creek MA falls completely within the boundary of the existing Salt Creek Hazardous ACEC and facilitates oil and gas exploration and development in the Salt Creek oil field area. The drilling of the No. 1 Salt Creek (or No. 1 Dutch) in October 1908 opened Salt Creek as one of the most productive fields in the Rocky Mountains. Based on data from the WOGCC, the Salt Creek oil field has produced about 671-million barrels of oil and 723-billion cubic feet of gas as of October 2003 (BLM 2005b). Salt Creek is the oldest and largest oil field in the southern Powder River Basin, the largest sweet oil-producing field in the world, and is currently the third largest oil producer in Wyoming (BLM 2005b). In 2002, Salt Creek produced 36% of the oil produced in the planning area, and well over half of the original oil-in-place in Salt Creek still remains (BLM 2005b). In addition, the implementation of a carbon dioxide flood began in the Salt Creek field in 2002 and will continue for the next ten years.

After a century of oil and gas development, the Salt Creek oil field area provides important grazing resources and habitats for nesting raptors, black-tailed prairie dogs, mule deer, pronghorn, and other birds and small mammals. The area contains prehistoric archeology sites, historic oil field sites, the Bozeman Trail and provides for limited recreational hunting opportunities.

Sand Hills

The approximately 17,630 acre Sand Hills area in east central Natrona and west central Converse counties is identified for special management to maintain the integrity of soils and vegetation and to protect highly erosive soils. Soils in the area are susceptible to moderate to severe wind and water erosion. Ninety-five percent of the MA has been identified as having high wind-erosion potential, which is nearly one quarter of all high wind-erosion soils on public surface in the planning area. Sand dunes are a dominant feature in the area and provide visual relief from the surrounding landscape. Although the area contains examples of both active and inactive dunes, the majority of the area is stabilized by vegetation. The sand dunes vary in length from 100 to 500 yards; some reach a height of 300 feet. Pioneer native grasses can be observed on many of the dunes.

While a number of sand hills and sand dunes occur in other areas of Wyoming and the Rocky Mountain System, the Sand Hills area occurs in close proximity to Casper and mostly comprises public lands (both surface and federal mineral estate) within the boundary of the MA. The Sand Hills area is a system that provides habitats for big game and nongame species. Approximately 13% of the area is considered to be a crucial wildlife habitat. No Greater Sage-Grouse leks and only one raptor nest have been identified within the area. A segment of the Bozeman Trail passes through the center of the MA. Sand dunes within the Sand Hills MA may meet habitat requirements for the blowout penstemon, which is adapted to blowout dunes habitat caused and maintained by wind erosion.

Livestock grazing is a traditional and historic land use in the area and oil and gas development has occurred in this area since the late 1950s. The area has low-to-moderate development potential for oil and gas. Oil and gas leases in a portion of the area (3,170 acres) are held by production from development at Cole Creek and South Cole Creek. Other portions of the area are leased (10,270 acres); approximately 42% is unleased (7,370 acres).

Ninety-eight percent of the MA is identified as having low oil and gas development potential; however, a multimillion-dollar three-dimensional geophysical project was recently completed in this area, which could lead to further development and leasing of the area. No known mining claims occur within the area; however, numerous mining claims for uranium recently have been filed adjacent to the MA along the northeastern boundary.

South Bighorns/Red Wall

The South Bighorns/Red Wall complex includes wildlife habitats, unique vegetation, cultural and historic values, and a high-value recreational area. A comprehensive perspective on management of the Southern Bighorns is described in *The Past, Present and Future Management of the Southern Big Horns (*Bennett 2001). The area encompasses mule deer crucial winter range, elk crucial winter range, and Greater Sage-Grouse habitats. The Red Wall/Gray Wall provides nesting habitats for a variety of raptor species and contributes to the visual quality of the area. The area also contains a unique plant community-curl-leaf mountain mahogany which is a component of big game crucial winter ranges. Curl-leaf mountain mahogany is an important fall and winter forage for deer and elk and is utilized by livestock. Forests and woodlands provide hiding, escape, and thermal cover for wildlife as well as provide a small commercial source of wood products. Mountain big sagebrush communities in the area support a wide variety of wildlife species, as an important food source and as hiding and nesting cover. In addition, the area provides habitats for a variety of wildlife, such as the mountain lion, swift fox, marmot, Greater Sage-Grouse, Hungarian partridge, and various migratory bird species.

The South Bighorns/Red Wall area exhibits a dense and diverse range of cultural and historical resources rivaling that found anywhere in Wyoming, including portions of the Cedar Ridge TCP and the Hole-in-the-Wall region. Evidence that supports Native American use in the South Bighorns includes numerous temporary camps, stone-tool manufacturing localities, and food preparation and processing sites. Native American religious practitioners have identified stone circles found on exposed ridges as having religious significance. The South Bighorns provided several important travel routes used by Native Americans, pioneers, and outlaws.

The area is traversed by the South Bighorns/Red Wall National Back Country Byway, designated in 1990 and originating from two important SDWs, the Arminto and 33-Mile. These SDWs are still used today by the local ranching community, are two of the longest SDWs in the West, and were the first to be established in Wyoming. A sheepherder's monument is located at the intersection of these two SDWs. The National Back Country Byway provides access to the area, which offers numerous recreational opportunities, such as camping, hiking, fishing, hunting, and sightseeing. There are two BLM campgrounds within the area accessed by the national back country byway. Recreational OHV use is increasing and is intensive during the hunting season.

The South Bighorns/Red Wall area has high scenic values. The Chugwater Formation interrupts gentle flowing lines with steep vertical escarpments. The most prominent attribute of the Chugwater Formation is its striking crimson color. Buffalo Creek and Badwater Creek canyons, as well as numerous lesser canyons, dissect the area and add important diversity and richness to the visual quality.

Oil and gas leases in a small portion of the area (1,100 acres) are held by production from development at the Madden (Deep) oil and gas field primarily in Fremont County, which is administered by BLM's Lander Field Office. Approximately 20,180 acres, of which 12,540 acres is public surface and 20,180 acres are federal mineral estate, are administratively unavailable for oil and gas leasing.

Numerous mining claims occur in the area. An increased interest in uranium has increased filings of new mining claims in the area. There are three active sand and gravel permits in the area; two are free-use permits and the other is a negotiated contract. In addition, there are talc and soapstone claims, with some copper exploration, in the area west of Grave Springs Campground along the EK Trail.

Wind River Basin

Improvements in hydraulic fracturing technology have encouraged extensive oil and gas development in parts of the Wind River Basin within the field office. The Wind River Basin MA is situated in the western portion of Natrona County and the Casper Field Office manages it to facilitate oil and gas production. Although gas production in the planning area declined from 100- to 63-billion cubic feet per year since 1999, drilling in the eastern Wind River Basin portion of the planning area may reverse or at least flatten the decline during the next few years. In addition, the eastern portion of the Wind River Basin is prospective for additional discoveries of natural gas (BLM 2005b). Estimates for the gas-in-place resource for the portion of the Wind River Basin within the field office range from approximately 228-trillion cubic feet to 268-trillion cubic feet. The estimate for deep gas-in-place is approximately 72-trillion cubic feet present within that part of the Wind River Basin that occurs within the field office (BLM 2005b).

The Wind River Basin provides a diversity of habitats for numerous plant and wildlife species, including mule deer, pronghorn, and various special status species, such as the mountain plover, white-tailed prairie dog, raptors, and the Greater Sage-Grouse. Portions of the Wind River Basin contain crucial winter ranges for both mule deer and pronghorn. The basin also contains sagebrush habitat for the Greater Sage-Grouse and other sagebrush obligates and a large number of prehistoric archeology sites and the Bridger Trail.

Kemmerer Field Office

The Kemmerer Field Office manages four ACECs, one WSA, and two Areas of Significant Resource Concern (ASRCs). Table 3-61 summarizes these existing special designations to include the resource values of concern identified for each area.

Table 3-61. Kemmerer Field Office Existing Areas of Critical Environmental Concern and Other Management Areas

Area	Existing Designation	Value(s) of Concern
ACEC		
Raymond Mountain	ACEC	Protects the needs of the sensitive species Bonneville cutthroat trout and identifies priority for riparian management.
Bridger Butte	ACEC	Protects sensitive cultural values, including Native American sensitive sites, NHTs and other historic and associated sites, and special status plant species.
Cushion Plant Communities	ACEC	Cushion plant populations – habitats.
WSA		
Raymond Mountain	WSA	Protects sensitive wildlife habitats and winter ranges, as well as scenic values.
ASRC		
Rock Creek Tunp	ASRC	Protects sensitive overlapping of wildlife habitats (big game winter ranges and migration corridors, Greater Sage-Grouse yearlong habitats, sagebrush obligate and special status species habitats); cultural values, including NHTs and associated sites; and special status plant species.
Bear River Divide	ASRC	Protects sensitive overlapping of wildlife habitats (big game winter ranges and migration corridors, Greater Sage-Grouse yearlong habitats, sagebrush obligate and special status species habitats); cultural values, including NHTs and associated sites; and special status plant species.

ACEC – Area of Critical Environmental Concern
ASRC – Area of Significant Resource Concern
NHT – National Historic Trail
WSA – Wilderness Study Area

Areas of Critical Environmental Concern

Raymond Mountain

The Raymond Mountain ACEC was designated in 1982 as part of the Pioneer Trails Management Framework Plan and lies within the Raymond Mountain WSA and adjacent to other federal land and state and private lands. The BLM manages the Raymond Mountain watershed to protect the needs of the sensitive Bonneville cutthroat trout, which is in danger of being extirpated from the drainage. The Raymond Mountain ACEC provides yearlong habitats for all life stages of the Bonneville cutthroat trout and other native nongame aquatic species (WGFD 2004a).

The Raymond Mountain ACEC includes 12,670 acres of BLM-administered surface and mineral estate along the northwestern edge of the planning area and lies wholly within the area managed by the Thomas Fork HMP (BLM 1979). The Raymond Mountain ACEC designation is based on a recommendation within the Thomas Fork HMP to designate aquatic and riparian habitats of the Thomas Fork drainage as an ACEC to amplify management needs of the Bear River (Bonneville) cutthroat trout (BLM 1982), a BLM sensitive species. Referring to habitat for the Bonneville cutthroat trout in this area, the 1979 Thomas Fork HMP indicates, "overall, 73% of the fisheries habitat in this drainage is in an apparent declining trend." In addition to brush spray projects, BLM (1979c) indicates "… intensive utilization of riparian vegetation by livestock, and beaver historically resulted in reduced channel stability, accelerated stream bank erosion, channel downcutting, lower water tables, and disclimax in riparian vegetation communities." Cooperative management strategies developed with local livestock permittees/lessees have provided additional protections for sensitive resources in the area through livestock reductions and season of use restrictions. Livestock grazing currently is permitted within the Raymond Mountain ACEC.

Currently, no oil and gas leases or mining claims exist within the ACEC. The area exhibits no to low development potential for oil and gas. Coal occurrence potential within the ACEC is low to moderate with no development potential. Most of the Raymond Mountain ACEC exhibits moderate-to-high phosphate occurrence potential and low trona occurrence potential.

Bridger Butte

The Bridger Butte ACEC is located south of I-80 between Lyman and Evanston and is intended to protect sensitive cultural values, including NHTs and associated sites. Historical accounts and emigrant diaries repeatedly refer to Bridger Butte as an important landmark that signified their approach to Fort Bridger, an important rest stop on the journey West. In addition, several Native American tribes have identified Bridger Butte as an area of tribal significance.

The area includes habitats for special status plant species populations, including tufted twinpod, prostrate bladderpod, Maybell locoweed, and Payson beardtongue. Rare animals inhabiting the area include the Uinta ground squirrel and Idaho pocket gopher. In addition, the area of the Blacks Fork includes populations of roundtail chub and flannelmouth suckers (WGFD 2004a). The ACEC exhibits low oil and gas development potential and low occurrence potential for coal, phosphate, and trona.

Cushion Plant Communities

The ACEC comprises known populations and seven endemic species. Cushion plant communities are sparsely vegetated areas with low-growing, mat-like tufts of vegetation with bare soil and gravel between the individual plants. Cold winters, little rainfall, and strong winds contribute to the development of these specialized communities. The communities are vulnerable to surface disturbance and have a slow recovery time. Usually 50 years or more are required to restore the communities to their original native state after disturbance. The cushion plant communities frequently contain uncommon and regional endemic plant species. Species composition varies from one community to another. Typical associates found in these areas include different species of phlox, twinpods, bladderpods, and legumes.

The area northeast of Kemmerer within the ACEC includes active livestock grazing and oil and gas development. The ACEC exhibits moderate oil and gas development potential and low occurrence potential for coal, phosphate, and trona.

Wilderness Study Areas

Raymond Mountain

One WSA exists within the Kemmerer Field Office. The Raymond Mountain WSA is located in the Sublette Mountain Range (Raymond Mountains). The WSA is approximately 19-miles long, 4-miles wide at its widest point, and includes approximately 32,880 acres. The WSA has diverse vegetation and step topography. A major portion of the area is forested with Douglas-fir, lodgepole pine, and other coniferous trees, as well as aspen. The southern end of the WSA contains stands of big sagebrush and rock outcrops.

Current management of the Raymond Mountain WSA is subject to the provisions of the Interim Management Policy and Guidelines for Lands Under Wilderness Review: BLM Manual 6330 (BLM 2012b). Management emphasizes preservation of wilderness values until wilderness determination is made by Congress. The Raymond Mountain WSA exhibits very low oil and gas development potential, moderate-to-high phosphate occurrence potential, and most of the WSA is classified as having low occurrence potential for coal and trona.

Areas of Significant Resource Concern

Rock Creek/Tunp

The ASRC is located northwest of Kemmerer and is intended to protect sensitive overlapping wildlife habitats, cultural values, NHTs and associated sites, and special status plant species. The area includes significant physical traces of the Oregon-California NHT that retain historic scenic qualities. This area also provides habitats for, and identified locations of, several special status plant species.

This area is within the Wyoming Game and Fish Department's Strategic Habitat Plan Priority Area 1 for both the Green River Regional Wildlife Division and the Pinedale Regional Fish Division. The area contains overlapping big game crucial winter ranges and a north-south migration corridor for mule deer, as well as migration corridors for elk, pronghorn, and moose. Currently, the area is closed during the winter season to motorized vehicles to protect wintering big game. The area supports yearlong and seasonal habitats for Greater Sage-Grouse, other sensitive sagebrush obligate species, and all local big game species. In addition, the northeast portion of the ASRC contains designated elk parturition habitats. The area also contains a raptor migration corridor and potentially provides habitats for Bonneville cutthroat trout, bluehead suckers, and leatherside chub. Roundtail chub and flannelmouth suckers also may utilize the Willow Creek drainage.

The entire ASRC exhibits low oil and gas development potential. Most of the area exhibits low occurrence potential for coal; however, approximately 5,000 acres exhibit moderate occurrence potential. Phosphate occurrence potential within the ASRC is mostly moderate with less than 10,000 acres classified as low and less than 1,000 acres classified as high occurrence potential. The entire area has low occurrence potential for trona.

Bear River Divide

The ASRC is located southwest of Kemmerer and directly south of the Rock Creek/Tunp ASRC. The two areas are connected by underpasses that allow movement of big game from one side of U.S. Highway 30 to the other. The Bear River Divide ASRC is intended to protect and enhance critical wildlife habitats, cultural values, and paleontology resources. The area includes traces of the Oregon-California NHT, Bear River Divide Trail Landmark, Fossil Butte National Monument viewshed, and internationally renowned fossil fish paleontological resources.

This ASRC is within the Wyoming Game and Fish Department's Strategic Habitat Plan Priority Area 1 for both the Green River Regional Wildlife Division and the Pinedale Regional Fish Division (WGFD 2004a). The WGFD reports that the area "...contains crucial big game winter range for the Wyoming Range mule deer, Uinta mule deer, West Green River elk, Carter Lease antelope, and Bear River Divide moose herd units" (WGFD 2004a). The area also contains a north-south migration corridor for mule deer, as well as migration corridors for elk and pronghorn. The area supports yearlong and seasonal habitats for Greater Sage-Grouse, other sensitive sagebrush obligate species, and all local big game species. The area also contains a raptor migration corridor. In addition, the area potentially provides habitats for Bonneville cutthroat trout, bluehead suckers, and leatherside chub, Roundtail chub and flannelmouth suckers also may utilize area drainages.

The eastern portion of the ASRC is located over the Fossil Basin paleontological feature, and the northeast portion is part of the viewshed area of Fossil Butte National Monument. This area will protect and highlight the paleontological deposits in the area, as well as scenery and views from Fossil Butte National Monument.

A number of gas plants, including Carter Creek, Road Hollow, and Whitney Canyon, occur in the area, including associated surface pipelines. The ASRC exhibits low to high oil and gas development potential. Coal and phosphate occurrence potentials within the ASRC primarily have low-to-moderate oil and gas development potential. Trona occurrence potential within the area is low.

Newcastle Field Office

The Newcastle Field Office manages one ACEC.

Whoopup Canyon Area of Critical Environmental Concern

The Whoopup Canyon petroglyph area was designated an ACEC in 1981 and consists of 1,440 acres in eastern Weston county. The site is an extensive complex of rock art panels and associated archaeological deposits. It is one of the oldest rock art sites in North America. Management objectives for the area are to protect and study the rock art in the Whoopup Canyon area; expand public education and interpretation in the area; protect cultural resource values from degradation; and provide for wildlife, scenic values, and Native American concerns.

Pinedale Field Office

The Pinedale Field Office manages four ACECs, three MAs, and two WSAs. Table 3-62 displays these areas.

Table 3-62. Pinedale Field Office Special Designation Areas: Existing Areas of Critical Environmental Concern, Management Areas, and Wilderness Study Areas

Area	Existing Designation	Values of Concern
Rock Creek	ACEC	Protect the Rock Creek drainage to enhance wildlife habitat, ensure quality aquatic habitat for the sensitive Colorado River cutthroat trout, provide crucial winter range for a portion of the Piney elk herd, and protect visual resources to maintain visual resource management class characteristics.
Beaver Creek	ACEC	Enhance wildlife habitat, ensure quality aquatic habitat for the sensitive Colorado River cutthroat trout, and protect elk calving habitat.
Trapper's Point	ACEC	Preserve the viability of the big game migration bottleneck, cultural and historic resources, and important livestock trailing use.
New Fork Potholes	ACEC	Protect unique pothole wildlife habitat for trumpeter swans and other migratory waterfowl, elk and deer parturition areas, and geologically unique areas.
Miller Mountain	MA	Protect the open space, natural landscape values, and crucial big game winter ranges in the Miller Mountain area.
Ross Butte	MA	Protect fragile soils and watersheds, sensitive plant species and communities, paleontological and archaeological sites, unique geology, and visual values in the Ross Butte area.
Wind River Front	MA	Maintain the visual, recreation, and air quality resources in the management area, enhance wildlife habitat, and protect the integrity of the U.S. Air Force Detachment 489 Seismic Monitoring Station.
Lake Mountain	WSA	Protect wilderness characteristics.
Scab Creek	WSA	Protect wilderness characteristics.

ACEC – Area of Critical Environmental Concern; MA – Management Area; WSA – Wilderness Study Area

Areas of Critical Environmental Concern

Rock Creek

The management objective for the 4,960-acre Rock Creek ACEC is to protect the Rock Creek drainage to ensure quality aquatic habitat for the Colorado River cutthroat trout and to provide crucial winter range for a portion of the Piney elk herd. This ACEC was designated in the 1988 Pinedale RMP. Because oil and gas leases are issued in aliquot parts, the boundary stretches beyond the actual hydrologic unit of the Rock Creek drainage. Land management actions within the drainage are more restrictive than those applied to the area that falls outside the watershed.

Beaver Creek

The objectives for managing the 3,590-acre Beaver Creek ACEC are to ensure quality aquatic habitat for the sensitive Colorado River cutthroat trout and to protect elk calving habitat. Beaver Creek was designated as an ACEC in the 1988 Pinedale RMP.

Trapper's Point

Trapper's Point is a major funnel, or bottleneck, for mule deer and pronghorn in their migrations to and from winter range. The bottleneck is formed by the Green River to the west and the New Fork River agricultural lands to the east and comprises 9,540 acres. A recent upswing in residential development to the east compounds the definition and constriction of the bottleneck. The Upper Green River Cattle Association relies on this area for movement of cattle from desert to forest allotments and back. This tradition has occurred for almost 100 years. Going back further in time, one of the most significant archaeological sites within the planning area is in the heart of the bottleneck, attesting to its long tradition with pronghorn. The Trapper's Point Site, 48SU301, is a pronghorn kill and butchering site that is more than 6,000 years old. Numerous other cultural sites are concentrated in the area. The Trapper's Point ACEC was designated in the 2008 Pinedale RMP.

New Fork Potholes

This unique, 1,820-acre subsection of the Wind River Front contains nearly 100 glacial potholes, which are depressions formed by huge blocks of ice stranded in a field of glacial outwash materials. Upon melting, these blocks left depressions in the landscape, which today remain in the form of small lakes. Abundant waterfowl use the ecosystem for nesting and brood rearing and as a stopover point in their migrations. Reintroduction efforts for the trumpeter swan have been attempted in the past. Riparian vegetation surrounds the potholes, providing habitat for various wildlife, including neotropical birds, elk, deer, and moose. A portion of the region serves as crucial elk winter range. The area is accessible for semi-primitive motorized recreational activities. The New Fork Potholes ACEC was designated in the 2008 Pinedale RMP.

Management Areas

Miller Mountain

This ecosystem is a remote, largely roadless landscape consisting of steep foothills with a combination of sagebrush, aspen, and conifer vegetation types. The 66,440-acre area is an extension of the Lake Mountain WSA viewshed and contains Visual Resource Management (VRM) Class II values. It is identified as elk parturition and crucial winter range, contains lynx analysis units, and is widely used for big game hunting. It also contains potential Colorado River cutthroat trout habitat in Miller and Coal Creeks. Numerous small perennial streams and sensitive riparian habitats occur throughout the area. The area offers recreational opportunities for semi-primitive motorized activities. Miller Mountain is rich in cultural history and includes an ancient pictograph site, historic Fort Hill, and more recent stone sheepherder cairns that signified range boundaries. The Miller Mountain Management Area was established in the 2008 Pinedale RMP.

Ross Butte

This ecosystem is dominated by a badlands landscape that is virtually roadless and offers wide scenic vistas similar to the Painted Desert of Arizona. The soils, which are barren and unstable, provide unique habitat for BLM Wyoming sensitive endemic plant species. Winter habitat for sage-grouse and mule deer occurs in this MA. The 35,670-acre area contains abundant archaeological materials and unique sites considered important and sensitive to Native Americans. One TCP is known, and the landform types found in this system frequently contain other sensitive cultural resources. Several important cultural sites, including the Wardell Buffalo Trap (48SU301), are in the vicinity of Ross Butte. An overview study has been conducted that ties Ross Butte directly to the Wardell buffalo trap as a lookout and sacred site. In addition, the badlands formation is known to contain many fossils in the Wasatch and Green River Formations.

The landscape of the Ross Butte MA, which is unique to the Pinedale Field Office, offers substantial recreation potential, including hiking, mountain biking, wildflower viewing, and other activities. Reardon Draw, an ephemeral drainage within the Ross Butte MA, is listed as "impaired" under Section 303(d) of the Clean Water Act. According to the list of impaired or threatened water bodies, the cause of this impairment is physical degradation, and the silt resulting from this condition is considered a threat to wildlife and agriculture. The Ross Butte Management Area was established in the 2008 Pinedale RMP.

Wind River Front

This landscape was formed by Pleistocene glacial events that formed world-class geologic features, including terminal and lateral moraines and potholes. Unique to this 201,240 acre landscape are huge boulders randomly scattered across a backdrop of rolling sagebrush foothills. Three designated Wild and Scenic River (WSR) segments intersect this area. Semi-primitive motorized and non-motorized recreation opportunities include hunting, rock climbing, wilderness trailheads, sightseeing, antler hunting, hiking, mountain biking, and fishing. The Wind River Front MA, which lies in the foreground of the Bridger Wilderness and its Class I airshed, encompasses migration corridors for big game and for crucial winter ranges for moose, elk, and mule deer. It also supplies wintering and breeding habitats for sage-grouse. The Wind River Front Management Area was established in the 2008 Pinedale RMP.

Wilderness Study Areas

Lake Mountain

The 13,490 acre Lake Mountain WSA contains important elk winter range, as well as Colorado River cutthroat trout habitat. This WSA also contains a 100-acre area designated for collecting moss rock. However, a documented analysis has not been performed to determine whether this type of activity would be compatible with BLM Manual 6330. Therefore, permits to extract moss rock will not be issued until such analysis is conducted or the WSA is designated as wilderness or released for other multiple uses. Lake Mountain WSA was determined to be difficult to manage as wilderness; therefore, it was not recommended for designation as wilderness in the *Final Rock Springs Wilderness EIS* (BLM 1990b). Nonetheless, the BLM must manage the area as a WSA until such time as the Congress does or does not designate it as wilderness.

Scab Creek

This 7,710-acre area was originally established and managed as a primitive area in 1975. In April 1985, the Scab Creek Instant Study Area was proposed by former President Ronald Reagan for addition to the National Wilderness Preservation System. The Scab Creek WSA adjoins the Bridger Wilderness in the Bridger-Teton National Forest, which lies to the east. Scab Creek WSA offers extraordinary natural wilderness features and ample opportunity for solitary wilderness experiences. The area was withdrawn from locatable mineral availability in 1970.

Rawlins Field Office

The Rawlins Field Office manages three ACECs, five WSAs, nine Wildlife Habitat Management Areas (WHMA), and two other areas of concern. Table 3-63 lists the existing ACECs and Management Areas within the Rawlins Field Office.

Table 3-63. Rawlins Field Office Existing Areas of Critical Environmental Concern and Management Areas

Area	Existing Designation	Value(s) of Concern
Areas of Critical Environmental Concern		
Blowout Penstemon ACEC	ACEC	Manage the endangered blowout penstemon plant and its habitat.
Cave Creek Cave ACEC	ACEC	Hibernaculum and maternity roost for several bat species. Provide recreational opportunities.
Sand Hills/JO Ranch ACEC	ACEC	Protect the unique vegetation community complex, maintain wildlife habitat values, minimize soil erosion, and promote recreational opportunities. Manage and protect the JO Ranch for historical and cultural values.
Management Areas and Wildlife Habitat Management Areas		
Cow Butte/Wild Cow WHMA	WHMA	Protect crucial winter habitat for elk, mule deer, and important habitat for Columbian sharp-tailed grouse. Maintain or enhance the aspen and mountain shrub complexes.
Chain Lakes WHMA	WHMA	Manage the unique, fragile, and rare alkaline desert lake system and wildlife habitat values associated with the lake system. Manage pronghorn winter habitat and other wildlife habitat values. Seek the cooperation of owners of adjacent property in management of the habitat.
Jep Canyon WHMA	WHMA	Protect crucial winter habitat for elk and nesting habitat for raptors. Seek the cooperation of owners of adjacent property in management of the habitat.
Laramie Peak WHMA	WHMA	Protect habitat for bighorn sheep, elk, and mule deer. Seek the cooperation of owners of adjacent property in management of the habitat.
Laramie Plains Lakes WHMA	WHMA	Manage potential habitat for the endangered Wyoming toad. Seek the cooperation of owners of adjacent property in management of the habitat.
Pennock Mountain WHMA	WHMA	Protect crucial winter habitat for elk and mule deer. Seek the cooperation of owners of adjacent property in management of the habitat.
Red Rim-Daley WHMA	WHMA	Protect crucial winter habitat for pronghorn and nesting habitat for raptors. Seek the cooperation of owners of adjacent property in management of the habitat.
Upper Muddy Creek Watershed Grizzly WHMA	WHMA	Manage habitat for the Colorado River fish species unique to the Muddy Creek watershed. Manage crucial winter habitat for elk and mule deer. Seek the cooperation of owners of adjacent property in management of the habitat.
Wick-Beumee WHMA	WHMA	Protect crucial winter habitat for elk and year-round habitat for wildlife. Seek the cooperation of owners of adjacent property in management of the habitat.

Area	Existing Designation	Value(s) of Concern
High Savery Dam and Reservoir Site	WHMA	Manage to protect the High Savery Dam and Reservoir site. Manage to support development of a fishery for Colorado River cutthroat trout. Manage the area for recreation purposes.
Historic Trails Management Area	MA	
Shamrock Hills RCA	WHMA	Maintain or improve habitat and protect the concentration of breeding and nesting ferruginous hawk species, as well as other bird species, including the mountain plover, sage sparrow, and Greater Sage-Grouse and crucial winter/yearlong range for pronghorn. Seek the cooperation of owners of adjacent property in management of the habitat.
Stratton-Steppe Sagebrush Research Area	MA	Manage the scientific values in the study area.
Special Recreation Management Areas		
Continental Divide National Scenic Trail SRMA	SRMA	Emphasize interpretive and educational opportunities. Ensure the continued availability of outdoor recreation opportunities associated with the Continental Divide National Scenic Trail (CDNST).
North Platte River SRMA	SRMA	Ensure the continued availability of outdoor recreation opportunities associated with the North Platte and Encampment Rivers.
OHV SRMA	SRMA	Provide opportunities for a safe OHV riding opportunity and OHV use education for local residents and visitors to the area.
Shirley Mountain SRMA	SRMA	Ensure the continued availability and diversity of outdoor recreation opportunities in the Shirley Mountains.
Adobe Town Dispersed Recreation Use Area	SRMA	Manage for primitive, middle, and front country recreation desired future use in addition to other multiple uses.
National Natural Landmarks		
Big Hollow NNL	NNL	Protect the geological significance of the sites.
Sand Creek NNL	NNL	Protect the geological significance of the sites.
Como Bluff NNL	NNL	Protect the integrity of paleontological resource values, preserve historic significance, and provide opportunity for other uses where appropriate.
Wilderness Study Areas		
Ferris Mountains WSA	WSA	Ensure the WSAs retain their suitability for preservation as wilderness. 1. Maintain the nonimpairment standard. 2. Prevent unnecessary or undue degradation. 3. Where possible, enhance wilderness values.
Adobe Town WSA	WSA	Ensure the WSAs retain their suitability for preservation as wilderness. 1. Maintain the nonimpairment standard. 2. Prevent unnecessary or undue degradation. 3. Where possible, enhance wilderness values.

Area	Existing Designation	Value(s) of Concern
Prospect Mountain WSA	WSA	Ensure the WSAs retain their suitability for preservation as wilderness. 1. Maintain the nonimpairment standard. 2. Prevent unnecessary or undue degradation. 3. Where possible, enhance wilderness values.
Encampment River Canyon WSA	WSA	Ensure the WSAs retain their suitability for preservation as wilderness. 1. Maintain the nonimpairment standard. 2. Prevent unnecessary or undue degradation. 3. Where possible, enhance wilderness values.
Bennett Mountains WSA	WSA	Ensure the WSAs retain their suitability for preservation as wilderness. 1. Maintain the nonimpairment standard. 2. Prevent unnecessary or undue degradation. 3. Where possible, enhance wilderness values.

Areas of Critical Environmental Concern

Blowout Penstemon

The Blowout Penstemon area contains 17,050 acres of potential and occupied habitat for the endangered blowout penstemon. This area encompasses unique sand dunes that contain steep sandy slopes deposited at the base of granite or sedimentary mountains. The blowout penstemon plant is restricted to sparsely vegetated, early successional shifting sand dunes created by wind erosion.

Cave Creek

The Cave Creek Cave area is located within the Shirley Mountain SRMA area and contains Cave Creek Cave. Ground water near Cave Creek provides unique humidity and temperature conditions that support hibernating and breeding bats. This cave provides for a hibernaculum and roost site for several bat species, including those on the BLM sensitive species list, because temperatures remain stable and the area is generally undisturbed. In addition to containing unique biological and geological resources, Cave Creek Cave provides unique recreational opportunities for spelunkers, which constitutes the majority of use by people during the late-spring, summer, and fall time period.

Sand Hills/JO Ranch

The Sand Hills/JO Ranch ACEC protects about 12,680 acres of public land for its unique vegetation complex, wildlife habitat values, and recreational opportunities. The bitterbrush/big sagebrush plant community, which is interspersed with patches of serviceberry, chokecherry, and aspen and occurs on a deep sand soil, is the only representation of this vegetative mix within the State of Wyoming. This area provides crucial winter range for mule deer and elk, and nesting and foraging habitat for raptors, Greater Sage-Grouse, and Columbian sharp-tailed grouse populations.

The JO Ranch includes the historic JO Ranch and the Rawlins-to-Baggs Freight Road. The JO Ranch is a unique example of continuous ranching activities of over 100 years in the Washakie Basin. This property includes a flood irrigation system along the valley bottom, which has resulted in a very high-quality habitat for wildlife. This system will require maintenance and planning to sustain it for the future.

Wilderness Study Areas

Adobe Town

The Adobe Town WSA consists of a single study area within the Rawlins and Rock Springs Field Office administrative boundaries. This WSA includes 32,650 acres of BLM-managed lands within the Rawlins Field Office. The WSA is located in southeastern Sweetwater County, 25 miles south of Wamsutter. It is bounded on the north by the checkerboard land pattern and the Manual Gap Road, on the west by the Adobe Town Rim Road, on the south by a fading two-track, and on the east by the Willow Creek Road.

Bennett Mountains

The Bennett Mountains WSA includes 5,950 acres of BLM-managed public lands, with no inholdings or split-estate lands. The WSA is located in north-central Carbon County, east of Seminoe Dam, and is situated about 35 miles northeast of Rawlins. It is part of the Seminoe Mountain range, a small, rugged range that rises abruptly from the surrounding lowlands. The WSA is bounded on the north and east by private and state lands, on the south by a power line road, and on the west by the Bennett Mountain Road.

Encampment River Canyon

The Encampment River Canyon WSA includes 4,500 acres of BLM-managed lands, with no inholdings or split-estate lands. The WSA is located in southern Carbon County, approximately two miles south of Encampment and one mile north of the Forest Service Encampment River Wilderness. It lies in the foothills of the Sierra Madre. The Encampment River bisects the WSA.

Ferris Mountains

The Ferris Mountains WSA includes 21,880 acres of BLM-managed public lands and one privately owned inholding of 160 acres. The WSA is located in northwestern Carbon County, about 40 miles north of Rawlins. The Ferris Mountains are a small mountain range, rising abruptly from the gently rolling plains that surround the WSA. The WSA is bounded on the north by the rolling plains of the Sweetwater Valley, on the south by the level expanses of Separation Flat, on the west by Muddy Gap, and on the east by Miners Canyon.

Prospect Mountain

The Prospect Mountain WSA includes 1,140 acres of BLM-managed public lands, with no inholdings or split-estate lands. The WSA is located in southern Carbon County, approximately 16 miles southeast of Encampment and eight miles north of the Colorado-Wyoming border. It is situated along the southwestern flank of the Snowy Range in the Medicine Bow Mountains.

Encampment River Wild and Scenic River

The segment of the Encampment River is 2.51 miles long. It begins in the SW1/4 of section 25 and ends in the NW1/4 of section 24; T. 14 N., R. 84W. Within this segment of waterway, the river flows through the Encampment River WSA, which includes one public land parcel determined to meet the WSR eligibility criteria. This segment includes a rugged canyon with colorful rock outcroppings and thick riparian vegetation. The river is considered a “Class 2” stream (very good trout water of statewide importance), as designated by Wyoming Game and Fish Department, that attracts anglers from outside the region. A public campground is located directly downstream from the river segment and provides easy public access to the segment. This segment is also associated with historic copper mining operations and tie hacking, with an old flume and mining associated sites (e.g., prospector pits, shafts, adits, mining cabins) existing on public lands within the river corridor. This segment also includes important bighorn sheep lambing grounds along the steep canyon walls above the river. The outstanding scenic, recreational, historical and wildlife values associated with these public lands makes this a uniquely diverse waterway segment in the region. This segment of the Encampment River is located within the Encampment River WSA and is currently managed in a fashion compatible with a WSA designation.

Wildlife Habitat Management Areas

Chain Lakes

Management of the Chain Lakes WHMA is coordinated with the WGFD by MOUs signed by BLM and the Wyoming Game and Fish Commission (owner of adjacent property in the checkerboard landownership pattern) in 1970 and 1976. The MOU objectives include the use of livestock grazing as a management tool, maintenance of an optimum population of pronghorn, maintenance of public ownership, administration of the area practically and economically, and discouragement of new fences. The southwestern portion of the WHMA has moderate potential for oil and gas development and currently is being developed in the western portion. The rest of the WHMA has a low potential for oil and gas development. Locatable mineral potential is low. Different laws, organizational goals and objectives, and management opportunities govern the BLM, responsible for public land, and WGFD, responsible for private land. This area encompasses one livestock grazing allotment (Chain Lakes), and is currently used by sheep in the winter.

The Chain Lakes area is located north of I-80, northeast of Wamsutter, and north of Creston Junction. It contains 30,560 acres of public land and occurs in a checkerboard ownership pattern where approximately 54% of the lands are either owned or leased by WGFD, and the remaining 46% are federal lands administered by the Rawlins Field Office. The area contains migration corridors and seasonal ranges for pronghorn, along with raptors, Greater Sage-Grouse, and other wildlife. It also contains a majority of the Chain Lakes, a unique desert alkaline wetland community. Management actions would continue to protect and identify components of the alkaline desert lake system, including historic mud pots and other geologic features and wildlife habitat.

Cow Butte/Wild Cow

The Cow Butte/Wild Cow WHMA, located between Rawlins and Baggs, was developed to promote management of upland and riparian habitats for wildlife and other multiple-uses. It encompasses 63,700 acres of mostly BLM-administered public land (49,570 acres), along with 4,770 acres of private land and 8,700 acres of state land. It borders the Upper Muddy Creek Watershed area to the north and the Sand Hills ACEC to the northwest. Of special concern in the area are the steep slopes and gullies that have the potential to accelerate erosion that would lead to increased habitat degradation. The moderate and steep slopes on south and west aspects are the principal areas used by elk during critical winter periods. This area encompasses a significant portion of elk crucial winter range. Impediments to wildlife movements from existing fences and habitat fragmentation have resulted in a loss of usable elk crucial winter range.

The area has a combination of diverse upland habitat conditions intertwined with perennial and ephemeral stream systems and riparian habitat, which combine to support an abundance of wildlife species, including elk, mule deer, pronghorn, Greater Sage-Grouse, sharp-tailed grouse, and raptors. The most important factor of the area is the mosaic mix of these wildlife habitats resulting from the diversity of plant communities, topography, soils, and climate. Vegetation communities within this area include aspen, four types of sagebrush, mountain shrub, and riparian/wetland communities which provide for the array of habitat.

There are seven different grazing allotments either wholly or partially contained within the area, including that portion of the Grizzly allotment that lies outside the upper Muddy Creek watershed. The WGFD established the 38,090 acre Grizzly Habitat Management Area in 1992. In conjunction with the acquisition of the Grizzly allotment, an MOU, habitat management plan, and allotment management plan were developed between the WGFD and BLM to guide management of aquatic and terrestrial wildlife and fisheries habitat.

Jep Canyon

The Jep Canyon WHMA protects about 13,810 acres of public land for elk crucial winter range as well as for raptor nesting habitat. There is a Raptor Concentration Area within the boundaries of the WHMA, with a high concentration of raptors including but not limited to red-tailed hawks, Cooper's hawks, golden eagles, and prairie falcons. The high relief topography and wind deposition of snow provide a diversity of vegetation communities, including aspen. Windswept south- and west-facing slopes provide open foraging areas for elk at critical times.

Laramie Peak

The Laramie Peak WHMA consists of approximately 18,660 acres of BLM-administered land, 11,500 acres of private land owned by the WGFD, and 6,700 acres of state land. There are 20 grazing allotments within the Laramie Peak area, all of which are licensed for cattle grazing. Ponderosa pine, Douglas fir, lodgepole pine, aspen, mountain shrubs, and grasslands dominate the vegetative communities. The area has steep granitic rock outcrops that drop into flat grasslands and vertical canyons, especially in the Laramie River and Duck Creek drainages.

The area has a wide variety of wildlife species including bighorn sheep, elk, mule deer, pronghorn, raptors, and fish species such as the hornyhead chub. The area has crucial winter range habitat for bighorn sheep, elk, and mule deer. One of the last remaining populations of the hornyhead chub in Wyoming occurs in this area. The area also contains habitat for the threatened Preble's meadow jumping mouse and potential habitat for Laramie columbine, a BLM sensitive species.

The Laramie Peak area is situated within the existing the Laramie Peak Bighorn Sheep Habitat Management Area that directs management of the BLM-administered lands in cooperation and coordination with Forest Service, WGFD, BLM (both the Rawlins and Casper Field Offices), and public interest groups (such as the Foundation for North American Wild Sheep (FNAWS). The main objective of the Laramie Peak Habitat Management Area is to restore, improve, and enhance habitat conditions for bighorn sheep and other wildlife species. There are 15 site-specific identified projects that are proposed in the Laramie Peak Bighorn Sheep Habitat Management Area. The habitat objectives of these projects are to remove forest canopy and increase grass production in order to improve summer forage, lambing areas, and movement corridors for bighorn sheep.

Laramie Plains Lakes

The Laramie Plains Lakes WHMA is located southwest of Laramie and contains Lake Hattie and Twin Buttes Reservoir as well as 1,600 acres of public land. The area has potential habitat for the endangered Wyoming toad, which is currently found in Mortenson Lake and Moeboer Lake, both located within close proximity. Although this area contains only potential habitat, it is highly possible that the toads can travel through the wetland corridors to Lake Hattie and Twin Buttes Reservoir. Recreationists heavily use this area. Shortgrass species dominate upland areas, whereas wetland areas consist of a combination of emergent aquatic vegetation and bare bank areas.

Pennock Mountain

The WGFD first established the 9,810-acre Pennock Mountain Elk Winter Range, located east of Saratoga, in 1962. The area contains crucial winter habitat for both elk and mule deer. BLM reserves all grazing preference for wildlife on 6,280 acres of BLM-administered public land, including 1,530 AUMs of forage for wintering elk. This area is closed to human presence and motorized vehicle use, including over-the-snow vehicles, from November 15 through April 30. The area contains mountain big sage, mountain shrub, aspen, cottonwood, and willow habitats.

Red Rim-Daley

The Red Rim-Daley Potential ACEC (11,100 acres) is a WGFD Cooperative WHMA and is located approximately 15 miles southwest of Rawlins. The Red Rim area contains both the Daley Ranch allotment and the Daley Ranch Pasture. The area contains scenic values throughout the red sandstone uplift. There are historic carvings in the rocks, with names and dates of people that traveled through the area. The area provides crucial winter range for pronghorn, giving this winter habitat national importance. The area may require additional management to maintain unique scenic and wildlife values.

Upper Muddy Creek Watershed/Grizzly

The Upper Muddy Creek Watershed/Grizzly WHMA includes 59,720 acres. The area contains those portions of the Muddy Creek watershed above the large headcut stabilization structure upstream of highway 789 within the Grizzly allotment. The Grizzly allotment is currently managed as a WHMA in cooperation with WGFD. The area contains unique fish habitats that support a rare community of native Colorado River Basin fish, including Colorado River cutthroat trout, bluehead sucker, flannelmouth sucker, roundtail chub, mountain sucker, and speckled dace. Elk and mule deer crucial winter range is located in this area. The high relief topography and wind deposition of snow provide a diversity of vegetation communities, including aspen.

Wick-Beumee

WGFD established the Wick Elk Winter Area, located on both sides of I-80 and between the towns of Elk Mountain and Arlington, in 1965. The area contains elk winter/crucial winter range and year-round habitat for wildlife. In conjunction with WGFD's purchase of the Wick Brothers Ranch, an MOU between BLM and WGFD was developed that reserves grazing use on the 280 acres of BLM-administered public land for elk and other wildlife. The terrain ranges from rugged foothills in the south to gently rolling plains in the north. Vegetative communities consist of sagebrush, mountain shrub, and aspen.

Other Areas of Concern

Shamrock Hills Raptor Concentration Area

Shamrock Hills Raptor Concentration Area protects about 18,400 acres of public land for its habitat and productivity of nesting raptor pairs. Shamrock Hills has one of the highest known nesting populations of ferruginous hawks in the United States.

Stratton Sagebrush Steppe Research Area

The Stratton Sagebrush Steppe Research Area is 5,530 acres that includes five small watersheds that have been used for research in the past. Currently, a portion of the Stratton area is withdrawn from locatable mineral entry. There is existing infrastructure that was put in place for past research objectives. Examples of this infrastructure include weirs for measuring stream flows, snow fences, vegetation plot markers, and precipitation gauge sites. The current management allows for grazing on three pastures within the research area, which is part of the Middlewood Hill allotment.

Rock Springs Field Office

The Rock Springs Field Office manages ten ACECs, two MAs, and seven WSAs. Rock Springs Field Office includes sections of the Sweetwater River which are found to be eligible and suitable as WSR but are not yet designated as such. Table 3-64 displays these areas within the field office.

Table 3-64. Rock Springs Field Office Special Designations and Management Areas

Area	Existing Designation	Values of Concern
Cedar Canyon	ACEC	To provide special management attention to a unique group of resource values; specifically, to protect and prevent irreparable damage to prehistoric cultural values (petroglyph panels and Indian campsites), visual aesthetics, and critical wildlife habitat.
Greater Red Creek	ACEC	To protect highly erosive soils, slumping, slopes greater than percent, and riparian areas in need of protection.

Area	Existing Designation	Values of Concern
Greater Sand Dunes	ACEC	To protect geologic, cultural, and wildlife values.
Natural Corrals	ACEC	To protect cultural, historic, geologic, and recreational values.
Oregon Buttes	ACEC	To protect and enhance the scenic integrity as an historic landmark and protect the significant wildlife values found in the area.
Pine Spring	ACEC	To protect cultural resource values.
South Pass	ACEC	To protect and enhance the scenic integrity as an historic landmark and protect the significant wildlife values found in the area.
Special Status Plants	ACEC	To maintain or enhance BLM Sensitive Species and their habitats.
Steamboat Mountain	ACEC	To ensure biological diversity and a healthy ecosystem; maintain the unique diverse habitats (big sagebrush, aspen, limber pine, and mountain shrub communities in the Steamboat Mountain area, especially on stabilized sand dunes along Steamboat Rim, Indian Gap, and in the Johnson, Lafonte, and Box Canyon areas; and provide suitable habitat to maintain the continued existence of the Steamboat elk herd and other big game populations.
White Mountain Petroglyphs	ACEC	To protect cultural resource values from degradation and provide for wildlife and scenic values, and Native American concerns.
Red Desert	MA	To manage for all resource values in the Red Desert area with emphasis on protection of visual resources, watershed values, and wildlife resources and to provide large areas of unobstructed views for enjoyment of scenic qualities.
Steamboat Mountain	MA	To manage for all resource values in the Steamboat Mountain area with emphasis on protection of visual resources, watershed values, plant and wildlife resources and to provide large areas of unobstructed views for enjoyment of scenic qualities.
Buffalo Hump	WSA	To protect wilderness, scenic and wildlife values.
Sand Dunes	WSA	To protect wilderness and scenic values and unique habitats.
Alkali Draw	WSA	To protect wilderness and scenic values and wildlife values.
South Pinnacles	WSA	To protect wilderness and scenic values and unique plant communities.
Honeycomb Buttes	WSA	To protect wilderness and scenic values and paleontological resources.
Oregon Buttes	WSA	To protect wilderness and scenic values and important cultural resources.
Whitehorse Creek	WSA	To protect wilderness and scenic values and important plant communities.

ACEC – Area of Critical Environmental Concern MA – Management Area WSA – Wilderness Study Area

Areas of Critical Environmental Concern

Cedar Canyon

The purpose of the ACEC is to provide special management attention to a unique group of resource values; specifically, to protect and prevent irreparable damage to prehistoric cultural values (petroglyph panels and

Indian campsites), visual aesthetics, and critical wildlife habitat. Highly erodible soils occur throughout the ACEC. The soils will be managed to maintain or reduce erosion levels and to improve vegetative ground cover. Cliffs, tree hollows, and pinnacles will be managed to provide nesting habitat. Vegetation will continue to be managed to provide habitat for wildlife. Habitat for raptors will be maintained or enhanced. The ACEC will be managed consistent with the Class II, Class III, and Class IV visual resource management classifications to protect, maintain, and enhance the visual resource values.

Greater Red Creek

The entire Red Creek watershed has been identified as 1) having highly erosive soils, 2) being subject to slumping, 3) having slopes greater than 25 percent, and 4) protecting riparian areas in need of protection. The Greater Red Creek Area involves the watershed values in the Pine and Little Mountain drainage systems. The watershed system relates directly to the amount of sedimentation contributed to the Green River drainage through Red Creek, Currant Creek, Sage Creek, Vermillion Creek, Canyon Creek, and other associated drainages. Watershed features such as water quality and stability are currently threatening the existence of Colorado River cutthroat trout through habitat deterioration.

Greater Sand Dunes

The ACEC was designated to protect geologic, cultural, and wildlife values. The Sand Dunes are part of the larger Killpecker dune field, one of the largest active dune fields in North America. The Killpecker dune field encompasses approximately 109,000 acres, extending 55 miles east from the Green River Basin across the Continental Divide into the Great Divide Basin. The ACEC is unique to the Wyoming Basin and contains values that are geologically, aesthetically and biologically interesting. In addition, the ACEC includes prehistoric and historic values, diverse wildlife use, high recreation use having the potential of increasing significantly, and high oil and gas values.

Natural Corrals

The Natural Corrals ACEC is managed primarily for cultural, historic, geologic, and recreational values. The lands within this ACEC are on the eastern flank of the Rock Springs Uplift (and within a large intermontane basin bounded by the Wind River Mountains to the north), the Uinta Mountains on the south, the Overthrust Belt on the west, and the Sierra Madre and Granite Mountains toward the east.

Oregon Buttes

The Oregon Buttes ACEC lies on a structural platform that joins the Rock Springs Uplift to the Wind River Mountain Range. It is managed primarily to protect and enhance the scenic integrity as an historic landmark and protect the significant wildlife values that are found in the area.

Pine Springs

This site is one of the most significant prehistoric campsites in southwest Wyoming. The site was continuously occupied from about 8000 B.C. to 1200 A.D. Cultural values at Pine Springs are potentially threatened by vandals and by cattle and sheep trampling in the area. One of the greatest dangers to cultural resources may result from intentional vandalism and illegal collecting.

South Pass Historic Landscape

The South Pass Historic Landscape encompasses the viewshed along the Oregon, Mormon Pioneer, California, and Pony Express trails and the Lander Cutoff (about 16.42 miles of trail with a 6-mile wide corridor along the Oregon, Mormon Pioneer, and California trails, and a 2-mile wide corridor along the Lander Cutoff). The topographic setting of South Pass facilitated American settlement of the Pacific Northwest, thus solidifying United States sovereignty over that region. South Pass is located on the northwest edge of the Wyoming Basin, which is a desert-like geographical feature that extends south for 150 miles and forms a complete break in the Rocky Mountain chain. Important historic values of the area include the viewscape created by the Continental Divide, including the top rim of Pacific Butte on the south and the divide between waters flowing to Pacific Creek and the Sweetwater River on the north and east.

Special Status Plants
The Special Status Plant Species ACEC was designated in 1997. Special status plants are those listed, proposed for listing, or candidates for listing as threatened or endangered under the ESA, identified by the state in a category implying potential endangerment or extinction, or species designated by the BLM State Director as sensitive. Management priority and emphasis for the ACEC was given to maintain or enhance these species and their habitats.

Steamboat Mountain
The area has highly varied topographic features and ranges in elevation from 7,063 to 8,683 feet. Unique habitats of stabilized sand dunes occur here that are found nowhere else in the district. Tall sagebrush communities (up to 8 feet tall) provide escape cover, shelter, thermal protection, and parturition areas. An understory of bitterbrush and a variety of other shrubs and grasses provide forage. Some of this sagebrush has been estimated to be over 300 years old.

The Steamboat Mountain ACEC contains approximately 43,270 federal acres of a total 48,330 acres within the described geographic boundaries. The management objectives for this ACEC are to: 1) enhance and maintain the water quality, vegetation, soil, and wildlife resources to ensure biological diversity and a healthy ecosystem; 2) maintain the unique diverse habitats (big sagebrush, aspen, limber pine, and mountain shrub communities) in the Steamboat Mountain area, especially on stabilized sand dunes along Steamboat Rim, Indian Gap, and in the Johnson, Lafonte, and Box Canyon areas; and 3) provide suitable habitat to maintain the continued existence of the Steamboat elk herd and other big game populations.

White Mountain Petroglyphs
The White Mountain Petroglyphs ACEC was designated to protect Indian drawings associated with the early ancestors of the present Shoshone tribe and perhaps other tribes. Common drawings include human figures, elk, buffalo, feather head dresses, and human stick figures. The management objectives of the White Mountain Petroglyphs ACEC are to protect cultural resource values from degradation and provide for wildlife and scenic values, and Native American concerns.

Management Areas

Red Desert Watershed Management Area
The Red Desert Watershed Management Area encompasses 645,570 acres of which 481,930 are public lands (federal surface/federal minerals, federal surface/private minerals, or private surface/federal minerals) administered by the BLM. The Red Desert Watershed Area includes all of the Great Divide Basin within the resource area. The Great Divide Basin is one of only a few closed basins found in the United States.

The management objective for the Red Desert Watershed Area is to manage for all resource values in the Red Desert area with emphasis on protection of visual resources, watershed values, and wildlife resources and to provide large areas of unobstructed views for enjoyment of scenic qualities. Six WSAs (Alkali Draw, South Pinnacles, Alkali Basin-East Sand Dunes, Red Lake, Honeycomb Buttes, and Oregon Buttes) are located within the watershed area. Of the six WSAs, Honeycomb Buttes and Oregon Buttes have been recommended for wilderness designation for a total of 40,900 acres within the watershed boundary. Approximately ten to 20 acres of the northeast corner of the Cedar Canyon ACEC and approximately two-thirds of the Oregon Buttes ACEC are also included in the area.

Steamboat Mountain
The Steamboat Mountain Management Area contains approximately 43,270 federal acres of a total 48,330 acres within the described geographic boundaries. The area has highly varied topographic features and ranges in elevation from 7,060 to 8,680 feet. Unique habitats of stabilized sand dunes occur here that are found nowhere else in the district. Tall sagebrush communities (up to 8 feet tall) provide escape cover,

shelter, thermal protection, and parturition areas. An understory of bitterbrush and a variety of other shrubs and grasses provide forage.

Water is abundant and found in good distribution through springs, ephemeral and perennial streams, seeps, and reservoirs. Snowpack commonly lies along steep slopes in lee areas late into spring. Two supplemental wildlife waters (guzzlers) are found in the area. The Steamboat Mountain area is of special interest because it provides a favorable environment for the survival of mountain plant species that are not found in the semi-arid plains of the surrounding area. It is one of only a few places where elk populations are found away from a high mountain environment. Surrounding this area is a complex winter range and additional parturition areas (30,000 acres). The area also provides habitat for an abundant population of pronghorn and mule deer. Two unique species of rodents are found within the Steamboat area. The yellow-bellied marmot and the Wortman's golden-mantled ground squirrel inhabit boulder fields in association with limber pine.

In addition to a number of relic plant populations, one candidate plant species (*Lesquerella macrocarpa*) and one state endemic plant species (*Townsendia spathufara*) are found within the Steamboat area. Several springs along the slopes of Steamboat Mountain also provide specialized habitat for a number of additional plant species not normally associated with the semi-arid climate of the Wyoming Basin.

Wilderness Study Areas

Buffalo Hump

The primary topographic relief of the Buffalo Hump WSA consists of sand valleys, blowouts, hills, and dunes with individual dunes exceeding heights of 100 feet. The interdunal areas contain ponds, grass-covered marshes, and playas. The WSA exhibits a natural condition of undisturbed sagebrush-grassland ecosystem intermingled with active sand dunes. Recreation values include rockhounding.

Sand Dunes

The Sand Dunes WSA comprises a large part of the Killpecker Sand Dunes and contains large areas of barren active dunes, wet meadows, greasewood, big sagebrush, and rabbit brush communities. A unique feature of the WSA is the Aeolian ice-cells that feed pools at the base of many of the large sand dunes. The naturalness of this WSA is considered exceptional because of the lack of human made intrusions. The flowing dunes virtually eliminate any evidence of human activity in the area. The Steamboat elk herd uses this area.

Alkali Draw

The Alkali Draw WSA contains a remnant of the Great Divide Basin-Red Desert area. A series of draws or canyons extend through the WSA, creating a "washboard" topographic effect. Alkali Rim dominates the southern aspect and exhibits colorful blue rock escarpments. Big sagebrush is the dominant vegetation community, with greasewood common along the major drainages. The WSA contains habitat for mule deer and elk. The WSA is in a natural condition, and the anthropogenic intrusions are substantially unnoticeable and undergoing natural revegetation.

South Pinnacles

The South Pinnacles WSA contains mostly flat topography with an exposure of broken rim rocks and ridges. Greasewood communities occupy the draws, with big sagebrush in the open areas. The WSA is natural in character and provides opportunities for solitude and varied recreation. However, due to the potential for gas production and the manageability of the area, the BLM did not recommended this WSA for designation as wilderness in the Record of Decision and Green River Resource Management Plan, signed August 1997.

Honeycomb Buttes

The Honeycomb Buttes WSA contains several terrain types, ranging from sagebrush hills and greasewood flats surrounding the badlands to eroding buttes, colored bluffs, and side canyons. This area is one of the best examples of badlands topography in the state and of fossil- and fossil cast-bearing formation in the region. These highly colorful and rugged desert badlands provide outstanding opportunities for solitude. The WSA is natural in character and relatively free of human activities because of the severe topography of the area.

Oregon Buttes

The Oregon Buttes WSA contains no private or state inholdings. The buttes are a prominent feature rising out of the Red Desert, with historical significance as the major landmark for travelers of the Oregon Trail. Resources of the area consist of limber pine stands, small aspen stands, prime raptor habitat, and valuable big game habitat. Visibility from the buttes extends for miles and provides scenic vistas of the mountain ranges to the north and south. The WSA is in a natural state and provides outstanding recreation opportunities for birdwatchers and photographers.

Whitehorse Creek

Whitehorse Creek WSA contains no private or state inholdings. A large portion of the area contains eroding red, green, and gray buttes. The area supports various habitats and landscapes, including aspen and limber pine stands, sheer sandstone cliffs, and badland topography. The WSA contains important raptor habitat. Opportunities for solitude and primitive recreation are high in areas of the WSA where large escarpments and buttes are located. The potential for gas production and the manageability of OHV use in the portion of the area with little topographic relief contributed to BLM's determination not to recommend this WSA for designation as wilderness in the Record of Decision and Green River Resource Management Plan, signed August 1997.

3.13.2 Forest Service

General Planning Area Description

Special designation areas discussed in this section include Special Interest Areas (SIAs), Research Natural Areas (RNAs), Inventoried Roadless Areas (IRAs), Wilderness Areas, Wilderness Study Areas, and Wild and Scenic Rivers. Special Interest Areas, RNAs, and IRAs are designated by the Forest Service in Land and Resource Management Plans and include unique and outstanding combinations of physical and biological resources and areas of special social interest. Wilderness Areas, Wilderness Study Areas, and Wild and Scenic Rivers are regulatory or congressionally mandated and are designed to protect or preserve certain resource qualities or uses. All of these areas are collectively referred to as "special areas."

Special Interest Areas are managed to protect or enhance regions with unusual characteristics, such as scenic, historical, geological, botanical, zoological, paleontological or others. Management emphasis is on protecting or enhancing and, where appropriate, developing and interpreting for public education and recreation, areas with unusual characteristics. Many uses are allowed in SIAs, including recreation, livestock grazing, mineral leasing, and road construction, but only if such uses do not degrade the characteristics for which these areas are designated (Map 3-17).

The National Environmental Policy Act of 1969 (NEPA) describes the responsibility of federal agencies to preserve important historic, cultural, and natural aspects of our national heritage. Regulations at 36 CFR 294.1 also allow for the classification of Special Interest Areas (SIAs): "Suitable areas of National Forest System land, other than Wilderness or wild areas, which should be managed principally for recreation use, may be given special classification."

Research Natural Areas are selected to provide a spectrum of relatively undisturbed areas representing a wide range of natural variability within important natural ecosystems and environments (for example: forest, shrubland, grassland, alpine, aquatic, and geological environments) and areas with special or unique characteristics or scientific importance (Map 3-17). RNAs are also selected to:

- Serve as reference areas for evaluating the range of natural variability and the impacts of management in similar environments;
- Maintain representative and key elements of biological diversity at the genetic, species, population, community, and/or landscape levels;
- Serve as areas for the study of ecosystems and ecological processes including succession;
- Provide onsite and extension educational activities; and
- Serve as baseline areas for measuring ecological change.

Provisions of the Organic Administration Act of 1897 (16 USC 551) authorize the Secretary of Agriculture to designate Research Natural Areas (RNAs).

Inventoried Roadless Areas are undeveloped areas typically exceeding 5,000 acres that meet the minimum criteria for wilderness consideration under the Wilderness Act. Inventoried Roadless Areas may contain improvements such as motorized trails, fences, outfitter camps, and evidence of historical logging activities (Map 3-17). As required by 36 CFR 219.17, IRAs are identified during Forest Plan development or revision and are qualified for study if they meet the following criteria:

- They are 5,000 acres in size or larger.
- They are less than 5,000 acres, but contiguous to an existing Wilderness Area.
- There are no classified roads (A classified road was defined at the time of inventory as a road constructed or maintained for long-term highway vehicle use. Therefore, IRAs may contain motorized and non-motorized trails and user created roads.).

Roadless Area Conservation Final Rule, 66 FR 3244 (Roadless Rule), was signed by former Secretary of the U. S. Department of Agriculture Dan Glickman on January 12, 2001. The Roadless Rule, codified at 36 CFR 294 Subpart B (2001), would have prohibited new road construction and timber harvest in inventoried roadless areas subject to exceptions. Specific exemptions would have allowed for roads in conjunction with the continuation, extension, or renewal of a mineral lease [36 CFR 294.12(b)(7)] and for roads pursuant to reserved or outstanding rights [36 CFR 294.12(b)(3)]. Exceptions also would have allowed for roads needed to protect public health and safety (law enforcement, fire suppression etc.), needed to conduct a CERLA action, needed to prevent irreparable resource damage, needed for road safety, and determined to be in the public interest. In addition, the rule specifically would not have affected a state's or private landowner's right of access to their land [36 CFR 294.12(b)(3) and 294.14 (a) and preamble at 66 FR 3251, 3253, 3256, 3259]. This rule defined inventoried roadless areas as "Areas identified in a set of inventoried roadless area maps," contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000.

Wilderness and Wilderness Study areas are generally defined as natural environments that have not been significantly modified by human activity. While these areas provide opportunities for solitude and for primitive and unconfined recreational experiences, they are also important for maintenance of species diversity, protection of threatened and endangered species, protection of watersheds, scientific research, and various social values (Map 3-17). Inside the boundary, the areas are protected from development, including development of roads, dams, or other permanent structures; from timber cutting; and from the operation of motorized vehicles and equipment. Outside the boundary, management activities continue, including logging, road building, development, and in many cases, private land development.

The Wilderness Act of 1964 established the National Wilderness Preservation System (NWPS). This system has grown dramatically since its inception and has been built through enactments of approximately 104 Wilderness bills, typically establishing Wilderness areas in a particular state. The Wilderness Act allows additional undeveloped and unroaded lands to be added to the NWPS.

The Forest Service initially inventories Wilderness potential by identifying roadless areas 5,000 acres or larger. There are three tests applied to roadless areas before they are considered for Wilderness recommendation: capability, availability, and need. While the Forest Service may nominate areas for Wilderness designation, only Congress may formally designate Wilderness areas.

Wild and Scenic Rivers are water bodies with outstanding natural, heritage, or recreational features in a free-flowing condition for the enjoyment of current and future generations. The Wild and Scenic Rivers Act of 1968 established a national policy for designating selected rivers or sections thereof to protect water quality and to fulfill other vital national conservation measures. The Act in Section 5(d) directs all federal agencies to give consideration to potential national wild, scenic, and recreational river areas in all planning for use and development of water and related land resources. Similar to Wilderness area designation, the Forest Service may only recommend the inclusion of a river within the National Wild and Scenic System. It is up to Congress to act upon the recommendation and to make the formal designation.

Bridger-Teton National Forest

Special Interest Areas

There is one SIA located within the BTNF (Map 3-17): Two Ocean Pass National Natural Area is a designated National Natural Landmark. This Natural Area is not located within or adjacent to Greater Sage-Grouse habitat and would not be affected by any management actions concerning this species.

Research Natural Areas

There are four RNAs within the BTNF, they include the Osborn Mountain, Gros Ventre, Afton Front, and Swift Creek (Map 3-17). These RNAs are not located within Greater Sage-Grouse habitat, do not support sagebrush vegetation and would not be affected by any management actions considered in this planning effort. Osborn Mountain RNA is a high elevation alpine plateau. The Gros Ventre and Swift Creek RNAs support tall forb communities. The Afton Front RNA is primarily Douglas fir.

Withdrawal Areas

The Wyoming Range Legacy Act established the Wyoming Range Withdrawal Area and affects all National Forest System lands and Federal minerals in the identified withdrawal area located in the Bridger-Teton National Forest totally approximately 1.2-million acres. The Act withdrew the area to: (1) all forms of appropriation or disposal under the public land laws; (2) location, entry, and patent under the mining laws; and (3) disposition under laws relating to mineral and geothermal leasing. The withdrawal area does not affect existing rights and allows for oil and gas leasing within one mile of the withdrawal boundary. The withdrawal has no time limit as it is a congressionally designated withdrawal. The Act amended the BTNF LRMP. There are numerous withdrawals across the Forest that have kept designated areas closed to the U.S. mining laws either by Secretarial Order or Public Land Order.

Inventoried Roadless Areas

There are 20 Inventoried Roadless Areas located within the BTNF (Map 3-17, Table 3-65).

Table 3-65. Inventoried Roadless Area Acreage in the Bridger-Teton National Forest

Inventoried Roadless Area	Total Acres
Lake Alice - Commissary Ridge	179,920
Nugent Park - Hams Fork	21,590
Salt River Range	259,270
Riley Ridge	17,600
North Mountain	8,560
South Wyoming Range	76,190
Little Cottonwood Creek	4,870
Grayback	315,650
Monument Ridge	17,380
Munger Mountain	12,900
Gros Ventre	435,320
Little Sheep Mountain	17,300
Mosquito Lake – Seven Lakes	30,010
Spread Creek – Gros Ventre R	172,820
Pacific - Blackrock Creek	26,370
Teton Corridor	28,160
Gannett Hills – Spring Creek	46,400
Palisades	81,870
Phillips Ridge	9,900
West Slope Winds	-

Wilderness and Wilderness Study Areas

The BTNF includes three wildernesses (Map 3-17 and Table 3-66). Two were designated with the 1964 Wilderness Act and one with the 1984 Wyoming Wilderness Act. The BTNF also has two WSAs that were designated by Congress as part of the 1984 Wyoming Wilderness Act (Map 3-17 and Table 3-66). The Palisades WSA includes approximately 135,800 acres on the Bridger-Teton and Targhee National Forests (82,580 acres are within the BTNF). The Shoal Creek WSA includes 32,370 acres contiguous with the Gros Ventre Wilderness. It forms the lower-elevation southern front of the Gros Ventre Mountains.

Table 3-66. Wilderness and Wilderness Study Areas Acreage in the Bridger-Teton National Forest

Name	Total Acres
Teton Wilderness	584,320
Gros Ventre Wilderness	285,410
Bridger Wilderness	426,350
Palisades WSA	135,800
Shoal Creek WSA	32,370

Name	Total Acres
Total	1,464,250

Although the three Wilderness areas differ from one another in character, they primarily represent high mountain environments and rugged terrain. The Teton Wilderness, known for its long distances and big game hunting opportunities, is visited by people from the larger region and nation-wide; a large majority of recreation use is guided and the major period of recreation use is late summer and fall. The Bridger Wilderness, known for its mountain lakes, scenery, and climbing, also attracts visitation from all over the nation and the world, with the high-use season being mid-summer. The Gros Ventre Wilderness is smaller and lesser known than the other two and attracts mostly local and regional visitation, although its proximity to Jackson Hole makes it attractive to national and international visitors as well. During the 2002 national visitor use monitoring study in the BTNF, wilderness visitors surveyed originated from over seventy zip codes. It was estimated that over 52,000 people visited one of the three wildernesses within the Forest that year.

The Palisades WSA includes high peaks and subalpine terrain, a variety of plant communities and vegetation types, and views of distant ranges, including the Tetons. Montane parklands in the mid-to-upper elevations have a wide diversity of forbs that create spectacular wildflower displays all summer. Wildlife includes several species of special interest: osprey and bald eagle near the Snake River, wolverine, elk, moose, mule deer, bighorn sheep, and introduced Rocky Mountain goat.

Shoal Creek WSA is bounded on the north by the Gros Ventre Wilderness. The area contains habitat for elk, moose, mule deer, mountain lion and other forest predators, migratory songbirds, goshawks, owls, and small mammals. It contains important winter range for elk, deer, and moose; the Dell Creek Game and Fish feedground is nearby. Spectacular geologic features exist within the WSA and in the adjacent Gros Ventre Wilderness, some of which are best seen from the WSA. These include bare, steep limestone faces and flatiron dip slopes, waterfalls (notably Shoal Falls and West Dell Falls), classic deep glacial canyons, and caves.

Wild and Scenic Rivers

In 1992, Forest Plan Amendment number 2 identified 602 miles in 31 river segments as eligible for inclusion in the Wild and Scenic River system and included additional standards that apply. In addition to those additional standards, the segments within designated wilderness are managed under standards and guidelines in Management Prescription 6 in the Forest Plan, while the remaining miles are managed under standards and guidelines listed in Management Prescription 3. Management direction protects these segments from activities that would diminish or change the free-flowing characteristic, the water quality, or the scenic, recreational, fish and wildlife and other values which make the segment eligible for designation.

The Snake River Headwaters Legacy Act of 2009 designated approximately 400 miles of the Snake River Headwaters as wild and scenic rivers. This designation crosses several administrative boundaries, including those of the BTNF, Grand Teton and Yellowstone National Parks, the John D. Rockefeller, Jr. Memorial Parkway and the National Elk Refuge. Of the designated miles, about 316 miles are on the BTNF.

Designated river segments include portions of Bailey Creek, Blackrock Creek, Buffalo Fork of the Snake River, Crystal Creek, Granite Creek, Gros Ventre River, Hoback River, Pacific Creek, Shoal Creek, Snake River, Willow Creek, and Wolf Creek. The Forest Plan Amendment and Comprehensive River Plan were released to the public in May 2013. Public comment period closed June 30, 2013.In the interim, those segments are managed by both the direction in Forest Plan Management Prescription 3, Amendment 2 and by the direction in the Wild and Scenic Rivers Act of 1968 and the Snake Headwaters Legacy Act of 2009.

In addition to the designated river segments, there are approximately 315 miles of rivers on the BTNF that remain eligible as Wild and Scenic rivers. Lands within a quarter mile corridor on each side of the rivers are managed similarly as if the rivers were designated. Management Prescription 3 in the Forest Plan protects these segments from activities that would diminish or change the free-flowing characteristic, the water quality, or the scenic, recreational, fish and wildlife and other values which make the segment eligible for designation.

Medicine Bow National Forest

Special Interest Areas

There are 13 SIAs found within the MBNF (Map 3-17 and Table 3-67). While none of these areas contain core sage-grouse habitat, two of the SIAs contain small acreages of general habitat.

Table 3-67. Special Interest Area Acreage in the Medicine Bow National Forest

Special Interest Area	Total Acres
Ashenfelder	2,100
Cinnabar Park	200
Ribbon Forest	4,350
Medicine Bow Peak	1,150
White Rock Canyon	680
Kettle Ponds	9,110
Tramway Trail	1,050
Roper Cabin Tie Dam	66
Douglas Creek Tie Dam	3
Horse Creek Tie Dam	7
Muddy Park Tie Dam	20
Sunken Gardens	240
Centennial Ridge	4,630
Total Acres	**23,606**

Tramway Trail: This 1,050-acre area is located on the Sierra Madre Mountain Range on the Brush Creek/Hayden Ranger District. This area was designated as an SIA because of historical copper mining that took place in the late 1800s and the remnant mining features that are still present today. Roughly 20 acres of this SIA are located in general sage-grouse habitat.

White Rock Canyon: This 680-acre area is located in the northern-most portion of the Snowy Range Mountains on the Brush Creek/Hayden Ranger District. This area was designated as an SIA because of its geologic, scenic, and wildlife values. Vegetation in the SIA ranges from sagebrush communities to mountain shrub communities to coniferous forests. Approximately 290 acres of the SIA are located in general sage-grouse habitat.

Research Natural Areas

There are five RNAs found within the MBNF (Map 3-17 and Table 3-68). No core sage-grouse habitat is present in any of the five RNAs. Of the five RNAs only one, the Battle Mountain RNA, contains general sage-grouse habitat.

Table 3-68. Resource Natural Areas Acreage in the Medicine Bow National Forest

Resource Natural Area	Total Acres
Battle Mountain	1,200
LaBonte Canyon	3,020
Browns Peak	470
Platte Canyon	8,980
Savage Run	1,060
Snowy Range	730

Battle Mountain: This 1,320-acre area is located on the Brush Creek/Hayden Ranger District; its principal distinguishing feature is a volcanic butte that supports a mosaic of plant communities. Quacking aspen woodland, lodgepole pine forest, mountain big sagebrush shrubland, and bluebunch wheatgrass vegetation occur primarily on top of Battle Mountain. Subalpine fir and limber pine woodlands as well as Saskatoon serviceberry shrubland occur mainly on the sides of the mountain. Roughly 720 acres of the SIA are located within general sage-grouse habitat.

Inventoried Roadless Areas

There are 31 Inventoried Roadless Areas (IRAs) located within the MBNF that collectively comprise approximately 320,000 acres, or roughly 29% of the land base (Map 3-17 and Table 3-69). Of the 31 IRAs, four contain core sage-grouse habitat.

Table 3-69. Inventoried Roadless Area Acreage by Number and Mountain Range in the Medicine Bow National Forest

Roadless Area Number	Name	Acres
Sierra Madre Area		
R20601	Strawberry Creek	5,880
R20602	Singer Peak	10,490
R20603	Big Sandstone	7,170
R20604	Little Sandstone	5,480
R20605	Battle Creek	5,890
R20606	Little Snake	9,920
R20607	Solomon Creek	5,760
R20608	Deep Creek	6,410
R20609	Bridger Peak	6,690
R20610	Mowry Peak	6,240
R20611	Huston Park Addition	8,400

Roadless Area Number	Name	Acres
R20612	Encampment River Addition	4,980
R20613	East Fork Encampment	7,430
R20614	Bear Mountain	9,430
Subtotal 14 roadless areas = 30% roadless		100,170
Snowy Range Area		
R20615	Pennock Mountain	9,590
R20616	Rock Creek	18,860
R20617	Snowy Range	29,640
R20618	Campbell Lake	7,090
R20619	French Creek	5,920
R20620	Libby Flats	11,080
R20621	Middle Fork	13,230
R20622	Sheep Mountain	17,610
R20623	Savage Run Addition	2,370
R20624	Platte River Addition	7,950
R20625	Illinois Creek	6,710
Subtotal 11 roadless areas = 25% roadless		130,050
Laramie Peak Area		
R20626	Soldier Creek	5,990
R20627	Gunnysack	12,880
R20628	Buffalo Peak	17,540
R20629	LaBonte Canyon	16,260
R20630	Laramie Peak	28,580
R20631	Cow Creek Mountain	8,270
Subtotal 6 roadless areas = 50% roadless		89,520
Total Medicine Bow roadless acres		**319,740**
% of National Forest System lands on Medicine Bow NF		**29%**

Source: RACR Medicine Bow National Forest Inventoried Roadless Areas (MBNF LRMP FEIS pg. 3-356)

Bear Mountain: This 9,430-acre IRA is located on the Sierra Madre Mountain Range and is comprised forested land (76%), non-forested land (1%), and shrubland (23%). A large portion of the area is classified as elk winter range. Livestock grazing occurs during the summer and fall seasons and several permitted outfitters and guides provide big game hunting and scenic horseback trips during hunting seasons. Historically, mineral exploration has occurred in the area. Approximately 120 acres of the IRA are located within core sage-grouse habitat.

Soldier Creek: This 5,990-acre IRA is located on the Douglas Ranger District in Converse County, Wyoming and is comprised of forested lands (72%), non-forested lands (8%), shrublands (18%), and grasslands (2%). Rocky Mountain elk, mule deer, black bear, and mountain lions are the primary big game species in the area. Livestock grazing occurs during the summer and fall seasons and incidental amounts of outfitter and guide operations occur during hunting seasons. The area has a low potential for mineral exploration and development. Approximately 220 acres of the IRA are located within core sage-grouse habitat.

Pennock Mountain: This 9,590-acre IRA is located on the Brush Creek/Hayden Ranger District in Carbon County, Wyoming, and is comprised of forested lands (76%) and shrublands (24%). Most of area is categorized as crucial elk winter range and an elk parturition area. The area contains three grazing allotments, all currently grazed with cattle. While little to no mineral exploration has occurred in the area, leasable mineral potential is unknown. Approximately 220 acres of core sage-grouse habitat are located in the IRA.

Platte River Addition: This 7,950-acre IRA is located on the Laramie Ranger District in Albany and Carbon Counties, Wyoming, and is comprised of forested lands (73%), shrublands (19%), and grasslands (8%). A significant portion of the addition areas serve as spring-summer-fall range for deer, big horn sheep, moose, and elk. The area contains two grazing allotments, both of which are currently grazed with cattle. Although prospecting for hard rock minerals has historically occurred, no oil and gas leases exist nor has any recent exploration been done adjacent to the area. Approximately 94 acres of the IRA are located in core sage-grouse habitat.

Wilderness Areas and Recommended for Wilderness

There are four Wilderness Areas located within MBNF (Map 3-17). Of the four, only one contains core sage-grouse habitat (Table 3-70). There are four areas located within the MBNF. This WSA does not contain any core sage-grouse habitat.

Table 3-70. Wilderness Area Acreage in the Medicine Bow National Forest

Wilderness Area	Total Acres
Savage Run	15,260
Platte River	22,750
Huston Park	30,590
Encampment River	10,020

Table 3-71. Recommended for Wilderness Acreage in the Medicine Bow National Forest

Recommended for Wilderness	Total Acres
Little Snake	3,960
Huston Park Addition	4,130
Encampment River Addition	2,350
Rock Creek	17,530

Platte River Wilderness: This 22,750-acre Wilderness area is managed by three Ranger Districts in two states. A small portion (740 acres) is located in Colorado's Routt National Forest, and the remaining 22,010 acres are located on the MBNF. This area is home to a wide variety of wildlife species including water and shore birds, Rocky Mountain bighorn sheep, elk, moose, and black bear. Approximately 82 acres of this Wilderness are located in core sage-grouse habitat.

Wild and Scenic Rivers

The Medicine Bow National Forest contains segments of WSRs (Table 3-72). There is no core or general sage-grouse habitat within any Wild and Scenic River areas.

Table 3-72. Wild and Scenic Rivers on the Medicine Bow National Forest

River/Stream	Eligible	Designated	Length (miles)	Classification
North Platte	Yes	Yes	16.35	Wild/scenic
Encampment	Yes	Yes	11.7	Wild/scenic
North Fork Little Snake	Yes	-	9.36	Scenic
West Branch North Fork Little Snake	Yes	-	7.72	Scenic
Roaring Fork Little Snake	Yes	-	3.73	Wild
Rose Creek	Yes	-	.89	Scenic

Thunder Basin National Grassland

Special Interest Areas

There are six SIAs located within the TBNG (Map 3-17). These six SIAs account for a total of 26,780 acres, or 5% of the land base. All of the SIAs contain core or general sage-grouse habitat or a combination of both (Table 3-73).

Table 3-73. Special Interest Area Acreage by Core and General Sage-grouse Habitat in the Thunder Basin National Grassland

Special Interest Area	Total Acres	Core Acres	General Acres
Alkali Divide	5,140	0	5,140
Buffalo Divide	490	0	490
Cellars	960	960	0
Cheyenne River Zoological	5,980	0	5,980
Cow Creek Historic Rangeland	14,170	9,890	4,280
Lance Geologic	40	0	40
Total Acres	**26,780**	**10,850**	**15,930**

Alkali Divide SIA: This 5,140-acre site features a high concentration of fossil remains from the Late Cretaceous Period ending roughly 65 million years ago. The site is within the Lance formation which is composed of dull gray, sandy shale alternating with, light-colored sandstones and thin lignite (brown coal) beds. The Alkali Divide SIA, which is the most productive fossil–bearing site on the TBNG, is located entirely within general sage-grouse habitat.

Buffalo Divide SIA: This 490-acre site features a series of prehistoric camps that run along a grassy ridge that separates the watersheds of the Belle Fourche and Cheyenne Rivers. Excavations conducted in the early 1990s indicated a protohistoric (after initial European contact but before good written records) occupation as a hunting camp during the summer and fall. Due to its excellent preservation and the presence of many associated artifacts, it is eligible for the National Register of Historic Places. The entire SIA is located in general sage-grouse habitat.

Cellars SIA: This 960-acre site is characterized by a series of prehistoric camps atop a continuous ridge overlooking the surrounding terrain. This complex of more than 120 stone circles was a major prehistoric campsite for early American Indians. The entire SIA is located in core sage-grouse habitat.

Cheyenne River Zoological SIA: This 5,980-acre site provides a prairie dog complex of approximately 3,000 acres, occupied mountain plover habitat, and potential black-footed ferret habitat. About 6.75 miles of the Cheyenne River also wind through the area, offering habitat for fish, beaver, and raptors. In addition, the area contains potential habitat for Ute ladies-tresses and bald eagle winter roost sites. The entire SIA is located in general sage-grouse habitat.

Cow Creek Historic Rangeland SIA: This 14,170-acre site features naturally appearing rangelands that function in a self-sustaining ecological manner. The area provides a glimpse into what rangelands were like in the pre homestead era, prior to the 1880s. Native vegetation and ecological processes function and are basically unaffected by human influence, with the exception of domestic livestock and the basic facilities needed to maintain them. Roughly 9,890 acres of this SIA are located in core sage-grouse habitat while the remaining 4,280 acres are in general sage-grouse habitat.

Lance Geologic SIA: This 40-acre site is characterized by a wash approximately ten acres in size containing numerous mushroom-like geologic features and three-dimensional views of ancient sedimentary structures. The area also offers opportunity for study of certain unique geologic features, ancient depositional environments, and paleontological and paleoecologic resources. The entire SIA is located within an area identified as general sage-grouse habitat.

Research Natural Areas

The TBNG contains two RNAs, they include the Rock Creek and Wildlife Draw RNAs (Map 3-17). Collectively, these two areas contain 1,210 acres and are both located entirely within core sage-grouse habitat (Table 3-74).

Table 3-74. Resource Natural Areas Acreage by Core and General Sage-grouse Habitat in the Thunder Basin National Grassland

Special Interest Area	Total Acres	Core Acres	General Acres
Rock Creek	590	590	0
Wildlife Draw	630	630	0
Total Acres	**1,220**	**1,220**	**0**

Rock Creek: This 590-acre area is located about eight miles northwest of Clareton, Wyoming and lies within the eco-region classified as the Great Plains-Palouse Dry Steep Province, Powder River Basin Section, Southern Powder River Basin-Scoria Hills Subsection. The principal distinguishing features include rolling hills with vegetation of the big sagebrush/needle-and-thread plant association and the needle-and-thread/blue grama plant association, and draws supporting the silver sagebrush/western wheatgrass plant association. Three undesirable plants occur in the area: cheatgrass, meadow brome, and yellow alyssum. Pronghorn antelope are common and elk may utilize the area.

Wildlife Draw: This 630-acre area is located about 32 miles west of Newcastle, Wyoming, and lies within the ecoregion classified as the Great Plains-Palouse Dry Steppe Province. The area contains rolling hills with several draw and is vegetated entirely with grasslands and sagebrush shrub-steppe. Vegetation includes needle-and-thread, blue grama, western wheatgrass and threadleaf sedge. Wyoming big sagebrush is widespread. Three draws contain ephemeral streams and support a silver sagebrush/western wheatgrass association. Four exotic plant species are present: cheatgrass, meadow brome, yellow alyssum, and salsify. No federally listed threatened or endangered plant or animal species are known to be present in the area. Further, given the narrow shape and small acreage of the area, it is too small to support populations of pronghorn antelope, elk, and mule deer.

Inventoried Roadless Areas

There are six IRAs on the TBNG that collectively comprise 58,620 acres, or roughly 10% of the land base. Each IRA contains core or general sage-grouse habitat or a combination of the two. Of the six IRAs, five contain 24,190 acres of core sage-grouse habitat and all six contain 34,420 acres of general habitat (Table 3-75).

Table 3-75. Inventoried Roadless Area Acreage by Core and General Sage-grouse Habitat in the Thunder Basin National Grassland

Inventoried Roadless Area	Total Acres	Core Acres	General Acres
Downs	6,510	3,600	2,910
Red Hills	6,840	0	6,840
Cow Creek Buttes	17,500	13,060	4,440
Duck Creek	12,330	4,240	8,090
HA Divide	5,060	1,900	3,160
Miller Hills	10,370	1,390	8,980
Total	**58,610**	**24,190**	**34,420**

Downs: This 6,510-acre IRA area is a mixed-grass prairie blended with sagebrush, cactus, and some greasewood. The landscape has a high degree of patchiness due to the substrate. Many shrubland communities occur in the area. Outstanding among these are patches of the birdsfoot sagebrush community which grows only on specialized clay and shale exposures. Wildlife includes prairie dogs, pronghorn antelope, mule and white-tailed deer, grassland birds, raptors, reptiles, and amphibians. Livestock and hunting are the two most frequent activities; however, public access for hunting opportunities is very limited. Roughly 3,600 acres are identified as core sage-grouse habitat while the remaining 2,910 acres are in general sage-grouse habitat.

Red Hills: This 6,840-acre IRA area is characterized by rolling sage- and grass-covered hills, red scoria escarpments and buttes, dissected by mostly easterly flowing drainages. This area is a mixed-grass prairie, blended with sagebrush, cottonwood, greasewood, ponderosa pine, and Rocky Mountain juniper. Wildlife includes prairie dogs, pronghorn antelope, mule and white-tailed deer, grassland birds, raptors, reptiles, and amphibians. The entire IRA is located within general sage-grouse habitat.

Cow Creek Buttes: This 17,500-acre IRA is a mixed-grass prairie, blended with sagebrush, cottonwood, greasewood, ponderosa pine, and Rocky Mountain juniper. Ponderosa pine is patchy and scattered about the lower slopes of buttes and atop mesas. Wildlife includes prairie dogs, pronghorn antelope, occasional elk, mule and white-tailed deer, grassland birds, an abundance of raptors (such as bald and golden eagles), reptiles, and amphibians. Current recreation includes hiking, viewing scenery and wildlife, dispersed camping, horseback riding, prairie dog shooting, hunting, and off-highway motorized recreation. Roughly 13,060 acres are identified as corc sage-grouse habitat while the remaining 4,440 acres are in general sage-grouse habitat.

Duck Creek: This 12,330-acre IRA is characterized by grassy lowlands, woody draws, rolling hills, rocky shale and limestone escarpments, and mesas. This area is representative of a mixed-grass prairie ecosystem at the lower elevations, rising to pine-covered mesas. Vegetation includes little bluestem grasslands, patches of sagebrush steppe, several kinds of shrublands, including greasewood, ponderosa pine woodlands, and Rocky Mountain juniper. Wildlife includes prairie dogs, pronghorn antelope, mule and white-tailed deer, sage-grouse, grassland birds, raptors, reptiles, and amphibians. Livestock grazing and hunting are the two most frequent activities in the area. Roughly 4,240 acres are identified as core sage-grouse habitat while the remaining 8,090 acres are in general sage-grouse habitat.

HA Divide: This 5,060-acre IRA is characterized by one large mesa with color-banded buttes tapering away from the mesa. The top of the mesa is comprised of ponderosa pine and Rocky Mountain juniper while side slopes are partially barren. In general, HA Divide is a mixed-grass prairie, blended with sagebrush, limited cottonwood, some greasewood, ponderosa pine and Rocky Mountain juniper. Wildlife includes prairie dogs, pronghorn antelope, mule and white-tailed deer, grassland birds, raptors (including the bald eagle and peregrine falcon), reptiles, and amphibians. Roughly 1,900 acres are identified as core sage-grouse habitat while the remaining 3,160 acres are in general sage-grouse habitat.

Miller Hills: This 10,370-acre IRA is a mixed-grass prairie, blended with sagebrush, cottonwood, greasewood, ponderosa pine, and Rocky Mountain juniper. Shrublands are found in the canyons on the north side of the Miller Hills around the base of the elevated plateau. The woodlands provide important habitat for bald eagle winter roosts. Wildlife includes prairie dogs, pronghorn antelope, mule and white-tailed deer, grassland birds, raptors, reptiles, and amphibians. Roughly 1,390 acres are identified as core sage-grouse habitat while the remaining 8,980 acres are in general sage-grouse habitat.

Wilderness Areas and Wilderness Study Areas, and Wild and Scenic Rivers

The TBNG does not contain any Wilderness or Wilderness Study Areas.

Wild and Scenic Rivers

The TBNG does not contain any Wild and Scenic Rivers.

3.14 Special Status Species

3.14.1 Bureau of Land Management

General Planning Area Description

Special status species are those listed as threatened or endangered, are proposed for listing, or are candidates for listing under the provisions of the ESA; those listed by a state implying potential endangerment or extinction, such as Native Species Status (NSS); or those designated by the BLM State Director as sensitive. The BLM defines sensitive species as those that could easily become endangered or extinct in a state unless protection is granted. Designated sensitive species are provided the same level of protection by the BLM as federal candidate species.

The BLM manages the challenges for special status animal and plant species in the planning area according to BLM Manual 6840 – Special Status Species Management (BLM 2001b), including the use of all methods and procedures necessary to improve the status of federally listed species and their habitats to a point where provisions of the Endangered Species Act (ESA) are no longer necessary. BLM Manual 6840 includes these objectives: (1) conserve listed species and the ecosystems on which they depend; and (2) ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list special status species, either under the provisions of the ESA or BLM Manual 6840. Management actions to address the challenges for federally listed plant species often are derived from the consultation process (i.e., Section 7 of the ESA). Lists of special status species are maintained under federal and state authority, including a March 1990 MOU between the WGFD and BLM Wyoming (WGFD and BLM 1990). The purpose of the MOU is to strengthen the cooperative approach to the management of wildlife and wildlife habitat on public land between the two agencies and to encourage them to work together to develop, enhance, maintain, and manage wildlife resources, including planning and sharing data concerning biological resources. BLM Wyoming Sensitive Species Policy and species list is provided in an annually updated memorandum (BLM 2010b, USFWS 2004a). The goals of BLM Wyoming policy regarding special status species follow:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure special status species are considered in land management decisions.
- Prevent a need for species listing under the ESA.
- Prioritize needed conservation work with an emphasis on habitat.

The USFWS provides regulatory oversight for all plant, fish, and wildlife species listed as threatened or endangered, proposed for listing, or are candidates for listing under the ESA. Management of federally listed species and the designation of critical habitats are overseen by the USFWS in accordance with the ESA.

Section 7 of the ESA requires that federal agencies (such as BLM) address impacts on species listed as threatened or endangered under the ESA through consultations with USFWS. Consultations begin informally when a federal agency requests a list of species listed under the ESA. If a listed species exists in the area being assessed, informal consultation will continue and/or BLM may prepare a Biological Assessment (BA). The initial determination of effect is made by the lead agency, in this case BLM (50 CFR Part 420). If, based on a BA or other informal consultation, the BLM determines that the Proposed LUP Amendments are likely to adversely affect any listed species or designated critical habitat or the USFWS does not concur in a BLM determination to the contrary, BLM enters formal consultation with USFWS. USFWS then prepares a Biological Opinion (BO) that determines whether the Proposed LUP Amendments would jeopardize the continued existence of a listed species or adversely modify critical habitat. The process of formal and informal consultation with USFWS ensures that BLM actions do not jeopardize the continued existence of listed species or adversely modify critical habitat.

The Wyoming Natural Diversity Database (WYNDD) maintains a list of Wyoming plant species of concern and plant species of potential concern and provides information on global and state abundance, legal status, and state distribution (Keinath et al. 2003). Species in Wyoming are considered to be of special concern if (1) the species is vulnerable to extinction at the global or state level due to inherent rarity, (2) the species has experienced a significant loss of habitat, or (3) the species is sensitive to human caused mortality or habitat disturbances. The WYNDD tracks, studies, and documents these special status species and other species considered to be rare within the State of Wyoming. The species on this list are watched to determine their abundance and whether they need to be added to the BLM-sensitive species list. By continuing to identify and avoid actions that could result in adverse impacts to these species and their habitats, their populations can be maintained so they will not need to be listed by the BLM as sensitive in the future. The BLM Wyoming State Office conducts an annual review of its sensitive species list to make additions or deletions based on the most current information on species status. Currently, the Wyoming State Government does not list any plant species as sensitive.

Wyoming Federally Listed Species

Table 3-76 shows the federally listed species that either: 1) are listed in Wyoming and occur in the state; 2) are listed in Wyoming but do not occur in the state; or 3) occur in Wyoming but are not listed in the state. Federal candidate species are also included in this list, but some may occur on the BLM special status species list as well.

Table 3-76. Federally Listed Threatened, Endangered, and Candidate Species for the State of Wyoming

Common Name	Scientific Name	Listing Status[1]
Mammals		
Black-footed Ferret[a], entire population, except where EXPN	*(Mustela nigripes)*	E
Canada Lynx[a], (Contiguous U.S. DPS)	*(Lynx canadensis)*	T
Grizzly Bear[a], lower 48 States, except where listed as an experimental population or delisted	*(Ursus arctos horribilis)*	T
North American Wolverine	*(Gulo gulo luscus)*	Proposed T
Preble's meadow jumping mouse[c], U.S.A., north-central CO	*(Zapus hudsonius preblei)*	T
Northern Long-eared Bat	*(Myotis septentrionalis)*	Proposed E
Birds		
Greater Sage-Grouse, entire	*(Centrocercus urophasianus)*	C
Interior Least Tern	*(Sternula antillarum)*	E
Piping Plover	*(Charadrius melodus)*	T
Whooping Crane[a], except where EXPN	*(Grus americana)*	E
Yellow-billed Cuckoo, Western U.S. DPS	*(Coccyzus americanus)*	Proposed T
Amphibian		
Wyoming Toad[a]	*(Bufo baxteri (=hemiophrys))*	E

Common Name	Scientific Name	Listing Status[1]
Fish		
Arctic Grayling, Upper Missouri River DPS	(*Thymallus arcticus*)	C
Bonytail Chub[b], entire	(*Gila elegans*)	E
Colorado Pikeminnow (=squawfish)[b], except Salt and Verde R. drainages, AZ	(*Ptychocheilus lucius*)	E
Humpback Chub[b], entire	(*Gila cypha*)	E
Kendall Warm Springs Dace[a]	(*Rhinichthys osculus thermalis*)	E
Pallid Sturgeon	(*Scaphirhynchus albus*)	E
Razorback Sucker[a], entire	(*Xyrauchen texanus*)	E
Plants		
Blowout Penstemon[a]	(*Penstemon haydenii*)	E
Colorado Butterfly Plant[a]	(*Gaura neomexicana var. coloradensis*)	T
Desert Yellowhead[a]	(*Yermo xanthocephalus*)	T
Fremont County Rockcress	(*Boechera pusilla*)	C
Ute Ladies'-tresses[a]	(*Spiranthes diluvialis*)	T
Western Prairie Fringed Orchid	(*Platanthera praeclara*)	T
Whitebark Pine	(*Pinus albicaulis*)	C

Source: USFWS 2011a
[1]Listing status abbreviations are as follows: E=endangered; T=threatened; C=candidate.
[a] Listed in Wyoming and occur in the state.
[b] Listed in Wyoming but do not occur in the state.
[c] Occur in Wyoming but are not listed in the state.

Descriptions of the federally listed and candidate plant and animal species for the planning area are written below. Some species may not occur within the planning area and are noted as such.

Black-footed Ferret

The black-footed ferret was designated as a USFWS endangered species in March 1967 under a precursor to the ESA of 1973 (*Federal Register* 1967). Black-footed ferrets are closely associated with prairie dog towns and rely almost entirely on these rodents as prey. Ferrets also use prairie dog burrows for denning and shelter. The black-footed ferret recovery plan (2013) requires a maintenance of approximately 247,000 acres (ac) (100,000 hectares (ha)) of prairie dog occupied habitat at reintroduction sites (specific actions are described in Part II of this plan) by planning and implementing actions to manage plague and conserve prairie dog populations (USFWS 2013). In Wyoming, ferrets historically occurred in all nonmountainous areas of the state (Clark and Stromberg 1987).

The black-footed ferret was thought to be extirpated from virtually its entire range by the 1970s due to habitat loss, prairie dog eradication, and disease. A small population was discovered near Meeteetse, Wyoming in 1981. Wild populations are limited to reintroduced populations in South Dakota, Montana, Arizona, Utah, Colorado, Wyoming, and Chihuahua, Mexico (USFWS 2006a).

Following outbreaks of distemper, surviving black-footed ferrets were brought into captivity and a captive breeding program was initiated. After a period of captive breeding, the WGFD and USFWS began to reintroduce ferrets to the Shirley Basin in 1991. Ferrets have continued to persist in Shirley Basin, and wild-born ferrets were documented in 1992 in that reintroduced population.

Two other historical occurrences of black-footed ferrets were in the planning area. One observation was made in 1972 in Lincoln County, and one cranium and one mandible were collected in 1979 from Uinta County (BLM 2005c). From 2002 to 2004, approximately 58 black-footed ferret surveys were conducted for projects in the planning area. Several prairie dog complexes were identified as potentially suitable for black-footed ferret reintroduction (BLM 2005c).

Canada Lynx

The Canada lynx is a federally threatened species. Canada lynx are secretive cats of coniferous or mixed forests of northern latitudes and high mountains. Snowshoe hares are the primary prey of Canada lynx, and snowshoe hare abundance is a limiting factor for Canada lynx. Forested landscapes containing a variety of seral stages provide foraging, denning, and travel or dispersal habitats for Canada lynx. The patchiness and distribution of Canada lynx habitats are factors in the vulnerability of the species. The habitat within good patches and the travel corridors between patches is essential for the Canada lynx (BLM 2005d). Alteration of natural disturbance regimes, various forest management practices, road building, and some recreational activities may affect Canada lynx habitats suitability.

Grizzly Bear

The grizzly bear is federally listed as threatened under the ESA. In Wyoming, grizzly bears may be found in coniferous forests, mountain-foothills shrublands, riparian shrub, and mountain-foothills grassland (Cerovski et al. 2004). Grizzly bears currently occupy Yellowstone and Grand Teton National Parks and portions of adjacent National Forest and private lands extending south in the Wind River Range to the Green River Lakes area and into the Wyoming Range (Bjornlie et al. 2012). The Greater Yellowstone Ecosystem grizzly bear population has experienced a 38.3% increase in distribution from 2004 to 2010 (Bjornlie et al. 2012) A Wyoming Grizzly Bear Management Plan was completed by WGFD in 2002 and amended in 2005 (Moody et al. 2005).

North American Wolverine

The wolverine is proposed for federal listing as a threatened species. They have been found in various habitats but are most commonly associated with boreal forest and tundra areas. This species has been reported near Boulder Lake and Cora (WNDD 2002). The main anthropogenic threat to wolverine populations here is mortality from trapping, shooting, vehicle collisions, predator/nuisance control activities, and other actions. Secondary to such direct mortality may be human-caused reductions in the abundance and diversity of ungulates and large carnivores with which wolverines are associated, and disturbance to wolverine dens by increasing numbers of recreationalists and light industrial activities (e.g., petroleum extraction, road building). Severe drought, which is a relatively frequent occurrence in the Central Rocky Mountains, could impact wolverine populations by reducing snow cover, which in turn makes kits more susceptible to predation and reduces the effectiveness of food caches. Drought, as well as severe winter conditions, may also reduce numbers of ungulates that provide the majority of wolverine food (Beauvais and Johnson 2004).

Preble's Meadow Jumping Mouse

The Preble's meadow jumping mouse is a small rodent with big feet that are adapted to jumping. It is closely related to other subspecies of meadow mice. The diet of these rodents consists of seeds, fruits, fungi, and insects. Hibernation occurs from October through May in small underground burrows that the mouse excavates. Nests are made of grass, leaves, or woody material excavated several centimeters below ground level. The Preble's meadow jumping mouse is primarily nocturnal or crepuscular but is occasionally observed during the day. Its preferred habitat is low undergrowth consisting of grasses, forbs, or a mixture of both in wet meadows and riparian corridors, or where tall shrubs and low trees provide adequate cover. The Preble's meadow jumping mouse exhibits a preference for lush vegetation along streams and herbaceous understories in wooded areas in close proximity to water. Threats to the Preble's meadow jumping mouse are the loss of riparian habitat, fragmentation of habitat, and reduction in preferred forage.

On February 2, 2005, USFWS proposed to remove the Preble's meadow jumping mouse from the list of threatened species protected by the ESA. The delisting proposal was based on recent genetic research indicating genetic similarities between the Preble's meadow jumping mouse and other subspecies of meadow jumping mouse. In search of the best science available, the USFWS commissioned another scientist to perform genetic analysis of a number of subspecies of meadow jumping mice, and the results of that study seemed to indicate that the Preble's meadow jumping mouse is indeed a distinct subspecies of jumping mouse and should continue to be protected by the ESA. Until a final rule is made, the Preble's meadow jumping mouse will continue to be protected and managed as a "threatened" species under the ESA.

Northern Long-Eared Bat

The northern long-eared bat is proposed for listing under the ESA as an endangered species (October 2, 2013; 78 FR 61046). Critical habitat is not proposed at this time. This bat is a medium-sized bat, distinguished from other Myotis species by its characteristically large ears and long, pointed tragus (projection of skin in front of the external ear). Northern long-eared bats are found throughout eastern and central North America and occur in the extreme northeastern portions of Wyoming. Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch in flight using echolocation, or by gleaning (picking) from vegetation. In the summer, male and reproductive female bats roost singly or in colonies in cracks, crevices, cavities, and under the bark of live and dead trees, while other males and non-reproductive females roost in cooler places like caves and mines. Breeding occurs in late summer and fall when bats swarm at entrances of hibernacula; however, females delay fertilization until spring when they emerge from hibernation.

Threats to the northern long-eared bat include white-nose syndrome (WNS), loss and degradation of summer habitat, collisions or barotrauma (injury to the lungs due to a change in air pressure) caused by wind turbines; and mine closures and vandalism of winter roosts and hibernacula (http://www.fws.gov/wyominges/Pages/Species/Species_Listed/NLEBat.html).

Greater Sage-Grouse

In March 2010, the USFWS determined that listing the Greater Sage-Grouse under the ESA was warranted but precluded. Therefore the sage-grouse was designated as a candidate species under the ESA. Greater Sage-Grouse are dependent on sagebrush habitats year-round. The general distribution of Greater Sage-Grouse is associated with the distribution of sagebrush (*Artemisia* spp.), and in particular, big sagebrush (*A. tridentata*) (Schroeder et al. 2004). Greater Sage-Grouse require open areas within the sagebrush community for leks where they perform courtship rituals. These strutting grounds (lek sites) are considered traditional because the birds return to them annually. After nesting, the hens lead their young to brood areas that support forb understory or succulent vegetation (i.e., riparian areas or irrigated fields) and large populations of insects in late spring and late summer. The sage-grouse diet consists almost entirely of sagebrush during late fall and winter. Map 3-18—Sage-grouse Habitat shows the distribution of Greater Sage-Grouse leks and core/priority and general habitat for sage-grouse for the entire planning area.

Table 3-77. Acres of Core/Priority, Connectivity, and General Sage-grouse Habitat within the Planning Area

Core/Priority Habitat	Connectivity Habitat	General Habitat
9,929,450	105,530	17,011,300

In 2012, the Director of the Fish and Wildlife Service asked the Conservation Objectives Team (COT), consisting of state and US Fish and Wildlife Service representatives, to produce recommendations regarding the agree to which the threats need to be reduced or ameliorated to conserve Greater Sage-Grouse so that it would no longer be in danger of extinction or likely to become in danger of extinction in the foreseeable future. The COT Report provides objectives based upon the best scientific and commercial data available at the time of its release.

The highest level objective identified in the COT Report is identified as to meet the objectives of the 2006 Western Association of Fish and Wildlife Agencies' (WAFWA) Greater Sage-Grouse Comprehensive Strategy of "reversing negative population trends and achieving a neutral or positive population trend."

The COT Report provides a Management Zone and Population Risk Assessment. The Report identifies localized threats from sagebrush elimination, fire, conifer encroachment, weed and annual grass invasion, mining, free-roaming equids and urbanization and widespread threats from energy development, infrastructure, grazing and recreation (p 18).

Concerning the Wyoming portion of the Wyoming Basin population, the report states:

> *This large population covers approximately two-thirds of the State of Wyoming... The population is separated from adjacent populations by distance and topography (Garton et al. 2011). Sage-grouse habitats are expansive and relatively intact outside of areas of energy development. Despite the long-term declines in populations, implementation of the Wyoming Governor's Executive Order for sage-grouse may help alleviate these declines. The primary threats to this portion of the population are energy development and transfer, including both renewable and non-renewable resources, long-term drought, and brush eradication programs. Declines of sage-grouse near oil and gas fields in this area have been well documented (Lyon 2000; Holloran 2005; Holloran and Anderson; Kaiser 2006). Residential development has also been identified as a threat. Recent conservation actions, including the Wyoming Governor's Executive Order designating protective stipulations for core areas (PACs) and the implementation of conservation easements within these areas have reduced the threat risk to this area. Designated state core areas (PACs) adequately capture redundancy and representation for the Wyoming portion of this population. Due to the large size of this population, the presence of large, contiguous habitats, and regulatory measures providing habitat protection, this population is considered low risk.*

In order to mitigate the statewide impacts of mineral development on Greater Sage-Grouse, the State of Wyoming created two initiatives composed of government agencies and private citizens. In 2004, the state implemented the Wyoming Local Sage-Grouse Working Group. There are eight working groups throughout Wyoming. The purpose of these groups is to develop and facilitate implementation of local conservation plans for the benefit of sage-grouse, their habitats, and, whenever feasible, other species that use sagebrush habitats. In addition, the Sage-grouse Implementation Team was created in 2007 to develop and initiate statewide plans for the conservation of sage-grouse.

The association with sagebrush is perhaps most evident in the late autumn, winter, and early spring when Greater Sage-Grouse are completely dependent on sagebrush for both food and cover. In winter, Greater Sage-Grouse inhabit areas with large expanses of moderate to dense sagebrush on gentle topography (Doherty et al. 2008). No less important is the reliance of Greater Sage-Grouse on sagebrush for protective nest cover during the breeding season. Greater Sage-Grouse have been shown to nest at a variety of distances from active leks and use many different micro sites for nest placement, making identification and mapping of this habitat difficult (Braun 2002). Upon hatching, Greater Sage-Grouse hens with chicks use areas close to locations of successful nests and gradually move towards moist areas as upland vegetation dries out (Braun 2002). In general, the Greater Sage-Grouse is a mobile species, capable of movements greater than approximately 31 miles (50 kilometers) between seasonal ranges. Despite this mobility, Greater Sage-Grouse appear to display substantial fidelity to seasonal ranges.

Sage-grouse breeding habitats are characterized by sagebrush 40 to 80 cm tall (Connelly et al. 2003). The average height of sagebrush most commonly used by nesting sage-grouse ranges from 11 to 32 inches (28 to 81 cm), and sagebrush canopy cover within sagebrush stands used for nesting generally ranges from 15% to 25% (Connelly et al. 2000). In Wyoming, Holloran (1999) found the mean height of nest shrubs to be 18.2 inches (46.4 cm), which was greater than the mean height of shrubs in the surrounding area. An analysis of sage-grouse nest site selection from seven study areas in Wyoming indicates that residual grass height should be a minimum of 3.9 inches (10 cm) in Wyoming big sagebrush dominated sites (Holloran et al. 2005). Optimum early brood habitat, similar to that of breeding, consists of sagebrush stands that are 11 to 32 inches (30 to 80 cm) tall, with a canopy cover of 10% to 25% and an herbaceous understory of 15% grass canopy and 10% forb canopy (Bohne et al. 2007). The average height of current year's growth should be at least seven inches (18 cm) by early June. Residual grasses from the previous year provide cover for nesting at the time of nest site selection by the hen and should be at least 3.9 inches (10 cm) in height in potential nesting habitat in these two vegetation types (Bohne et al. 2007).

During winter, sage-grouse feed on relatively short sagebrush, at least with respect to its height above snow (Connelly et al. 2003). It is critical that sagebrush be exposed at least ten to 12 inches (25 to 35 cm) above snow level to provide food and cover for wintering sage-grouse (Bohne et al. 2007). During relatively severe winters, a large proportion of sagebrush may be snow covered and unavailable for roosting or foraging. At the onset of winter, sage-grouse typically move to lower elevations with greater exposure of sagebrush above snow and taller sagebrush; in migratory populations, this movement may extend up to 160 km. Shrub density and structure, including height and canopy cover, also influence habitat selection by sage-grouse during winter. Cover of sagebrush in both arid and mesic sites should be maintained at 10% to 30% in wintering habitat and further reported that grouse used shrub heights of 25 to 35 cm above snow. Topography also influences use of winter habitats by sage-grouse. Flocks typically occur on south- or southwest-facing aspects and on gentle slopes (5%). Sheltered microsites ameliorate effects of wind, especially at low temperatures, and contribute to maintaining energy balance (Connelly et al. 2011).

Habitat loss and degradation, as well as loss of population connectivity, have been identified as important factors contributing to the decline of Greater Sage-Grouse populations rangewide (Braun 1998, Wisdom et al. 2002). Therefore, any activities that result in loss or degradation of sagebrush habitats that are important to this species should be closely evaluated for their impacts on sage-grouse. Minimization of disturbance during lek activity, nesting, and brood rearing is critical to sage-grouse persistence within these areas.

In Wyoming, information suggests that Greater Sage-Grouse populations are negatively affected by energy development activities, especially those that degrade important sagebrush habitat, even when mitigation measures are implemented (Braun 1998, Lyon 2000). Greater Sage-Grouse populations can repopulate areas developed for resource extraction after habitat reclamation for the species (Braun 1987). However, there is no evidence that populations attain their previous levels, and reestablishment of sage-grouse in a reclaimed area may take 20 to 30 years, or longer (Braun 1998). Recent information from a doctoral dissertation on the impacts of oil and gas development on Greater Sage-Grouse in the Pinedale Anticline revealed that as development increased, lek activity declined up to 100% (Holloran 2005).

State-wide seasonally explicit habitat selection models were developed by the U. S. Geological Survey to help identify and delineate suitable seasonal habitats. Regional variation in habitat selection behavior was quantified. Extensive radio-telemetry data from 11 sites across Wyoming ($n \approx 3,000$ individuals) were compiled. These telemetry data, in combination with high-quality GIS data, were used to develop seasonal habitat selection models for sage-grouse across Wyoming. Models at patch and landscape extents for three separate life stages: 1) nesting, 2) summer/late brood-rearing, and 3) winter habitat were developed. The state-wide models performed well; however, regional variation in habitat selection behavior was also assessed. Wyoming was divided into three regions and all seasonal models were developed on a regional basis. Variation in model form and the strength of selection for certain habitat components was quantified. Furthermore, the variation in model accuracy and precision between the state-wide and regional models to assess the value added by the regional approach was also quantified.

The first mortality of Greater Sage-Grouse from the mosquito-driven West Nile virus (WNv) was documented in 2002 in the Powder River Basin, Wyoming. Researchers monitoring radio-collared sage-grouse have provided the most insight on prevalence and mortality rates given that mortalities in collared birds are more likely to be found and in a timely manner. Weather conditions play a large role in predicting WNv outbreaks. As temperatures rise, the *Culex tarsalis* mosquito, the primary vector for WNv, is able to produce in larger numbers thereby increasing the potential for disease transmission. The probability of a future catastrophic outbreak of WNv is not predictable. Two distinct episodes of WNv impact have previously occurred in northeast Wyoming in 2002 and 2007.

A second factor contributing to potential for increased risk of disease transmission is associated with mosquito breeding habitat. Breeding habitats can develop from precipitation accumulating in natural or manmade wetlands, ponds and other bodies of standing water. Reservoirs constructed to hold water produced from Coal Bed Natural Gas (CBNG) production can greatly increase the amount of available mosquito breeding habitat. Walker (2008) found lower WNv infection rates outside of CBNG fields. The disease was present each year of the study and coincided with reduced annual female survival rates of up to 27% and reduced estimates of population growth 7-10% per year. Walker suggested that eliminating manmade water sources that provide suitable mosquito breeding habitat could reduce disease occurrence.

Based on Walker's research (Walker 2008), the BLM Buffalo Field Office requires oil and gas operator's to implement pest management plans to control mosquito production within CBNG produced water. This is often accomplished through the application of larvicides. The oil and gas industry also engineers new reservoirs to minimize available mosquito breeding habitat by constructing deep ponds with steep sides to reduce growth of emergent vegetation, which is a key component of suitable breeding habitat.

Northeast Wyoming oil and gas development and production activity has changed significantly since 2009. CBNG development in the Powder River Basin has continuously declined with the peak number of drilling rigs at 19 in 2010 and 11 for a short time in 2011, with as few as zero operating during some months throughout 2009-2012. This is in contrast to the peak number of 55 rigs operating in November of 2007. This decline is expected to continue as most CBNG leases are already drilled and natural gas prices remain low. Many operators have very active CBNG plugging programs which plug, abandon, remove surface facilities and reclaim CBNG locations, essentially removing the well, above-ground infrastructure and associated production activities from the landscape. According to the Wyoming Oil and Gas Conservation Commission, as of August 31, 2013, 355 CBNG wells had been drilled in the Powder River Basin (Adams, personal communication). Eighty-two percent of the wells were drilled on private surface (this includes split estate), 9% on State, 8% on BLM and 1% on U.S. Forest Service. Many wells drilled early in the development of CBNG on the eastern side of the basin have completed the production phase of development and are now being plugged and abandoned. As of August 2013, more than 7,600 wells have been plugged and abandoned or are in the process of being plugged and abandoned, 86% of which are on private surface, 12% on state land, 1% on BLM-administered land, and 1% on Forest Service (Adams, personal communication). A vast majority of CBNG wells have been shut-in, but they are still capable of production. It is unknown whether development levels will return to pre-2009 levels. New plays involving horizontal drilling and completion techniques and oil production are the factors driving where drilling is most active. Best practices, many of which were developed in the Powder River Basin, have been adopted by policy (See WY IM2012-019) and would be considered at the time development is proposed.

The risk of WNv due to increased mosquito habitat from holding ponds may also affect other special status bird species. Any shallow areas of water with emergent vegetation are susceptible to mosquito breeding and possible spread of WNv could occur. As such, water developments [associated with grazing activities] should be kept out of riparian and wetland areas where feasible, to help reduce the impacts to Greater Sage-Grouse from habitat loss, WNv, or reductions in forage in those areas. (Cagney et al. 2010).

Risks to Greater Sage-Grouse from oil, gas, and CBNG development include elevated mortality due to collisions with structures and vehicles, risk of WNv due to increased mosquito habitat from holding ponds, disturbance of birds that may force them into suboptimal habitats with elevated predation rates (resulting in a decline in habitat suitability), and direct habitat loss (Walker et al. 2007). The construction phase of CBNG well development (drilling and completion), which typically takes 1-2 months for a single drill bore (but can extend up to 14 months or more for a multiple drill hole well pad), is a period of high intensity human activity, noise, road and equipment use, and site disturbance. This period is considered one of particularly high impact to Greater sage-grouse, especially if it coincides with seasons when the birds might already be stressed (Walker et al. 2007). However, adverse impacts to sage-grouse may continue to occur beyond the construction phase and throughout normal operations during production (Holloran 2005; Walker et al. 2007; Doherty et al. 2008). Sage-grouse may simply avoid otherwise suitable habitat as the density of roads, power lines, or energy development increases (Lyon and Anderson 2003; Holloran 2005; Kaiser 2006; Doherty et al. 2008). Abandonment of leks may not occur during the first year of drilling and operations, but often is shown to occur within 2-10 years following well development (Walker et al. 2007, Harju et al. 2010, Hess and Beck 2012).

If produced water is stored in evaporation ponds or reservoirs, Greater Sage-Grouse could be vulnerable to the threat of WNv if *Culix tarsalis* mosquitos were allowed to breed in the holding ponds (Walker et al. 2007). The issues surrounding WNv are multi-faceted. Many actions considered necessary for addressing WNv and other potential impacts to statewide populations of sage-grouse are contemplated in the LUP Amendments. The analysis contained in the Population Viability Analysis (PVA) report assumed specific future development scenarios which we are inherently unable to predict. Likewise, the report assumes specific impacts would occur to Greater Sage-Grouse lek attendance when applying the stochastic "catastrophic outbreak" of WNv to the assumed development scenario. The PVA report predicts that if all assumptions remain unchanged, the result of such an outbreak would be a loss of population viability in the Wyoming portion of the basin. While the impacts to sage-grouse populations from WNv can be described in general terms, the potential for, and severity of, any future outbreak cannot be quantified; further, NEPA analysis cannot predict whether a stochastic event, such as a future catastrophic outbreak of WNv (as in the PVA model), would occur. At the time of leasing, without a discrete development proposal, the BLM has no information about whether or how a particular lease may be developed.

Specifically, not all oil and gas developments result in large volumes of produced water that would necessitate intensive planning and oversight with or without WNv occurrences. CBNG produced water evaporation ponds have been linked to outbreaks of WNv in the past, but recent efforts to construct and maintain these impoundments have had success in reducing mosquito breeding grounds and have been coupled with coordinated reclamation and habitat restoration efforts.

The authors of the PVA report concluded that "energy development alone would not result in extirpation of the sage-grouse population if all other environmental factors remained favorable. However, energy development combined with the threat of WNv compromises this small population. Intensive population monitoring combined with large scale habitat reclamation/restoration and reducing the WNv threat (man-made water sources) are recommended." (Quoted from: Northeast Wyoming Sage-Grouse (Draft) Conservation Plan Addendum dated October 20, 2013).

Further, the PVA report indicates that populations in the Powder River Basin remain viable, at the time of publication. The study further maintains that efforts to bolster populations near and within the basin itself through restoration can help to maintain or improve the remaining viability of these local populations. The BLM is operating with increased focus on accelerated reclamation and habitat restoration projects alike. The High Plains District has embarked on a new Healthy Lands focal area called Powder River Restoration and has further supported the development of a Candidate Conservation Agreement (CCA), covering 5 counties of northeastern Wyoming. The agreement is coupled with a Candidate Conservation Agreement with Assurances (CCAA) and a Conservation Agreement (CA). The intended outcome of all these agreements and collaborative conservation values is to further enhance the remaining viability of populations in the basin and throughout northeast Wyoming.

There are several ongoing studies and strategies for limiting the potential for WNv outbreaks in northeast Wyoming because the severe impacts of a widespread outbreak are of great concern to the BLM and its partners. The report reinforces the concept that robust strategies are necessary for healthy Greater Sage-Grouse populations that require large and predominantly unfragmented landscape-scale habitats. The Wyoming BLM continues to work with industry partners, WGFD, private landowners, and USFWS to maintain and manage for the long-term conservation and restoration of Greater Sage-Grouse habitats and populations in the PRB.

As explained below, the BLM has reviewed each of these subsequent publications, and determined that none constitute "significant new information relevant to environmental concerns and bearing on the proposed action or its impacts" such that supplementation is required. See 40 CFR 1502.9(c)(1).

NEPA requires agencies to prepare a supplement to the Draft EIS if 1) the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or 2) if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. A supplement is not necessary if a newly formulated alternative is a minor variation of one of the alternatives and is qualitatively within the spectrum of alternatives analyzed in the Draft EIS.

The Proposed LUP Amendments include components of the alternatives analyzed in the Draft EIS. Taken together, these components present a suite of management decisions that present a minor variation of alternatives identified in the Draft LUP Amendments/Draft EIS and are qualitatively within the spectrum of alternatives analyzed.

As such, the BLM has determined that the Proposed LUP Amendments is a minor variation and that the impacts of the Proposed LUP Amendments would not affect the human environment in a substantial manner or to a significant extent not already considered in the EIS. The impacts disclosed in the Proposed LUP Amendments/Final EIS are similar or identical to those described Draft LUP Amendments/Draft EIS.

Interior Least Tern

The interior least tern is listed as endangered in Nebraska, Colorado, and Montana, and accidental in Wyoming with one historical record in the southeast portion of the state (Orabona et al. 2012, USFWS 2008a). The Great Plains populations of these species are dependent upon the central and lower Platte River for survival and recovery (USGS 2004a). Interior least tern nesting habitat preferences include open, sandy, beach-like areas (USGS 2004a). The suppressed variability in flow on the Platte River has reduced sandbars and beaches, and reduced aquatic habitat for fish prey items (USGS 2004a). While the North Platte River does not provide habitat for this species, habitat along the central Platte River in Nebraska is sensitive to reductions in flows during critical periods as defined by the USFWS, and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado (Platte River Recovery Implementation Program 2011).

Piping Plover

The piping plover is considered threatened in most of the western Great Plains states, and is classified as a rare migrant in Wyoming (Orabona et al. 2012, USFWS 2008b). The Great Plains population of this species is dependent upon the central and lower Platte River for survival and recovery (USGS 2004a). Piping plover nesting habitat preferences include open, sandy, beach-like areas (USGS 2004a). The suppressed variability in flow on the Platte River has reduced sandbars and beaches, and reduced aquatic habitat for invertebrate prey items (USGS 2004a). While the North Platte River does not provide habitat for the species, habitat along the central Platte River in Nebraska is sensitive to reductions in flows during critical periods as defined by the USFWS, and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado (Platte River Recovery Implementation Program 2011).

Western Yellow-Billed Cuckoo

In July 2001, responding to a petition to list the western yellow-billed cuckoo under the ESA, the USFWS determined that such a listing was warranted but precluded by higher-priority listing actions (*Federal Register* 2001). As a result, the western yellow-billed cuckoo was designated as a Federal Candidate species. On October 3, 2013, the USFWS proposed the species for listing as Threatened. It prefers large tracts of deciduous riparian woodlands with dense, scrubby undergrowth. It frequently uses willow thickets for nesting and forages among large cottonwoods (Bennett and Keinath 2001). In Wyoming, the western subspecies of the yellow-billed cuckoo is considered uncommon and is found primarily along waterways in the lower Green River Basin. The predominant impact on the yellow-billed cuckoo is the loss of large blocks of riparian habitat due to fragmentation, overgrazing, exotic plant community changes, river management, and agricultural conversion of native vegetation. The yellow-billed cuckoo west of the Continental Divide is considered a distinct population segment (BLM 2004b).

Wyoming Toad

The Wyoming toad is a federal endangered species whose known natural populations since 1987 have been restricted to a 2-square-mile area around Mortenson Lake, and other locations within the Rawlins Field Office. An ongoing captive breeding program and reintroductions at selected sites within the toad's historical range in the Laramie Basin are enabling population increases by this species (BLM 2004b).

The use of pesticides has long been suspected as a cause for the decline of the Wyoming toad. Malathion is still used on some property adjacent to Mortenson Lake NWR (MLNWR) and other sites within the historical range of the toad. In years when the mosquito population reaches large densities the City of Laramie utilizes Malathion (P. Harrison pers. comm.). The increasing interest in mosquito control resulting from fear of west Nile virus has the potential to increase the use of Malathion by municipalities and ranches within the Laramie Basin and is therefore of concern. Irrigation has modified the habitat of the toad. Increased irrigation has resulted in less flooding in riparian areas and reduced the extent and quality of the floodplain wetlands where the toad formerly resided. However, new wetland habitat has been created by flood irrigation and the construction of reservoirs. The wetlands created by flood irrigation and reservoirs tend to be more saline than the river flood plain habitat.

Confounding the loss of habitat is the issue of water rights. Within the Basin, the demand for water far exceeds the supply. Those areas having senior water rights have first access to water that ultimately flows into MLNWR, and only after the needs of the senior water right holders have been met can junior water right holders receive water. In drought conditions, those holding junior water rights may not receive any water. This was the case in 2001 for HNWR (which obtains its water from Sand Creek and holds only junior water rights). At that time, many of the lakes within the Refuge became completely dry and those that did not dry up became increasingly saline. Though this has not been an issue at MLNWR it should be noted that the refuge receives most of its water from seepage from the Pioneer Canal, an irrigation water supply. Irrigation levels in neighboring meadows determine the amount of available water. In dry years when junior water rights are not met, less irrigation water flows through Pioneer Canal and therefore Mortenson Lake collects less seepage.

Genetic factors have been speculated as a cause contributing to the decline of the Wyoming toad and are definitely having an impact on current recovery efforts, as there is currently a small amount of gene diversity left in Wyoming toads. The longer a population stays at a reduced size, the greater the loss of genetic variation and the risks of stochastic demographic or environmental events. Currently, captive breeding efforts are attempting to maximize genetic diversity in the captive stock. It is not known whether natural predation was a factor in the initial decline of Wyoming toad populations, but due to small population size, predation is currently a serious potential threat to the Wyoming toad at MLNWR. Predation has been observed or documented at all life stages. Of particular importance are those predators that can have potentially large effects on the number of breeding adults (Geraud and Keinath 2004).

Bonytail Chub
The bonytail is listed as endangered in Wyoming under the ESA of 1973. In addition, it is listed as endangered in the State of Colorado and is legally protected by the State of Utah. Historically, the bonytail was abundant in the Colorado River and in its major tributaries such as the Green River and the Yampa River. At present, it is precariously extant in the Colorado River downstream of Lake Powell; it is nearly extinct upstream of Lake Powell. There is no critical habitat designated in Wyoming for endangered Colorado River fish species but critical habitat does occur downstream in close proximity.

The decline of the bonytail chub has been attributed to stream alteration caused by construction of dams, flow depletion from irrigation and other uses, hybridization with other Gila, and the introduction of nonnative fish species. The primary threats to bonytail population are streamflow regulation and habitat modification (including cold-water dam releases, habitat loss, and blockage of migration corridors); competition with and predation by nonnative fish species; hybridization; and pesticides and pollutants (USFWS 2002a).

Colorado Pikeminnow
The Colorado pikeminnow (formerly known as Colorado squawfish) is listed as endangered in Wyoming under the ESA of 1973. In addition, the Colorado pikeminnow is listed as threatened by the State of Colorado and is legally protected by the State of Utah. Historically, the Colorado pikeminnow was abundant in the Colorado River and most of its major tributaries such as the Yampa River and the Green River. The last documented pikeminnow in Wyoming was in the Little Snake River in 1990. There is no critical habitat designated in Wyoming for endangered Colorado River fish species but critical habitat does occur downstream in close proximity.

Humpback Chub
The humpback chub is listed as endangered in Wyoming under the ESA of 1973. In addition, it is listed as endangered by the State of Colorado and is legally protected by the State of Utah. Historically, it was abundant in the canyons of the Colorado River and in the canyons of four tributaries: the Green River, the Yampa River, the White River, and the Little Colorado River. Presently, two stable populations of humpback chub are known to exist, both near the Colorado-Utah border: Westwater Canyon (Utah) and Black Rocks (Colorado). The largest known population exists in the Little Colorado River in the Grand Canyon. Smaller populations of humpback chubs can be found in the main stem of the Colorado River (Arizona) and in sections of its tributaries such as the Green River (Utah and Colorado) and the Yampa River near Dinosaur National Monument. There is no critical habitat designated in Wyoming for endangered Colorado River fish species but critical habitat does occur downstream in close proximity.

Kendall Warm Springs Dace

The USFWS listed the Kendall Warm Springs dace as endangered in 1970. The species is also listed as a Species of Special Concern by the WGFD. The species is not known to exist on BLM-administered lands in the planning area. Kendall Warm Springs dace is endemic to about 300 meters of Kendall Warm Springs, a small tributary to the Green River in the Bridger-Teton National Forest near the town of Pinedale. It is the only known species in Kendall Warm Springs.

Human activities have influenced the Kendall Warm Springs for years. Cattle grazing and trampling have affected the integrity of the stream channel and plant life in and around the spring flowage. A road was built across the lower end of the creek prior to 1934 and is still the main transportation route for access into the upper Green River and the northern end of the Bridger Wilderness. Presently, 25 feet of stream was replaced by culverts. The culverts may prevent upstream movement of dace, isolating the upper half of the population. Historically the springs were used for bathing and clothes washing. An invertebrate study in 1978 reported that the use of soaps and detergents had depressed the aquatic community until such use was prohibited by the Forest Service in 1975. Fisherman used the Kendall Dace as fish bait for many years until the WGFD prohibited issuance of permits to seine or trap dace in the early 1960s. Additional protection from this use has been provided since 1970 when the dace was designated as an endangered species (USFWS 1982).

Pallid Sturgeon

The pallid sturgeon is listed as an endangered species which is found in the Platte River near its confluence with the Missouri River. Primarily, this species is found from the headwaters of the Missouri River downstream to the Mississippi River near New Orleans, Louisiana. The lower Platte River provides a braided channel of warm, sediment-rich waters with shifting sandbars and islands and a sandy substrate which reflects the original, unaltered habitat of pallid sturgeons (NRCNA 2004). While the North Platte River does not provide habitat for the sturgeon, their habitat in the lower Platte River in Nebraska is sensitive to reductions in flows during critical periods as defined by the USFWS, and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado (Platte River Recovery Implementation Program 2011).

Razorback Sucker

Historically, the razorback sucker was well distributed in the Colorado River and in many of its major tributaries. Presently, it is listed as endangered in Wyoming under the ESA of 1973. In addition, the razorback sucker is listed as endangered in the State of Colorado, and it is legally protected by the State of Utah. There is no critical habitat designated in Wyoming for endangered Colorado River fish species but critical habitat does occur downstream in close proximity.

Streamflow regulation and associated habitat modification are identified as primary threats to the razorback sucker. Regulation of streamflows in the Colorado River Basin is manifested as reservoir inundation of riverine habitats and changes in flow patterns, sediment loads, and water temperatures. Razorback sucker were once abundant throughout most of the Colorado River Basin, but the species now inhabits only about 24% of its original range. A major cause of decline has been loss of a contiguous complement of habitats used by the various life history phases. Ten barriers are identified in the upper basin upstream of Glen Canyon Dam within occupied habitat of razorback sucker. Five of these barriers are classified as medium or high-head structures that are partial or seasonal barriers to fish movement or that have been modified to allow passage. Maintenance of streamflow is important to the ecological integrity of large western rivers. Live histories of many aquatic species, especially fish, are often specifically tied to flow magnitude, frequency, and timing, such that disruption of historical flows can jeopardize native species. Enhancing natural temporal and spatial habitat complexity through flow and temperature management is the basis for benefitting the endangered fishes. Flow recommendations have been developed for some river systems in the Upper Colorado River Basin that identify and describe flows with the necessary magnitude, frequency, duration, and timing to benefit the endangered fish species. These flows were designed to enhance habitat complexity (e.g., suitable spawning areas, inundation of floodplain areas) and to restore and maintain ecological processes that maintain in-channel habitat complexity, and prevent vegetation encroachment and channel narrowing (USFWS 2002).

Plants

Blowout Penstemon

The blowout penstemon is ranked as critically imperiled at the global and state levels and endangered at the federal level based on its restricted distribution to open, early-successional habitat and regional endemic range in the Nebraska Sandhills Prairie and the Great Divide Basin in Wyoming. Approximately ten small populations are known within the entire distribution of this species. Critical habitat for the blowout penstemon is not designated within the planning area but the species is known to occur on BLM managed lands between Pathfinder Reservoir and Seminoe Reservoir.

The blowout penstemon is a perennial herb adapted to blowout dunes habitats caused and maintained by wind erosion. A very low number (1 to 5) of occurrences are documented for this species and it is rare (less than 5,000 individuals or less than 400 occupied acres) in abundance. Remaining populations of blowout penstemon are thought not to be stable; however, annual census data for this species in Wyoming have been available only since 2000. Fire suppression and dune stabilization are thought to have reduced suitable habitat for this species and isolated remaining populations. Threats to the blowout penstemon include habitat loss, stabilization of sand-dune habitat, natural plant succession, and collection by humans (Fertig 2001a; USFWS 1987). Two management requirements are identified for the blowout penstemon: 1) Reducing competition from other vegetation where the species is established; and 2) creating favorable conditions for colonization of new sites. Fire and livestock grazing may benefit the blowout penstemon or create favorable habitat conditions by controlling competing vegetation.

Colorado Butterfly Plant

The Colorado butterfly plant is ranked rare at the global level, imperiled at the state level, and threatened at the federal level based on the small number of sites globally, limited number of protected sites, and inherent population fluctuations. Habitat for the Colorado butterfly plant includes subirrigated, alluvial soils in floodplains and drainage bottoms at elevations of 5,000 to 6,400 feet. The Colorado butterfly plant is an early successional species adapted to periodically disturbed stream channels. In the absence of periodic disturbance from flooding (historically, fire and grazing disturbance may also have been important), establishment of dense vegetation may prevent new seedlings from establishing. A low number (6 to 20) of occurrences are documented for this species and it is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance. Trend data for six populations showed increases for the period 1984 to 1986, whereas seven other populations showed decreases for the same period. The Colorado butterfly plant within the protected F.E. Warren Air Force Base near Cheyenne, Wyoming shows a 16-year increasing trend; however, one subpopulation on the Air Force Base, located in a densely vegetated stream section, has declined (Fertig 2000a; Heidel 2005). Identified threats to the Colorado butterfly plant include herbicide spraying, livestock grazing, haying and mowing, water development, conversion of rangeland to cultivation, competition from exotic plants, and loss of habitat to urban expansion (Fertig 2000b). Changes in habitat suitability due to natural succession and the lack of periodic habitat; disturbance may threaten this species, even in protected areas (Fertig 2000c; USFWS 2000a).

Desert Yellowhead

This species only occurs in Fremont County within the BLM Lander Field Office. It will not be considered within the planning area under this RMP amendment.

Fremont County Rockcress

Fremont County rockcress (*Boechera pusilla*) is a candidate for listing under the ESA (76 FR 33924; June 9, 2011). This perennial herb has several long, slender stems that grow along the ground. Its small, light lavender, four-petaled flowers blossom from May to mid-June. Fremont County rockcress is endemic to sparsely vegetated, coarse, granitic soil pockets in exposed granite-pegmatite outcrops, with slopes generally less than 10 degrees. The only known population of Fremont County rockcress is located at 8,000–8,100 feet in elevation on lands administered by the BLM in the southern foothills of the Wind River Range. The primary threats to this species have not yet been fully identified. However, threats appear to be acting on the species as evidenced by a recent decline in population size. Threats to the species may be related to drought, disease, or other factors.

Ute Ladies'-Tresses

The threatened Ute ladies'-tresses grows on moist sub-irrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams at elevations between 1,780 and 6,800 feet. Populations have been documented from alkaline sedge meadows, riverine floodplains, flooded alkaline meadows adjacent to ponderosa pine-Douglas-fir woodlands, sagebrush steppe, and streamside floodplains. The Ute ladies'-tresses is well adapted to disturbances from stream movement and is tolerant of other disturbances, such as light grazing, that are common to grassland riparian habitats and reduce competition between the orchid and other plants (USFWS 1995). It is a perennial terrestrial orchid known to occur in western Nebraska, central and southeastern Wyoming, north-central Colorado, northeastern and southern Utah, east-central Idaho, southwestern Montana, and north-central Washington (BLM 2004b). In Wyoming, the plant is currently known from four counties and nine occurrences that represent three watersheds and geographic centers of distribution in eastern Wyoming, including a portion of the Antelope Creek watershed (Converse County), a portion of the Niobrara River watershed (Niobrara County), and a portion of the Horse Creek watershed (Goshen and Laramie Counties) (Heidel 2007).

Western Prairie Fringed Orchid

Western prairie fringed orchid occurs on wet-mesic subirrigated prairies and sedge meadows along the floodplain of the Platte River. Alterations to the peak flows of the Platte River have facilitated the conversion of most low-lying areas near the river from grassland to intensive agriculture (Northern Prairie Wildlife Research Center [NPWRC] 2006). Thus, little habitat remains that is suitable for the fringed orchid along the Platte River. While the North Platte River does not provide habitat for this species, their habitat in the lower Platte River in Nebraska is sensitive to reductions in flows during critical periods as defined by the USFWS and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado (Platte River Recovery Implementation Program 2011).

Whitebark Pine

Whitebark pine occurs in the Absaroka, Teton, and Wind River ranges. The best whitebark pine habitat in Wyoming occurs on the relatively dry Wind River Range, where whitebark pine is at the edge of its distribution. Whitebark pine was a major component of subalpine forests in the northern Rocky Mountains, the northern Cascades, the Blue Mountains, and the Sierra Nevada (Fryer 2002). Major threats are white pine blister rust, the mountain pine beetle, and succession as a result of fire suppression (NatureServe 2011).

BLM Special Status Species

Table 3-78 displays the BLM 2010 list of the special status species for the state of Wyoming. Several federal candidate species are also listed as BLM special status species, but are discussed as federally listed species for the purposes of organization.

Table 3-78. BLM Wyoming Special Status Species by Field Office

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Mammals (11)								
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Short-grass prairie.	X		X	X		
Fringed Myotis	*Myotis thysanodes*	Elevations less than 7,500 feet in forests and shrublands.	X	X	X	X		
Grey Wolf	*Canis lupus*	Habitat generalists—prairie, forest, shrublands.		X				X
Idaho Pocket Gopher	*Thomomys idahoensis*	Shallow, stony soils.		X			X	X
Long-eared Myotis	*Myotis evotis*	Coniferous forests; roosts in caves, buildings, or mines near a body of water.	X	X	X	X	X	X
Northern Long-eared Bat	*Myotis septentrionalis*	Coniferous forests; roosts in caves, buildings, or mines near a body of water.				X		
Preble's Meadow Jumping Mouse (Federal listed)	*Zapus hudsonius preblei*	Heavily vegetated, shrub-dominated riparian (streamside) zones.	X		X			
Pygmy Rabbit	*Brachylagus idahoensis*	Sagebrush in deep loose soils.	X	X			X	X
Spotted Bat	*Euderma maculatum*	Desert and coniferous habitats.		X	X			
Swift Fox	*Vulpes velox*	Grasslands and sagebrush/ grass in the eastern portion of the planning area.	X	X	X	X		
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves and mines.	X	X	X	X		
White-tailed Prairie Dog	*Cynomys leucurus*	Shrub-steppe and saltbush communities.	X	X	X		X	X
Wyoming Pocket Gopher	*Thomomys clusius*	Dry ridgetops; gravelly, loose soil; greasewood.	X	X				
Birds (17)								
Baird's Sparrow	*Ammodramus bairdii*	Grasslands, weedy fields.	X		X	X		

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Bald Eagle	*Haliaeetus leucocephalus*	Along major rivers, except during late winter when found in the Eden Valley.	X	X	X	X	X	X
Brewer's Sparrow	*Spizella breweri*	Sagebrush shrub, mountain-foothill shrub.	X	X	X	X	X	X
Burrowing Owl	*Athene cunicularia*	Grasslands, basin-prairie shrub, often with prairie dogs.	X	X	X	X	X	X
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	Grasslands and shrublands.	X					
Ferruginous Hawk	*Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops.	X	X	X	X	X	X
Greater Sage-Grouse (Federal Candidate)	*Centrocercus urophasianus*	Basin-prairie shrub, mountain-foothill shrub with sagebrush.	X	X	X	X	X	X
Loggerhead Shrike	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub.	X	X	X	X	X	X
Long-billed Curlew	*Numenius americanus*	Grasslands, plains, foothills, wet meadows.	X	X	X	X	X	X
Mountain Plover	*Charadrius montanus*	Areas of low vegetation, short-grass and mixed-grass prairie, openings in shrub ecosystems, prairie dog towns.	X	X	X	X	X	X
Northern Goshawk	*Accipiter gentilis*	Old-growth timber and cottonwood stands during the migration.	X	X	X	X	X	X
Peregrine Falcon	*Falco peregrinus*	Tall cliffs.	X	X	X		X	X
Sage Sparrow	*Amphispiza belli*	Sagebrush shrub, mountain-foothill shrub.	X	X	X	X	X	X
Sage Thrasher	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub.	X	X	X	X	X	X
Trumpeter Swan	*Cygnus buccinator*	Lakes, ponds, and marshes.	X	X	X	X	X	X
White-faced Ibis	*Plegadis chihi*	Marshes, wet meadows.	X	X	X	X	X	X

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Yellow-billed Cuckoo (western population) (Federal Candidate)	*Coccyzus americanus*	Closed-canopy, deciduous, riparian forests with a dense understory.	X	X	X	X	X	X
Fish (9)								
Bluehead Sucker	*Catostomus discobolus*	Colorado River drainage; large rivers, streams, and lakes.	X	X			X	X
Bonneville Cutthroat Trout	*Oncorhynchus clarkii utah*	Bear River drainage, clear mountain streams.					X	
Colorado River Cutthroat Trout	*Oncorhynchus clarkii pleuriticus*	Green River, Black's Fork and Little Snake River enclaves. Cool, clear water and well-vegetated stream banks for cover and bank stability (NatureServe 2009).	X	X			X	X
Fine-spotted Snake River Cutthroat Trout	*Oncorhynchus clarkii spp.*	Snake River drainage, clear, fast water.					X	X
Flannelmouth Sucker	*Catostomus latipinnis*	Colorado River drainage, large rivers, streams and lakes.	X	X			X	X
Hornyhead Chub	*Nocomis biguttatus*	Lower Laramie and North Laramie River Watersheds in small to medium sized, moderate to low gradient, clear gravelly streams, preferring pools and slow to moderate runs and is often associated with aquatic plants. Requires gravel areas free of silt for spawning.	X	X			X	X
Northern Leatherside Chub	*Lepidomeda copei*	Bear, Snake and Green River drainages, clear, cool streams and pools.		X			X	X
Roundtail Chub	*Gila robusta*	Colorado River drainage, mostly large rivers, also streams and lakes.	X	X			X	X
Yellowstone Cutthroat Trout	*Oncorhynchus clarkii bouvieri*	Yellowstone drainage, small mountain streams and large rivers.						X

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Reptile (1)								
Midget Faded Rattlesnake	*Crotalus viridis concolor*	Mountain foothills shrub, rock outcrop.		X				
Amphibians (4)								
Boreal Toad (Northern Rocky Mountain population)	*Bufo boreas boreas*	Wet habitats in foothills, montane, and subalpine areas.	X	X			X	X
Columbia Spotted Frog,	*Rana luteiventris*	Variety of vegetation communities, including subalpine forest grasslands and sagebrush habitats, at elevations from 1,700 to 6,400 feet (WGFD 2005f). Spotted Frog requires both aquatic and terrestrial habitats.		X			X	X
Great Basin Spadefoot	*Spea intermontana*	Springs; seeps; permanent and, temporary waters during the breeding season and loose sandy soils in arid habitats the rest of the year (WYNDD 2005).	X	X			X	
Northern Leopard Frog	*Rana pipiens*	Small fishless ponds for reproduction and upland habitats for summertime foraging.	X	X	X	X	X	X
Plants (33)								
Beaver Rim Phlox	*Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000 to 7,400 feet.		X			X	X
Cedar Mountain Easter Daisy	*Townsendia microcephala*	Rocky slopes of Bishop Conglomerate 8,500 feet.		X				
Cedar Rim Thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, and fine textured, sandy-shaley draws 6,700 to 7,200 feet.	X	X				X

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Dorn's Twinpod	*Physaria dornii*	Dry, calcareous-shaley soils on slopes and ridges w/mountain mahogany and rabbitbrush 6,500 to 7,200 feet.					X	
Dune Wildrye	*Elymus simplex var. luxurians*	Drifting sand dunes at 7,130 feet.		X				
Entire-Leaved Peppergrass	*Lepidium integrifolium var. integrifolium*	Wyoming populations occur in sparsely vegetated and seasonally wet clay flats, greasewood communities on clay hummocks, and moist alkaline meadows at 6,200 to 6,770 feet.					X	
Gibbens' Beardtongue	*Penstemon gibbensii*	Sparsely vegetated shale or sandy-clay slopes 5,500-7,700 feet.	X					
Green River Greenthread	*Thelesperma caespitosum*	White shale slopes and ridges of Green River Formation 6,300 feet.		X				
Laramie Columbine	*Aquilegia laramiensis*	Crevices of granite boulders and cliffs 6,400 to 8,000 feet.	X		X			
Laramie False Sagebrush	*Sphaeromeria simplex*	Cushion plant communities on rocky limestone ridges and gentle slopes 7,500 to 8,600 feet.	X		X			
Large-fruited Bladderpod	*Lesquerella macrocarpa*	Gypsum-clay hills and benches, clay flats, and barren hills 7,200 to 7,700 feet.		X			X	X
Limber Pine	*Pinus flexilis*	Timberline and at lower elevation with sagebrush. Associated species are Rocky Mountain lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper	X	X	X		X	X

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Many-stemmed Spider-flower	*Cleome multicaulis*	Semi-moist, open saline banks of shallow ponds and lakes with Baltic rush and bulrush 5,900 feet.			X			
Meadow Pussytoes	*Antennaria arcuata*	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950 to 7,900 feet.		X				X
Meadow Milkvetch	*Astragalus diversifolius*	Sagebrush valleys and closed-basin drainages in moist alkaline meadows at 6,500 to 6,620 feet.	X	?				
Ownbey's Thistle	*Cirsium ownbeyi*	Sparsely vegetated shaley slopes in sage and juniper communities 6,440 to 8,400 feet.		X				
Persistent Sepal Yellowcress	*Rorippa calycina*	Riverbanks and shorelines, usually on sandy soils near high-water line	X					
Porter's Sagebrush	*Artemisia porteri*	Sparsely vegetated badlands of ashy or tufaceous mudstone and clay slopes 5,300 to 6,500 feet.			X			
Precocious Milkvetch	*Astragalus proimanthus*	Cushion plant communities on rocky, clay soils mixed with shale on summits and slopes of white shale hills 6,800 to 7,200 feet.		X				
Prostrate Bladderpod	*Lesquerella prostrata*	Cushion plant or sparse sage grassland communities on slopes and rims of whitish to reddish or gray limey clays and soft sandstones with a surface layer of fine gravel at elevations of 7,200 to 7,700 feet.					X	
Sidesaddle Bladderpod	*Lesquerella arenosa var. argillosa*	Dry, open rock outcrops of gravel, shale, or limestone and barren, often seleniferous, roadsides 4,200 to 4,300 feet.				X		

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Slender Moonwort	*Botrychium lineare*	Montane forests or meadow habitats -deep grass and forbs of meadows, under trees				X		
Small Rock Cress	*Boechera (Arabis) pusilla*	Cracks/crevices in sparsely vegetated granite/pegmatite outcrops in sage/grasslands 8,000 to 8,100 feet.		X				
Stemless Beardtongue	*Penstemon acaulis*	Cushion plant or black sage grassland communities on semi-barren rocky ridges, knolls, and slopes at 5,900 to 8,200 feet.		X				
Trelease's Milkvetch	*Astragalus racemosus var. treleasei*	Sparsely vegetated sagebrush communities on shale or limestone outcrops and barren clay slopes at 6500 to 8200 feet.		X			X	X
Tufted Twinpod	*Physaria condensata*	Sparsely vegetated shale slopes and ridges 6,500 to 7,000 feet.		X			X	X
Uinta Greenthread	*Thelesperma pubescens*	Sparsely vegetated benches and ridges on coarse, cobbly soils of Bishop Conglomerate 8,200 to 8,900 feet.		X			X	
Whitebark Pine	*Pinus albicaulis*	Montane forests and on thin, rocky, cold soils at or near timberline at 8,000 to 10,500 feet.					X	X
Williams' Wafer-Parsnip	*Cymopterus williamsii*	Open ridgetops and upper slopes with exposed limestone outcrops or rockslides 6,000 to 8,300 feet.			X			
Winward's Narrow Leaf Goldenweed	*Ericameria discoidea var. winwardii or Ericameria winwardii*	Barren clay shale slopes and silty clay out-wash from outcrops at 7,000 to 7,100 feet.					X	

Species Common Name	Scientific Name	Habitat	Field Office Occurrence					
			Rawlins	Rock Springs	Casper	Newcastle	Kemmerer	Pinedale
Wyoming Tansymustard	*Descurainia torulosa*	Sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone 8,300 to 10,000 feet.		X				
TOTALS		**All species: 73**	**41**	**51**	**30**	**24**	**42**	**38**

Source: BLM Wyoming Sensitive Species Policy and List, March 31, 2010

Descriptions of BLM special status species for the planning area are written below. Please see the federally listed species descriptions for candidate species.

Special Status Mammals

Black-tailed Prairie Dog

Black-tailed prairie dogs inhabit dry upland prairies and are located in the northeast corner of the planning area. These animals are diurnal and live in towns. Within towns, small groups of black-tailed prairie dogs will display territorial behavior toward adjacent groups. They feed mostly on forbs and grasses but may eat grasshoppers and other insects. They live in burrows with mounds that are usually one to two feet high and 25 to 75 feet apart from each other. Black-tailed prairie dogs may be dormant for short periods of time in cold weather but are not true hibernators. They do compete with livestock for food; however, the amount is negligible. Although once numerous on the prairies, they are less abundant today due to sylvatic plague (e.g., disease) and poisoning. The black-tailed prairie dog has a yellowish body, but the tip of the tail is black (Burt et al. 1980; BLM 2004b). Many special status wildlife species are found in prairie dog towns, including the black-footed ferret, burrowing owl, mountain plover, and swift fox.

Fringed Myotis

Fringed myotis roost in caves, mine tunnels, rock crevices, and old buildings in colonies that may number several hundred. This is a highly migratory bat that arrives in Trans-Pecos Texas by May, at which time it forms nursery colonies. These colonies begin to disperse in October, and the winter locales and habits of this bat remain a mystery. This species appears late in the evening to forage for insects, commonly beetles (NatureServe 2011). They fly slowly and are highly maneuverable, allowing the bats to forage close to the vegetative canopy or about the face of small cliffs. The single young is born in late June or early July after a gestation period of 50-60 days. Immature individuals have been found in July and August in colonies of adult females. The young are able to fly at 16-17 days of age. As with other species of *Myotis*, adult males and females do not associate with each other in summer (NatureServe 2011).

Primary threats to fringed myotis are roost disturbance, habitat alteration, and toxic chemicals. Roost disturbance (especially of maternity roosts and hibernacula) can take the form of direct human contact or alternation of the roost environment. Habitat alteration refers to modification of any component of the required habitat mosaic (i.e., open water, conifer forest, and roost structures) or modification of how those components relate to each other spatially. Chemicals refer primarily to pesticides and toxic impoundments from industry and resource extraction, which can cause direct bat mortality and reduce populations of insect prey (Keinath 2003).

Gray Wolf

Gray wolves are habitat generalists and may inhabit a wide variety of habitat types. The main habitat requirements for gray wolves include the presence of abundant prey (i.e., elk) and relatively low levels of human activity (BLM 2004h). Dispersing gray wolves are capable of traveling very long distances. Human activities associated with roads and other linear corridors cause fragmentation of gray wolf habitats. The major causes of mortality among gray wolves are legal and illegal harvest, depredation control, disease, and vehicle collisions (BLM 2004h). At least 277 wolves in ≥43 packs (including >21 breeding pairs) inhabited Wyoming on December 31, 2012. Of the total, there were ≥83 wolves and ≥10 packs (including ≥6 breeding pairs) inside Yellowstone National Park (YNP), ≥8 wolves and ≥2 packs (≥O breeding pairs) in the Wind River Reservation (WRR), and ≥186 wolves and ≥31 packs (including ≥15 breeding pairs) in Wyoming outside YNP and WRR (WGFD et al. 2013).

Idaho Pocket Gopher

The Idaho pocket gopher occurs in shallow, stony soils in sagebrush, sagebrush grassland, and mountain meadows (Cerovski et al. 2004) and feeds on roots and plant parts of forbs, grasses, and herbs. The strongly fossorial Idaho pocket gopher is endemic to southwestern Wyoming and southeastern Idaho, extending slightly into southwestern Montana and northern Utah. It has been documented in Uinta, Lincoln and Sublette counties (Beauvais and Dark- Smiley 2005).

Threats to the Idaho pocket gopher are soil disturbance and compaction due to increased petroleum exploration and extraction. In this context, increased road densities and abundances that accompany petroleum development may be more of a threat than the construction of well-pads and pipelines. Runoff from melting snow and high groundwater tables can force temporary redistribution of pocket gophers. Harsh winters and late spring/early fall freezes can also affect pocket gopher populations, probably mostly by increasing juvenile mortality. Weather and its influence on food and cover are a dominant factor in determining annual populations of pocket gophers (Beauvais and Dark-Smiley 2005).

Long-eared Myotis

The long-eared myotis utilizes coniferous forests, especially ponderosa pine and juniper, cottonwood-riparian, basin-prairie shrublands, and sagebrush-grassland habitat types (Cerovski et al. 2004). Roost sites for long-eared myotis include snags, loose bark, rock crevices, caves, and mines. Long-eared myotis are thought to hibernate in caves and mines. Like many bat species, the long-eared myotis is sensitive to human disturbance during hibernation (Cerovski et al. 2004). The long-eared myotis is thought to occur in suitable habitats throughout Wyoming, although the majority of records are from the western half of the state.

Preble's Meadow Jumping Mouse

See species description under federally listed species.

Pygmy Rabbit

Pygmy rabbits depend on stands of medium-to-tall, dense sagebrush in conjunction with deep, friable soils to provide yearlong food, cover, and burrow sites (Keinath and McGee 2004). These habitats are often found in swales and drainages in a patchy distribution across the landscape. The pygmy rabbit is the only rabbit native to North America that digs its own burrows. It also is uniquely dependent on sagebrush, which makes up most its diet; however, other vegetation is also consumed. Dense sagebrush and relatively deep, loose soils are important characteristics of pygmy rabbit habitat (Green and Flinders 1980). Breeding occurs during the spring and early summer; females may produce a litter of about six young.

In Wyoming, pygmy rabbits occur in the southwestern portion of the state. Recent surveys documented their range extending further east and northeast then previously known (Purcell 2006). Pygmy rabbits in the Cumberland Gap area of the planning were found in tall, dense homogenous stands of basin big sage and mountain big sage; pygmy rabbits in the Moxa Arch area were located in desert mixed-shrub communities and burrows scattered along hillsides of sand (Purcell 2006). In May 2005, a petition to list the pygmy rabbit as threatened or endangered was found not to be warranted at this time. The USFWS concluded that the petition does not contain substantial scientific information to move ahead with a more detailed study of the species.

The primary anthropogenic impacts on pygmy rabbits (and indeed the primary threats in general) are land use practices which change the quality and continuity of sagebrush habitat. These habitat changes are primarily caused by conversion of shrub-steppe to other uses (e.g., cropland, urban and rural development, and petroleum development), sagebrush removal for cattle grazing, and change in the fire regime. Conversion to other uses permanently prevents pygmy rabbits from inhabiting the impacted areas and contributes to fragmentation of available habitat. It is the primary cause of the near extinction of the Columbia Basin population. Habitat changes in corridor areas which provide connectivity between populations can also be a threat to the persistence of pygmy rabbit populations. The expansion of non-native vegetation, such as cheatgrass (*Bromus tectorum*) and knapweed (*Centauria spp.*), in sagebrush-grassland habitats following disturbance events may decrease the availability of sagebrush habitat for pygmy rabbit populations. Such invasive annuals provide fine fuels than can alter fire frequency, ultimately facilitating reduction of the remaining shrub component and pygmy rabbits have been shown to avoid dense stands of cheatgrass (Keinath and McGee 2004).

Spotted Bat

Spotted bats are found in open ponderosa pine, pinyon-juniper woodland, canyon bottoms, riparian corridors, open pasture and hayfields. In Wyoming, they have been associated with canyons, cliffs, and nearby permanent water (NatureServe 2011). Little is known of the behavior of the spotted bat except that it appears to be most active well after dark. Most individuals caught in mist nets set over water, where bats come to drink, have been captured after midnight. Easterla (1973) speculated that its swoop over a water hole is made at relatively high speeds because several of the bats he has captured have been injured when they struck the nets. While in flight the bat emits a series of strident "tics" similar to, but higher pitched than, those of the Mexican big-eared bat (*Idionycteris phyllotis*). Several authors have commented on the docile disposition of captive spotted bats, but occasional individuals are ill-tempered. Available data indicate that moths are highly important in their diet. In fact, these bats may feed almost exclusively on moths.

Impoundment of reservoirs and recreational rock climbing may impact the species in local situations. Large-scale pesticide programs may impact spotted bats by reducing availability of prey. Habitat on public lands is under considerable pressure due to exploration and development of mineral and fossil fuel resources including coal bed methane, oil, natural gas, and coal. Seismic surveys regularly occur over vast areas and may impact spotted bats if they take place near roosts. Power plants with the associated power lines and roads, and wind energy developments, invade remote sections of public lands and may bring human-disturbance impacts to roosting habitat. Blasting for roads, pipelines, etc. associated with energy development may impact roosting bats; however, the level of disturbance has not been quantified.

Timber harvest in riparian areas may impact all bat species. The rarity of spotted bats makes it a sought-after museum specimen, and collection may impact local populations (O'Farrell 1981; Fenton et al.1987). O'Farrell (1981) considered the level of impact from scientific collecting to be significant. Several researchers (Easterla 1973, Poche and Bailie 1974, Poche 1975, 1981) documented lack of mark/recapture returns for spotted bats, suggested that the species is sensitive to minimal human disturbance, and may abandon an area due to human activities, including scientific research. Spotted bats characteristically occur at a low population density and in disjunct subpopulations, factors that increase vulnerability. The species is a generalist in terms of foraging habitat, but specializes in prey selection (Luce et al. 2004).

Swift Fox
This species occurs in short- and mid-grass prairies, agricultural areas, and irrigated and native meadows within the planning area. Although not an obligate, the swift fox often is found in association with prairie dog towns. The swift fox uses underground dens year-round. The species feeds on small birds, rabbits, and mice in the winter and, typically, ground squirrels in the spring. In addition to small mammals, the swift fox supplements its diet with insects during summer and fall. This species was petitioned for listing under the ESA, but its protection under that statute was found not warranted. The swift fox population in Wyoming currently appears to be relatively stable.

The swift fox is extremely vulnerable to human activities such as trapping, hunting, automobiles, agricultural conversion of habitat, and prey reduction from rodent control programs. Although hunting and trapping used to be a serious problem for swift fox throughout their range, this is less of an issue today. The greatest human threat to swift fox populations is loss of habitat due to new agricultural cultivation and urban, suburban expansion. However, the larger geographic areas within current swift fox range where the land use pattern has not been altered significantly for decades (rangeland and farmland) are not likely to change in the foreseeable future. Vehicle collisions can be a problem, and may limit the growth of small and isolated populations. Prairie dog colonies are high quality habitats for the swift fox, due to their high densities of prey items and burrows, but elimination of prairie dog colonies continues to reduce quality habitat for the swift fox rangewide. The swift fox is legally harvested in Colorado, New Mexico, Kansas, and Texas, but is protected in the remaining states in which it is found. With more attention being paid to the swift fox in recent years, anthropogenic impacts on this canid species have decreased lately. Habitat specificity is a concern for swift fox populations because they require open expanses of prairie and grassland habitats. This type of habitat has diminished greatly over the past 100 years and now there is much less of it in the United States. The areas of prairie that do exist, need to protected in order to sustain swift fox populations, and other populations of prairie dwelling species (Dark-Smiley and Keinath 2003a).

Townsend's Big-Eared Bat
This bat is found in western North America, ranging from southern British Columbia to southern Mexico (CDOW 2009). Townsend's big-eared bat is a year-round resident of Wyoming, concentrated in the southeastern and north-central regions of the state; although it is considered rare (WGFD 2005f). Its distribution seems to be determined by availability of roosts, such as caves, mines, tunnels, crevices and masonry structures with suitable temperatures, making the conservation of suitable roosts essential to the management of this species (CDOW 2009). Loss of habitat appears to be the main threat to the species (WGFD 2005f). This bat is generally solitary or gathers in small groups, although during summer females may form larger maternity colonies. Townsend's big-eared bat can be found in mines, caves and structures in woodlands and forests to elevations above 9,500 feet. They often hang near the entrances to roosts, in the "twilight zone." The animals do not make major migrations and appear relatively sedentary. Hibernacula have low and stable temperatures, sometimes with moderate airflow, during late October to April. The bat is quite sensitive to changes in temperature and humidity within the hibernaculum and may arouse to move to a more favorable location. Populations may be principally limited by high winter mortality due to the absence of roosts with stable temperatures (CDOW 2009).

White-tailed Prairie Dog
White-tailed prairie dogs generally are found in desert grassland and shrub grassland habitats with moderate slopes at altitudes ranging between 5,000 and 10,000 feet. The white-tailed prairie dog is found in central and southwestern Wyoming and inhabits various grassy habitats, including mountain valleys, mesas, and shrubby and semidesert grasslands (Clark et al. 1971). White-tailed prairie dogs form colonies and spend much of their time in underground burrows, often hibernating during the winter. The species breeds in the spring, and young can be seen aboveground in early June. Their diet is composed of grasses and bulbs. The white-tailed prairie dog is the main food source of the endangered black-footed ferret.

White-tailed prairie dogs are susceptible to rapid population declines resulting from flea-borne sylvatic plague. In addition, historical and current activities, including shooting, poisoning, and habitat conversion, have affected white-tailed prairie dog populations. The USFWS reviewed a petition to list the white-tailed prairie dog under the ESA and concluded the petition did not contain substantial scientific data to support the petitioned action as warranted (Federal Register, November 9, 2004). Since then, the BLM developed the Wyoming BLM Statewide Programmatic White-tailed Prairie Dog (*Cynomys leucurus*) Biological Evaluation (approved by USFWS in July 2007) that included conservation measures and strategies for protecting the species.

Wyoming Pocket Gopher

The Wyoming pocket gopher is characterized by very strong front limbs with long nails used for digging, small ears, small eyes, and fur-lined cheek pouches used to carry food. Pocket gophers live most of their lives in burrow systems and underground tunnels. Very little is known about the Wyoming pocket gopher, and assumptions about its distribution, ecology, and status are based on a few museum records and anecdotal reports from about 30 years ago. Distribution of the species is believed to be restricted to Sweetwater and Carbon Counties in Wyoming, with a possible occurrence in very northern Colorado. Based on the life histories of other pocket gophers, Wyoming pocket gophers likely do not live more than two breeding seasons, reproduce the calendar year following birth, and have one litter with four to six young per year. The species' diet is likely primarily the roots, stems, and leaves of forbs, with some consumption of grasses and shrubs (USFWS 2011b).

Special Status Birds

Baird's Sparrow

This uncommon summer resident occupies grasslands and nests in depressions; however, no documented nests have been recorded within the planning area. The Baird's sparrow forages on insects and seeds.

Bald Eagle

The bald eagle is currently a BLM sensitive species. Since the federal delisting of the bald eagle on July 9, 2007 (USFWS 2007), the species continues to be protected under the Bald and Golden Eagle Protection Act. They generally occur in areas with open water and near concentrations of winter ungulates, waterfowl, and/or fish. Bald eagle nesting habitat is defined as any mature stand of conifer or cottonwood trees in association with rivers, streams, reservoirs, lakes, or any significant body of water. Although their main food item is fish, additional food items may include ducks, coots, rabbits, carrion, and small rodents. Bald eagles are believed to live for more than 30 years in the wild and even longer in captivity. They mate for life and often reuse old nests from previous years. Bald eagles are sensitive to various human activities. Responses to human disturbance vary and may include short-term, temporal, or spatial avoidance of the disturbance, to total reproductive failure and abandonment of breeding areas (BLM, Buffalo Field Office). Other concerns for bald eagles include disease, lack of food, and bad weather (BLM 2004b).

Brewer's Sparrow

The Brewer's sparrow breeds in high-elevation shrubs and thickets and in sagebrush deserts. The BLM lists it as a Sensitive Species, and the WGFD lists it as a Species of Greatest Conservation Need (WGFD 2010). Confirmed or suspected breeding has been documented in 27 of Wyoming's 28 degree blocks (Orabona et al. 2012). Brewer's sparrows are known to nest in the north region, west of Daniel, southwest of Boulder, north of Fontenelle Reservoir, and in the extreme east (WNDD 2002). The primary threat to Brewer's sparrows is from anthropogenic activities that alter, both deliberately and inadvertently, the structure and composition of sagebrush-dominated ecosystems in western North America. In many areas human actions have replaced sagebrush systems with other land cover types, fragmenting both native sagebrush habitat and dependent populations of Brewer's sparrows and other taxa of concern. Several techniques have been used across North America to convert sagebrush into grassland for agricultural purposes. Discing, chaining, and herbicides have been employed to this end. Some Wyoming sagebrush range has undergone these treatments, probably to the detriment of Brewer's sparrows and other sagebrush obligates. The effects of discing and chaining probably depend on exactly how these operations are carried out; specifically, the size of sagebrush patches treated. Resource managers often re-seed areas of disturbed sagebrush with exotic grasses, commonly crested wheatgrass (*Agropyron cristatum*), which degrades habitat quality for Brewer's sparrows. Brewer's sparrows are negatively impacted by intense burning of shrubs, at least until shrub species recover, and the presence of cheatgrass can eliminate shrub recovery. In general, nest predation is regarded as a threat to most passerines nesting in shrub habitats (Hansley and Beauvais 2004).

Burrowing Owl

The burrowing owl is a mid-sized owl closely associated with prairie dog colonies that occurs within the planning area. Burrowing owls nest in grassland, scrub, and steppe areas, usually using burrows excavated by other animals (Martin 1973). The species often nests within or adjacent to prairie dog towns (Canadian Wildlife Federation 2008; Apple 2002b). This species is relatively tolerant of human activity (Johnson and Anderson 2008; Dechant et al. 2003).

Primary threats across the North American range of the burrowing owl are habitat loss due to land conversion from agricultural and urban development, and habitat degradation and loss due to reductions of burrowing mammal populations. The elimination of burrowing mammals through control programs and habitat loss has been identified as the primary factor responsible for declines of burrowing owls. Additional threats to burrowing owls include habitat fragmentation, predation, illegal shooting, pesticides and other contaminants. The types and significance of threats during migration and wintering are poorly understood (USFWS 2003).

Columbian Sharp-tailed Grouse

Historically in Wyoming, the range of the Columbian sharp-tailed grouse extended westward from the Continental Divide. Currently, the only Wyoming population of Columbian sharp-tailed grouse is found within the Rawlins Field Office, located from the Colorado state line north to the Sand Hills ACEC. These grouse typically are found in mountain and basin big sagebrush habitat. In spring this species concentrates on traditional dancing grounds for courtship and breeding. These dancing grounds are typically found in mixed-shrub habitat of antelope bitterbrush, snowberry, serviceberry, chokecherry, and big sagebrush, evenly mixed with grasses and forbs. Broods in Wyoming are found most often in mountain shrub and sagebrush, with a high density of snowberry. Birds move to ridges and knolls in mountain shrub habitat during the fall, and then move to riparian habitat with exposed mixed-shrub communities at all elevations in the winter, where they feed on buds, berries, and catkins (BLM 1987). There is currently no hunting season for Columbian sharp-tailed grouse, but there are some accidental takings where the populations overlap with Greater Sage-Grouse. The bird was proposed for listing, but this was found not warranted by USFWS.

Threats to Columbian sharp-tailed grouse are widespread across its range in Region 2, occur at all spatial scales, and transcend local, state, and regional jurisdictions. Many of the threats are interrelated and synergistic in their impacts on Columbian sharp-tailed grouse. Even when the threats are not related, their impacts tend to be cumulative. The primary threats are all human-related. Foremost are habitat loss and degradation caused by conversion of native habitats to pasture and croplands, overgrazing by domestic livestock, energy development, use of herbicides to control big sagebrush, alteration of natural fire regimes, invasion of exotic plants, and urban and rural expansion.

Possible loss of Conservation Reserve Program (CRP) lands is the single most important immediate threat to Columbian sharp-tailed grouse in Region 2 and elsewhere throughout the subspecies' range. Currently, CRP lands support 21% of the known active leks in Region 2, and many CRP fields provide critical nesting and brood-rearing habitats for Columbian sharp-tailed grouse. Nearly 70% of all CRP contracts within the occupied range of Columbian sharp-tailed grouse in Region 2 are scheduled to expire by 2010, and there are strong indications that Congress will not include provisions in the 2007 Farm Bill for their renewal. What will become of these lands if the contracts are allowed to expire is uncertain, but it is likely that their value as habitat for Columbian sharp-tailed grouse will diminish.

Livestock grazing is the dominant use on public and private lands within the occupied range of Columbian sharp-tailed grouse in Region 2. While grazing levels have declined in Region 2, grazing continues to be an issue because lands subjected to past overgrazing have not been rested and given the opportunity to recover.

Until recently, oil and gas development was not considered a threat to Columbian sharp-tailed grouse in Region 2. However, with oil and gas prices reaching all-time highs and with strong support from the current political administration, oil and gas exploration and development have increased dramatically throughout the West. This activity has expanded into the core range of Columbian sharp-tailed grouse in Region 2. Impacts of oil and gas development include direct habitat loss and fragmentation from well, road, and pipeline construction; displacement (i.e., avoidance behavior) of individuals caused by excessive human activity; increased avian predation due to the construction of artificial perch sites; and increased mortality due to collisions with utility lines and vehicles. If oil and gas resources in Region 2 are developed to their fullest potential, the outcome could be devastating to Columbian sharp-tailed grouse populations.

The most essential component of habitats used by Columbian sharp-tailed grouse during winter in Region 2 is the presence of serviceberry (*Amelanchier* spp.). Serviceberry is the primary food source for Columbian sharp-tailed grouse from late fall through early spring. Any activity that reduces the distribution and abundance of serviceberry may have negative consequences to Columbian sharp-tailed grouse (Hoffman and Thomas 2007).

Ferruginous Hawk

The ferruginous hawk occurs in grassland and shrublands during the spring, summer, and fall seasons throughout the planning area. Ferruginous hawks often nest on the ground, lone trees, topographic high points, or cliffs. Ferruginous hawks occur in areas with abundant prey, typically grassland rodents and lagomorphs (Johnsgard 1990). There are numerous ferruginous hawk nest sites in the planning area. This species is considered sensitive to disturbance during the nesting period.

Loggerhead Shrike

Shrublands are the preferred habitats for the loggerhead shrike and are found throughout the planning area. This species typically nests in deciduous trees or tall shrubs and feeds on insects, small vertebrates, and carrion. Loggerhead shrikes generally inhabit open country with shrubs and low trees for nesting, and spiny shrubs so they can impale their prey (Porter et al. 1975).

Threats include a reduction in quality and quantity of native grassland and shrub-steppe communities is a major contributing factor, particularly on wintering grounds in the southern United States and Mexico. Other threats include livestock grazing (decreased prey availability and altered habitat structure), pesticide use (decreased prey availability and direct mortality), and invasive species (feral predators, non-native plants). Management in Wyoming should focus on habitat preservation and restoration, with an active monitoring effort and research to uncover the reason behind apparent population declines (Keinath and Schneider 2005).

Long-billed Curlew

The long-billed curlew is an upland shorebird occupying grasslands and wet meadows in the planning area. Long-billed curlews typically nest in prairie and grassy meadows near water, but occasionally choose dry upland sites. Typical nest sites are on the ground near water and a supply of insects and aquatic macroinvertebrates. This species has been observed foraging adjacent to riparian area and on sage-grouse leks in the spring.

Habitat degradation is the single greatest threat to the Long-billed curlew. Loss of grassland breeding habitat to agriculture and development has been extensive over the years. Long term global warming trends may shrink potential breeding distribution as climate change influences habitat. Older plantings of exotic crested wheatgrass (*Agropyron cristatum*), and infestation of knapweeds (*Centaurea* spp.) can severely degrade nesting habitat. Conversely, cheatgrass, one of the most invasive exotics in the western U.S., seems to provide better nesting habitat than natural bunchgrass due to its sparse growth. Habitat loss on wintering grounds is also a problem as many wetland areas have been drained and grasslands have been lost to urban growth. The long-billed curlew was once hunted and trapped in many areas of their range. Today they are not legally hunted, but a three year study conducted in Idaho suggested that some level of illegal harvest continues to occur. Long-billed curlews are somewhat tolerant of human disturbance if it results in only minor habitat degradation, but human disturbance can be a substantial problem during brood-rearing. Excessive vehicle traffic and recreational use of breeding habitats can result in nest abandonment or disruption in parental brooding. Livestock grazing during the breeding season can result in the destruction of nests and eggs; however, only very heavy grazing would constitute a significant source of nest loss. In Wyoming, particularly in the breeding area along the Beaver Creeks (near Merna) and the New Fork River (Pinedale), farmers utilize a controversial practice called “dragging.” This involves pulling long logs and metal rods across the native grassland in the belief that it will improve native grass seed dispersal and inhibit Artemisia growth. This destroys curlew nests if done anytime from March 15 to May 30. Housing developments that have recently been built in critical curlew habitat near Casper and Sheridan have resulted in habitat loss (Dark-Smiley and Keinath 2004).

Mountain Plover

The mountain plover inhabits shortgrass prairies and shrubsteppe habitats, both for breeding and wintering. This species prefers areas with little vegetative cover for nesting, particularly prairie dog towns. The primary forage for the mountain plover is insects, grass seeds, and berries. In 2003, the USFWS withdrew its proposal to list the mountain plover as threatened because information indicated that threats to this species were not significant and that the population was stable (USFWS 2003). As part of a settlement agreement, in July 2010 the U.S. Fish and Wildlife Service re-opened the comment period and designated mountain plover as a proposed species for listing under the ESA. A new listing decision was due to the Federal Register by May of 2011. After a thorough review of all available scientific and commercial information, the Fish and Wildlife Service determined that the mountain plover is not threatened or endangered throughout all or a significant portion of its range.

Agricultural practices on native grasslands have had direct and indirect impacts on mountain plover. Any mechanical treatment of the landscape (i.e., tilling, planting, application of fertilizers and pesticides) during the nesting phase can potentially destroy nests and eggs. Conversion of marginal native sod to winter wheat has altered the physical topography of much of the western Great Plains, precluding nesting plovers. Certain crops appear attractive to mountain plover during the courtship and nesting phase. Planting may destroy early nests, and re-nesting plovers may abandon when subsequent crops (millet and sunflower) grow beyond a certain height. The regional shift to large-scale plantings of such crops may result in a substantial reproductive sink for mountain plovers. Fragmentation of prairie grasslands and loss of native habitats has been affected by many factors. Eradication of prairie dogs, which remarkably has been estimated from 99% of their former range, has resulted in disruption of the natural pattern of prairie disturbance which mountain plover have an affinity for, especially in the northern portion of the species range. Adult survival rates both on the wintering grounds, and the breeding grounds are high, therefore the greatest threat of predation is of nest contents and chicks prior to fledging (Smith and Keinath 2004a).

Northern Goshawk

The northern goshawk is a large accipiter associated with coniferous forests and aspen stands. This species is a seasonal migrant in the planning area. Nesting habitats are generally in coniferous forests. Northern goshawks often forage throughout the forest, including in aspen stands, meadows, and forest openings. Several northern goshawk nest sites have been documented in the planning area.

Removal or excessive fragmentation of mature forests in habitat suitable for nesting and foraging is a considerable extrinsic threat to Northern Goshawks. Grazing pressure may contribute to a loss of habitat complexity and decline of prey base in certain habitats, such as aspen stands and riparian vegetative communities. Goshawks are presently susceptible to declines in available prey; therefore, management practices negatively impacting prey abundance would have a detrimental impact on goshawks, and increase effects of stochastic events (i.e., prolonged drought or cold, damp during the early nesting period). Increased forest fragmentation will likely increase competition and predation on goshawk populations. Habitat generalists and species better adapted to more open woodlands such as corvids and other raptors (hawks and owls) can displace goshawks, compete for nesting structures, deplete the prey base, and depredate nests and adults (Smith and Keinath 2004b).

Peregrine Falcon

The peregrine falcon is a mid- to large-sized falcon associated with a variety of habitats during the spring, summer, and fall seasons. Nesting habitats for this species include cliffs, canyons, or other secure topographic features typically near larger water bodies. Nesting sites occur near an abundant prey base. This species is considered uncommon within the planning area; however, it has been observed migrating through the area. This species was delisted from the federal endangered species list in 1999.

Before legal protection, shooting, trapping, and egg-collecting accounted for loss of many hundreds of falcons and their eggs. From late 1940s to early 1970s, use of organochlorine pesticides, particularly DDT and HEOD (dieldrin, aldrin) in agriculture and forestry and for human disease control resulted in bioaccumulation of toxic residues in prey species, which in turn contaminated falcons, causing both lethal and sublethal effects. Urban-dwelling peregrines are killed or injured by flying into windows or other features of buildings while chasing prey, occasionally by collision with moving vehicles, including aircraft at airports; sometimes strike wires. Recently fledged young can fall down chimneys, are killed by air-conditioning equipment or other machinery on tops of buildings. Young in nests on bridges often fall into water, significantly reducing productivity at such sites. Loss or modification of nesting places, which are limited in number and often nonreplaceable (e.g., cliffs, ledges, special trees, towers, buildings); however, the species has latitude to switch among alternate nesting places in same territory where >1 exists (e.g., from building to stone quarry in Salt Lake City, UT). Careless methods of field study can result in injury or death of adults and young, or abandonment of eggs (no known case of abandoning young), which could effect on long-term population stability. Inspection of nest site just before or during laying is likely to cause falcons to abandon that site and re-nest elsewhere on same cliff or in the same territory (White et al. 2002).

Sage Sparrow

The sage sparrow nests in large tracts of arid shrub and sagebrush communities. Sage sparrow is common in suitable habitats within the planning area.

The primary threat to sage sparrows is from anthropogenic activities that alter, both deliberately and inadvertently, the structure and composition of sagebrush-dominated ecosystems. In many areas human actions have replaced sagebrush systems with other land cover types, fragmenting both native sagebrush habitat and dependent populations of sage sparrows and other taxa of concern. Probably the largest threat to sagebrush ecosystems in western North America, and by extension to sage sparrows and other sagebrush obligates, is the complex interaction between invasion by the Asian annual cheatgrass and alteration of native fire regimes. Cheatgrass is steadily invading sagebrush-dominated basins from west-to-east, replacing native sagebrush steppe with an exotic grassland. In general, nest predation is regarded as a threat to most passerines nesting in shrub habitats (Hansley and Beauvais 2004).

Sage Thrasher

The sage thrasher nests in large, open tracts of dry shrub and grassland with dense stands of sagebrush, bitterbrush, or rabbitbrush. Sage thrashers are common in suitable habitats within the planning area.

Primary threats to sage thrasher habitat are agricultural field cultivation, domestic grazing, invasion of exotic plant species, change in fire frequency, fragmentation from oil and gas development, and increased recreational use. To maintain populations of sage thrasher, it is important to protect and maintain extensive, intact shrub-steppe habitats and rehabilitate sagebrush habitats that have been lost, fragmented, or degraded. In addition, it is essential to understand the impacts of habitat alteration on local and range wide sage thrasher populations (Buseck et al. 2004).

Trumpeter Swan

The trumpeter swan is an occasional migrant that nests on muskrat houses or small islands in open water. The trumpeter swan feeds mainly on aquatic vegetation and macroinvertebrates. Trumpeter swans are found in the extreme eastern and western regions of Wyoming.

Excessive market hunting for food, skins, and feathers was the primary cause of the historic decline in trumpeter swans. Currently all three trumpeter swan populations (Pacific Coast Population, Rocky Mountain Population, Interior Population) are threatened by conversion, disturbance, degradation of breeding, and (especially) winter habitat by various human land uses. Activities with the greatest potential for causing future population declines include: altering aquatic vegetation and substrate (e.g., dredging, damming, siltation), substantial changes to uplands adjacent to wetlands, including changes to vegetation (e.g., introduction of exotics, tree planting), landform (e.g., berm and levee construction) and other features (e.g., construction of fences, power lines, and other flight hazards); increasing fluctuations in water levels, changes in drainage patterns, and long-term increases or decreases in water level; increasing levels of and exposure to petroleum products and other toxic chemicals, including lead shot; active harassment such as intentional hazing, chasing and shooting; passive harassment such as construction noise, vehicle noise and boat traffic; any activity that interrupts normal behavior and causes stress and flight; and establishing residences and recreation sites that promote near-constant human presence (e.g., campgrounds, cabins, vacation homes) in or near breeding or wintering habitat (Travsky and Beauvais 2004a).

White-faced Ibis

The white-faced ibis occurs in marshes, wet-moist meadows, lakes, and irrigated meadows and has been confirmed as nesting in the planning area (Orabona et al. 2012). They also have been documented north of Fontenelle Reservoir (WNDD 2002) and have been observed near Big Piney during the spring migration.

The greatest human threat to white-faced ibis populations is habitat degradation and destruction due to agricultural practices. Due to the nomadic nature of the white-faced ibis, populations would likely decline abruptly and unpredictably as habitat is lost and degraded. Diversion of natural water supplies away from existing wetlands to irrigation projects has led to temporary, or sometimes permanent, abandonment of traditional colony sites. Pesticide use is one of the major threats to white-faced ibis populations. DDT-DDE contamination causes eggshell thinning, leading to cracking, denting or crushing of eggs during incubation. This in turn results in lower hatching success and reduced reproductive output. Human disturbance of breeding colonies may cause partial or total desertion of nests, especially during nest-site selection, nest-building, and incubation. Anthropogenic impacts in Wyoming are likely similar to those discussed for the entire range of the white-faced ibis, with cattle grazing and development in wetland areas being a major concern (Dark-Smiley and Keinath 2003).

Yellow-Billed Cuckoo
See species description under federally listed species.

Special Status Fish ,
Bluehead Sucker
The bluehead sucker has an interesting distribution, occurring in the Colorado River, from the Grand Canyon up into its tributaries, including the Green, Yampa, Gunnison, and San Juan Rivers, but absent from the Colorado River below the Grand Canyon, including the Gila River Basin. It is also native to the Bear and Weber River drainages and the Snake River upstream of Shoshone Falls (Lee et al. 1980). Recent studies suggest that bluehead sucker populations are declining throughout their historic range (Ptacek et al. 2005); potential threats include habitat degradation resulting from impoundment and dewatering. The presence of dams throughout the bluehead sucker's range may interfere with migrations as well as water temperature. Holden and Stalnaker (1975) collected white sucker and longnose sucker in the upper Colorado River Basin. Competitive interactions with these two introduced species could also harm the bluehead sucker. Hybridization with flannelmouth and white suckers may also be threatening the integrity of this species in the upper Colorado River Basin (Holden and Stalnaker 1975), although the threat of hybridization is greatest with the white sucker. In spring 2006, only one population of bluehead sucker in the Green River drainage was free from the introduced white suckers (Cavalli 2006). Populations of bluehead sucker within the planning area were severely reduced in 1962 when the Upper Green River and its tributaries above the Flaming Gorge Dam were poisoned with rotenone (Holden 1991). After the poisoning, the bluehead sucker was found to be one of the dominant species below the Flaming Gorge Dam (Holden and Stalnaker 1975). The surviving populations above the dam have repopulated the area to their current levels. The current number of bluehead suckers in the Green River drainage is very low, and the distribution is limited (Cavalli 2006). Given its wide tolerance of habitat types, it is likely that this species could occur throughout the area.

Bonneville Cutthroat Trout
The Bonneville cutthroat trout is a subspecies native to the Bonneville basin. It evolved primarily as a lake-dwelling population inhabiting Lake Bonneville during the pleistocene. After the Bonneville flood, the lake drained and the subspecies became restricted to stream-dwelling populations in the isolated river drainages. Because the river systems are naturally isolated, the Bonneville basin has been divided into Geographic Management Units or GMUs. Within the Bonneville Basin, human activities have altered aquatic habitat and the physical processes that create and maintain that habitat, resulting in a significant decline in fish populations. Bonneville cutthroat trout were thought to be extinct in the early 1970's, but recent work has revealed several genetically pure populations interspersed throughout its range. In order to prevent the listing of Bonneville cutthroat trout as a sensitive species by state and federal agencies, a Conservation Agreement was signed by the state and federal entities responsible for Bonneville cutthroat trout conservation (UDWR 2011).

Hybridization is a concern for many cutthroat trout populations. An introgressed population results when a non-native species or subspecies is introduced into or invades native cutthroat trout habitat; the two species interbreed (i.e., hybridize); and the resulting hybrids survive and reproduce. If the hybrids backcross with one or both of the parental species, genetic introgression occurs. Continual introgression can eventually lead to the loss of genetic identity of one or both parent species, thus resulting in a "hybrid swarm" consisting entirely of individual fish that often contain variable proportions of genetic material from both of the parental species. The greater concern for cattle grazing stems from direct stream impacts where cattle are permitted to dwell in or are trailed through stream channels and riparian areas. Without adequate management, cattle can trample and destroy instream habitat and stream banks. They forage on lush riparian vegetation, which leads to degraded stream conditions and changes in channel morphology. Trampling destroys undercut banks resulting in wider and shallower channel morphology. Where this occurs, Bonneville cutthroat trout can be impacted by increased water temperatures, loss of habitat complexity, altered macroinvertebrate food-base, and increased deposition of fine sediment. When livestock grazing is managed appropriately, it can occur in the vicinity of stream and riparian habitat, and habitat conditions that support fish populations can still be maintained.

Currently, timber harvesting affects Bonneville cutthroat trout through the indirect effects of road building and deforestation. Road building is known to add fine sediment to streams where roads cross or follow stream channels. These fine sediments can fill interstitial spaces important for successful spawning and survival of eggs and larval fish, as well as alter the macro-invertebrate food base. Deforestation can also add sediment input into streams where riparian buffers are not implemented. Loss of trees also increases water volume draining into stream channels, which can alter flow and sediment regimes or exacerbate catastrophic flooding during extreme precipitation events. Direct effects of water diversions and depletions (dewatering) on Bonneville cutthroat trout occur where reaches are dewatered or made inaccessible by instream barriers. Secondary effects of water development may include higher water temperatures in summer months because of lower water volume, diminished riparian condition, and altered instream and shoreline habitat, all of which can impact cutthroat trout spawning and populations. Oil and gas development could affect Bonneville cutthroat trout through increased land disturbance from roads and pads that could cause water quality problems associated with increased sediment loads, and through leaks, spills, and discharge of produced water reaching Bonneville cutthroat trout habitat (USFWS 2008c).

Colorado River Cutthroat Trout

Colorado River cutthroat trout is the only native Colorado River trout and one of only two native salmonids (the other being the mountain whitefish). It develops brilliant red, orange, and golden-yellow coloration, especially during spawning. The Colorado River cutthroat trout was once common in the Upper Green River and Colorado River watersheds, with approximately 21,400 miles of habitat in the western United States (Hirsch et al. 2006). Declines in Colorado River cutthroat trout distribution have been documented in a number of reports (Colorado River Cutthroat Trout [CRCT] Coordination Team 2006; Behnke and Zarn 1976; Binns 1977; Martinez 1988; Young 1995). Analysis of distribution data indicates that they currently occupy approximately 14% of its former range (Hirsch et al. 2006). Colorado River cutthroat trout exist in isolated sub drainages in Colorado (1,359 miles), Utah (1,111 miles), and Wyoming (552 miles) (Behnke 1992; Hirsch et al. 2006; Young 1995). They have hybridized with non-native salmonids in many areas, reducing the genetic integrity (CRCT Coordination Team 2006). Pure populations of Colorado River cutthroat trout have been extirpated from much of their historical range.

Fine-spotted Snake River Cutthroat Trout

The fine-spotted Snake River cutthroat trout is distinct from other cutthroats due to the very fine spots covering the fishes' sides. It is thought to be a subspecies of the Yellowstone cutthroat, but it has not been genetically confirmed. The native range of this fish is the upper Snake River, Greys, and Salt Rivers above Palisades Reservoir. This cutthroat prefers medium to large sized streams with overhead cover. Larger fish are piscivorous, and will also eat small rodents, annelids, insects, and snails; smaller fish will consume aquatic invertebrates. Habitat alteration and introduction of nonnative fish species are the main threats to the welfare of this cutthroat trout (WGFD 2005f).

Flannelmouth sucker

The flannelmouth sucker's native range spans the entire Colorado River Basin, including the Green, Yampa, Gunnison, San Juan, and Little Colorado Rivers; the Gila River Basin; and the mainstream Colorado River (Lee et al. 1980). They have declined in number and distribution throughout their historic ranges, although they remain fairly abundant throughout the Colorado River Basin, in contrast to many native fishes in the region (Rees et al. 2005a). However, dispersal is an important component of this species' life-history, and aggregations of adults below dams during spawning season suggest that impoundments may be disrupting spawning migrations (Chart and Bergersen 1992; McKinney et al. 1999). Furthermore, evidence of hybridization between the flannelmouth sucker and the introduced white sucker in the upper Colorado River

Basin (Holden and Stalnaker 1975; Valdez 2002) indicates another threat to the integrity and persistence of this species. As of spring 2006, only one known population of flannelmouth sucker in Wyoming had not been impacted by the introduced white suckers (Cavalli 2006). Within the planning area, flannelmouth sucker populations were severely reduced in 1962 when the Upper Green River and its tributaries upstream of Flaming Gorge Dam were poisoned with rotenone (Holden 1991). The surviving populations above the dam have repopulated the area to their current levels. Flannelmouth sucker populations, or their hybrids with white suckers, are found in several mountain lakes above the town of Pinedale (Cavalli 2006). They are also likely found in the large to moderate stretches of river within the planning area.

Hornyhead Chub
The hornyhead chub historically occurred throughout the plains' streams of North America; from New York to eastern North Dakota, and south to Arkansas. Isolated populations were historically found in western Nebraska, southeastern Wyoming and northeastern Colorado, but the species has been extirpated from Colorado and Nebraska. In Wyoming, two populations of hornyhead chub were found in the North Laramie River and Laramie River in the 1990s. These populations are completely isolated from other portions of the species range, and the populations appear to be declining. Habitat preferences include gravel substrate, moderate to low gradient, cool/clear water, and are often associated with aquatic plants (Robinson and Buchanan 1988). The hornyhead chub has a complex reproductive strategy that requires the males build nests, constructed from stones and pebbles, on a fine gravel or pebble substrate, in relatively shallow water, often below a riffle. Stones and pebbles are transported up to six meters by the species using their snout or carrying them in their mouth (Robinson and Buchanan 1988). Declines in the species population are attributed to the loss of habitat and competition with non-native species.

Northern Leatherside Chub
According to Johnson et al. (1995), the leatherside chub was once a candidate for federal protection under the ESA; however, at present, the species has no federal status. The leatherside chub is native to the southern and eastern Bonneville Basin (including Salt Lake and Provo Lake drainages) and upper Snake River above Shoshone Falls (Utah, Idaho, and Wyoming) and the Wood River drainage in Idaho. It has also been introduced into the Green River in Utah (Lee et al. 1980). This species has experienced declines and local extirpations in various parts of its range. Reasons for the decline include impoundments, dewatering, siltation, and predation by introduced brown trout (Walser et al. 1999). The leatherside chub is not native to the Green River, so any leatherside chub found within the planning area would constitute an introduced population. Although documented occurrences of leatherside chub in the Green River are restricted to Utah (Lee et al. 1980), the prevalence use of this species as a bait fish indicates that leatherside chub certainly could be in the Upper Green River in Wyoming. Surveys are needed to determine whether this species occurs within the area.

Roundtail Chub
The species is endemic to the Colorado River Basin and historically, commonly occurred in most medium to large tributaries of the Upper Colorado River Basin below elevations of 7,500 feet (Rees et al. 2005b). The taxonomy of the genus *Gila* continues to change because some subspecies have recently been re-classified as unique species (Rees et al. 2005b). Declines in abundance throughout the roundtail chub's range have been attributed mainly to the many forms of habitat degradation that followed the construction of dams throughout the Colorado River Basin, such as disruption of the natural flow regime, changes in temperature and turbidity regimes, and channelization. In particular, the loss of natural flooding seems to limit roundtail chub recruitment (Brouder 2001), and low temperatures below reservoirs exclude roundtail chub from tailwater reaches (Vanicek et al. 1970). Declines in roundtail chub populations within the planning area can be attributed partially to September 1962, when 444 miles of the Green River and tributaries above Flaming Gorge Dam were poisoned with rotenone. Recovery of roundtail chub in this region has probably been hampered by the invasion of non-native fish species following the poisoning (Holden 1991). Within the planning area, roundtail chub distribution is not well documented. Suitable

habitat likely exists from above Fontenelle Reservoir to Pinedale. Populations are known to occur in several mountain lakes above the town of Pinedale (Cavalli 2006). Once the Green River enters mountainous regions where water temperatures drop, habitat likely becomes unsuitable for roundtail chub.

Yellowstone Cutthroat Trout

Yellowstone cutthroat trout inhabit relatively clear, cold streams, rivers, and lakes in northwestern Wyoming. The trout is native to the Yellowstone River drainage and downstream to the Tongue River, including the Big Horn and Clarks Fork River drainages. It can also be found in Snake River tributaries such as Pacific Creek. The fish can be identified by large black spots on the caudal peduncle (tail area before the tail fin). This trout feeds on aquatic and other insects, zooplankton, mollusks, freshwater shrimp, and other trout. The major threat to this species is the introduction and crossbreeding of other trout species. Loss of habitat is another major threat (WGFD 2005f).

Special Status Reptile

Midget Faded Rattlesnake

The midget-faded rattlesnake (*Crotalus viridis concolor*) is limited to rocky outcrops with a southern to easterly aspect below 7,500 feet and associated feeding areas. The distribution of the midget-faded rattlesnake is limited by key habitat features (i.e. den sites and prey) specifically, large rock outcrops associated with the Green River and Flaming Gorge Reservoir.

Threats to the midget faded rattlesnake include episodic natural disturbances, such as wildfire and summer cold-snaps; predation; vehicle collisions, noting that snakes are attracted to roads as a basking surface; collection of the snake, both legal and illegal; and deliberate killing. The construction of Flaming Gorge Reservoir has probably reduced the viability of midget faded rattlesnake populations in Wyoming. The reservoir likely flooded much suitable habitat and has probably reduced, if not eliminated, most of the east-west gene flow in the state. Currently there are no protected areas occupied by the midget faded rattlesnake in Wyoming (Travsky and Beauvais 2004b).

Special Status Amphibians

Boreal Toad

Western boreal toads can be found breeding in wet meadows, ponds, marshes, and other shallow waters in spring. In summer, this species uses upland montane sites, usually within 300 to 1,500 feet of the breeding ponds. During hibernation, western boreal toads seek shelter under rocks or logs, or in rodent burrows (Keinath and Bennett 2000). In 2000, several adults, tadpoles, and metamorphs were discovered downstream of the confluence of the Middle and South Sawmill Creeks on BLM-administered land, about ten miles northwest of LaBarge. This species also has been found in the central and east-central regions of Wyoming (WNDD 2002).

There are seven general classes of anthropogenic and natural threats that directly and indirectly affect boreal toads and their habitat. These classes of threats are: 1) the loss, deterioration, and fragmentation of aquatic and terrestrial habitats; 2) introduction of non-native species; 3) environmental pollutants; 4) increases in ambient UV-B radiation; 5) climatic change; 6) pathogens; and 7) human commerce.

Specific direct threats to boreal toads on lands managed by the Bureau of Land Management in Wyoming include: air quality and atmospheric deposition, timber harvest, grazing, fire and fire management activities, non-native species and their management, road and trail development, on-and off-road vehicle use, development and management of recreational facilities, development and management of water impoundments, harvest and commerce, habitat fragmentation and metapopulation impacts, and finally the lack of information on specific populations.

No single factor has been identified as the primary threat to boreal toad habitat. It is possible that any resource management that has a negative effect on mountain wetlands or ponds will also negatively affect breeding habitats for boreal toads. Conservation efforts for this species can be best applied at the local population level. Conserving specific breeding populations that are free from chytrid infection and not significantly threatened by other natural or human related factors is, in the authors' opinion, the most effective method for conserving boreal toads in the Rocky Mountain region (McGee and Keinath 2004).

Columbia Spotted Frog

Columbia spotted frogs are found in Fremont, Lincoln, Sublette and Teton counties (WGFD 2005f). Columbia spotted frogs are regularly found at water's edge in or near forest openings. Wetlands at or near treeline are also used, but populations are uncommon in large, open intermountain valleys. Breeding takes place in lakes, ponds (temporary and permanent), springs, and occasionally backwaters or beaver ponds in streams. Young and adult Columbia spotted frogs often disperse into marsh and forest habitats, but are not usually found far from open water. These frogs feed mainly in riparian habitat, occasionally in bordering meadow/woods; juveniles forage farther from water (Miller 1978). Threats include predation and competition from introduced bullfrogs, and reduced habitat quality (WGFD 2005f).

Great Basin Spadefoot

This species occupies sagebrush communities below 6,000 feet in elevation, west of the Continental Divide. The Great Basin spadefoot toad utilizes ephemeral wetlands and is known to hibernate deep into the soil for years until sufficient rainfall occurs and they emerge and reproduce. Adult toads may also be found in the shrublands near water. Amphibian populations are generally declining worldwide. This trend is expected in the planning area as well. The Great Basin spadefoot has been documented within the planning area (Crews 2005).

Northern Leopard Frog

The northern leopard frog occupies riparian and wetland habitats and typically is found in cattail marshes and beaver ponds in the plains, foothills, and montane zones up to 9,000 feet above mean sea level (MSL) in the planning area. Adults feed on tadpoles, insects and other invertebrates. Northern leopard frogs have been observed in the planning area.

Introduced predaceous fish have been clearly implicated in the decline of some frogs and are found in much of Wyoming. Ongoing management by various agencies to maintain introduced predaceous fish makes it difficult to resolve the conflict between this priority and the need to protect populations of northern leopard frogs. Overwintering mortality can be high at times in ranid frogs it is important that overwintering sites be identified and protected. The complex life cycle of amphibians and the permeability of their skin make them especially susceptible to ecotoxicological agents. The amount of toxicants dumped into the environment has created an enormous amount of chemical pollution and most likely contributed to amphibian declines across the world. Breeding ponds used by northern leopard frogs tend to collect all manner of toxicants from runoff water, and *R. pipiens* doubtless are exposed to these agents at all points in their life cycle range-wide. Also, the skin of amphibians is highly permeable so the toxicants undoubtedly enter the body of northern leopard frogs. Other threats include: infectious disease, road-related mortality, habitat disturbances and obstructions to migratory pathways, over collection, and stratospheric ozone levels and ultraviolet penetration (Smith and Keinath 2004c).

Special Status Plants

Beaver Rim Phlox

Beaver Rim phlox is a slightly prickly matted plant with large white flowers, determined in 1988 to be endemic to Wyoming. This species grows on dry desert hills on sparsely vegetated slopes with sandstone, siltstone, or limestone substrates at elevations of 6,000 to 7,400 feet. Populations of Beaver Rim phlox occur in the Green River Basin in Sublette and Lincoln counties and southern Fremont County. The Green River Basin populations differ morphologically from those in Fremont County by having short-stalked glandular hairs on the leaves, as well as narrower leaves. Beaver Rim phlox is known to occur in the planning area. General threats to the Beaver Rim phlox include disturbance from oil and gas development, pipeline construction, and highway construction.

Cedar Mountain Easter Daisy
This species was recently discovered and is found only in southwest Sweetwater County, Wyoming. It grows in nearly identical habitat to that of *Thelesperma pubescens*. The population of the Cedar Mountain Easter daisy grows on a rocky slope at the summit of Cedar Mountain within one mile of a population of *Thelespenna pubescens*. Very little is known about this species. However, the Wyoming Natural Diversity Database performed a status survey of this species in the summer of 1994. A monitoring program was established and it is recommended that monitoring be done yearly. Due to the extreme rarity and apparently very small population size, surface disturbance could significantly impact this species to the point of extinction.

Cedar Rim Thistle
Cedar Rim thistle is a Wyoming endemic perennial herb that grows on barren slopes, fans, and draws in open areas within Wyoming big sagebrush grasslands at elevations of 5,800 to 7,500 feet on specific geologic formations. Known populations of Cedar Rim thistle are limited to the Green River Basin in Sublette County, the Beaver Rim area of Fremont County, the Sweetwater River Valley in Carbon County, and highlands on the east side of Flaming Gorge in Sweetwater County (Fertig and Beauvais 1999). Pest control measures, including the spraying of herbicides and release of bio-control insects to control other species of thistle that are invasive, are the main threats to the Cedar Rim thistle. The plant does not appear to be affected by livestock grazing or mineral exploration (Fertig and Beauvais 1999).

Dorn's Twinpod
Dorn's twinpod is a BLM sensitive species and a Natural Heritage Network (NHN) global and state critically imperiled species. This species is a locally endemic perennial herb restricted to the southern Overthrust Belt in Lincoln and Uinta counties. Dorn's twinpod grows on clay-gravel or sandyshale slopes with little plant cover at elevations of 6,500 to 7,600 feet. Threats include OHV use, road construction, and mineral exploration. Dorn's twinpod grows on BLM-administered land and on adjacent state and private land. Within the planning area, there are four main populations with 97% of the population occurring in a contiguous area comprising three populations within southwestern Lincoln County and one population within Uinta County.

Dune Wildrye
The range wide distribution of *Elymus simplex* var *lexurians* is only known from Sweetwater County, in the upper Green River basin, possibly within the Rock Springs and Rawlins Field Offices. This species occurs in drifting sand dunes at elevations of 7130 feet. Dune wildrye is a strongly rhizomatous, perennial grass with bluish herbage, often tinged with purple on the extremities. Due to the grasses habitat specificity, it can be impacted by recreational activities within dune areas (Heidel et al. 2002).

Entire-leaved Peppergrass
Entire-leaved peppergrass is a sensitive species in Wyoming, as well as a NHN global, state, and trinomially imperiled species. It is a perennial forb found on desert hills, sparsely vegetated and seasonally wet clay flats, and moist alkaline meadows at elevations between 6,200 to 6,770 feet in Lincoln and Uinta counties. Entire-leaved peppergrass is a regionally endemic species of northeastern Utah and southwestern Wyoming, found within Fossil Butte National Monument and in one location within the planning area. Threats to the species include human development, which has caused the loss of many of Utah's entire-leaved peppergrass populations.

Gibbens' Beardtongue
Gibbens' beardtongue occurs on sparsely vegetated shale or sandy-clay slopes at 5,500–7,700 feet in elevation. Threats to the Gibbens' beardtongue include razing, mineral development, recreation, roads and

weeds. Drought, climate conditions and big game herbivory may directly or indirectly impact the species and erode its habitat (Fertig 2009).

Green River Greenthread

The Green River greenthread is a Category 2 Candidate under review for federal listing as Threatened or Endangered. The species is known from two locations in Wyoming and one historical occurrence in northeastern Utah. Both Wyoming Locations occur within the planning area on escarpments above the Green River about two miles southeast of the town of Green River. The Green River greenthread was discovered in 1988 growing on a ridge of barren white shale derived from the Green River Formation. This population is located in the vicinity of a heavily used recreational area where individual plants have been dislodged by off road vehicle activity. A second population was discovered in 1994 during a status survey by the Wyoming Natural Diversity Database. The newly found occurrence has not been directly impacted, but exists in an area of past drilling activity. Due to its extreme rarity, impacts from seismic activity, mineral development, off-road vehicle use, or any other surface disturbing activity could have serious impacts on this species. A monitoring plan was established in 1994 and should be monitored yearly to provide trend data. A habitat management plan which would prescribe protective actions is planned for this species.

Laramie Columbine

The Laramie columbine is ranked as an imperiled species at the state and global levels based on rarity and vulnerability to extinction. Although no intensive surveys have been conducted for this species, eight occurrences of this perennial herb are documented. The Laramie columbine is restricted to the Laramie Range in southeastern Wyoming and more than 50% of this local endemic plant species' continental range is encompassed in Wyoming. Habitat for this species includes shady crevices and ledges in granite boulders or cliffs. A moderate number (21 to 75) of occurrences are documented for the Laramie columbine, including Converse County. The species is rare (less than 5,000 individuals or less than 400 occupied acres) in abundance. Although trend data is not available, populations are thought to be stable. Due to the remoteness and rugged nature of the Laramie Range, populations of this species are not presently considered threatened; however, populations near trails and campgrounds could be adversely impacted by collecting, grazing, and trampling by hikers and OHV use.

Laramie False Sagebrush

This southeastern Wyoming endemic species is known to occur in southwestern Converse and southeastern Natrona Counties (Fertig 2000d). More than 50% of its continental range occurs in Wyoming. Six of the 11 sites in four counties where this species is documented were discovered as recently as 1997. Laramie false sagebrush is a perennial herb occurring on rocky limestone soils at elevations of 7,545 to 8,530 feet above MSL. A low number (6 to 20) of occurrences are documented for this species and it is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance. Threats to this species include road development, vehicle traffic, and competition from invasive, non-native plant species (Fertig 2000d). In addition, one of the limestone outcrops where this species occurs is being quarried.

Large-fruited Bladderpod

Large-fruited bladderpod is a perennial species that grows in open Gardner's saltbush and squirreltail communities on barren clay hills and flats. Usually, populations are found on slopes of less than 15% on low hills, knolls, or colluvial fans at elevations of 6,800 to 7,700 feet. Soils are usually fine to textured barren clays and shales. The large-fruited bladderpod is endemic to an area less than 25 square miles in size on the western rim of the Great Divide basin and in the Green River Basin near Opal and Ross Butte, Wyoming. Disturbance from oil and gas mining and exploration is a threat to the species. OHV use and wild horse activity are also possible threats. Management entities with known populations of large-fruited bladderpod include the BLM Kemmerer, Pinedale, and Rock Springs Field Offices.

Limber Pine
Limber pine occurs in rocky areas at elevations from 4,900 to 12,000 feet. This species is cold and drought tolerant, and does not tolerate shade. It is long lived and slow growing, and can often identify the treeline ecosystem boundary. This species associates with a root mycorrhizal fungus, and has a mutualistic relationship with Clark's nutcracker for seed dispersal. White pine blister rust is the main threat to this species (NatureServe 2011).

Many-stemmed Spider-flower
The many-stemmed spider-flower is a rare wetland annual species occurs as a disjunct population in Wyoming and is documented for Natrona County. Habitat for the many-stemmed spider-flower is limited to alkaline playa wetlands. A very low number (1 to 5) of occurrences are documented for this species and it is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance. The many-stemmed spiderflower is thought to be in decline. Threats to this species include water development projects; however, the annual life-cycle and specific habitat requirements may increase the potential for chance extinction from extended drought or other stochastic events.

Meadow Milkvetch
Meadow milkvetch has been recorded in south central Wyoming and possibly in southwest Wyoming. This *Astragalus* is found in moist, alkaline meadows and swales in sagebrush valleys or closed drainage basins from 4,400 to 6,600 feet. Threats to this species include habitat loss due to agriculture and livestock grazing (NatureServe 2011).

Meadow Pussytoes
Meadow pussytoes is a regional endemic species. Meadow pussytoes grows in subirrigated meadows within broad stream channels surrounded by sagebrush grassland at elevations of 4,950 to 7,900 feet. The plants occur on the drier margins of "hummocky" meadows. On more level sites with bare soil, the plants occasionally form vegetative mats. It is absent from riparian areas and other locations exhibiting saturated soils and dense graminoid or shrub cover (Fertig and Beauvais 1999). Twenty sites are known from Wyoming, all in Fremont County. Riparian meadows in the planning area at elevations of 7,200 to 7,900 feet have potential for occurrences of meadow pussytoes (Laster 2002a). Primary threats to the species in Wyoming generally include OHVs, mining, and water projects (Fertig and Beauvais 1999). Grazing is considered a threat but to a lesser extent than originally thought.

Ownbey's Thistle
This species is endemic to northwest Colorado, northeast Utah, and southwest Wyoming. It is known only from two sites in Wyoming. In the Rock Springs Field Office, Ownbey's thistle has been found on the east side of the Flaming Gorge National Recreation Area, and along the Currant Creek drainage. Its habitat consists of steep, shaley soils associated with desert shrub communities. Due to its extreme rarity, surface disturbance could significantly impact the species. The plant's spiny nature makes it unpalatable as forage for livestock. However, herbicide spraying could negatively impact the species. Construction activity associated with oil and gas, range projects, and other project developments potentially threatens the plant's habitat. A proposed general floristic inventory of this area in 1995-96 may reveal more occurrences of this species.

Persistent Sepal Yellowcress
Persistent sepal yellowcress is found on riverbanks and shorelines, usually on sandy soils near the high water line. Increasing water storage capacity may be the primary threat to populations of persistent sepal yellowcress along man-made reservoirs in central and western Wyoming. Raising water levels could permanently inundate lower-lying colonies of this species, preventing the germination of existing seedbanks. Although the loss of low-lying sites could be offset by the creation of similar habitats on newly flooded, higher banks, migration of persistent sepal yellowcress to these new sites would require an off-site seed source since the existing seed bank would be flooded. Colonization of new habitat might be very slow

unless augmented by human release of persistent sepal yellowcress seed. Water levels at Seminoe Reservoir would have been permanently raised under the proposed Stage III project in the mid-1980s. Maintaining reservoirs at a constant level may also be a potential problem for this species because it would encourage later successional species to become established and crowd out populations of disturbance-adapted plants like persistent sepal yellowcress. Current management, in which water levels fluctuate annually, appears to be ideal for periodically creating new microsites favorable for persistent sepal yellowcress colonization. Impacts from fishing, swimming, boating, hiking, and other non-motorized activities appear to be minimal at these sites. Off-road vehicle (ORV) use, however, may result in significant soil compaction or uprooting of plants in beach areas. Competition from exotic species may impact population recruitment. Many sandy beaches along reservoirs are becoming infested with *Tamarix chinensis*, which could stabilize the substrate over time and reduce the amount of disturbed habitat available for persistent sepal yellowcress. The increased shade may also have adverse effects on the population. Additionally, the Bureau of Reclamation uses pesticides for weed control around the reservoirs, which may affect plants that come into contact with the pesticide. Populations of persistent sepal yellowcress in small inlets of Seminoe Reservoir may receive high use by wildlife species, especially deer and raccoons. It is not known if trampling or herbivory by wildlife is a potential threat to this species (Fertig and Welp 1998).

Porter's Sagebrush
Porter's sagebrush is endemic to the Wind River Basin with known occurrences only in Fremont, Johnson, and Natrona counties. Habitat for this perennial subshrub is sparsely vegetated badlands from 5,300 to 6,500 feet above MSL. A low number (6 to 20) of occurrences are documented for Porter's sagebrush. This species is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance. Although trend data are not available, trends since 1950 are thought to be stable. Threats to this species include oil and gas exploration and development as all known occurrences are within a known geologic structure identified as high priority for gas exploration and development.

Precocious Milkvetch
This legume is known only from four locations in the vicinity of McKinnon in extreme southwestern Sweetwater County. Precocious milkvetch is found in cushion plant communities in sagebrush grasslands on rocky clay (possibly calcareous) soils. Most of the known habitat for precocious milkvetch is on public lands. A field survey conducted for the BLM by the Wyoming Natural Diversity Database in 1989 established permanent transects in four locations for population monitoring (with the recommendation that they be read every three years). Estimates of population size at that time ranged from 1,000 to 10,000 plants. Due to its very restricted geographic range, the precocious milkvetch is extremely vulnerable to extinction. The entire species occurs within an area of less than ten square miles.

Prostrate Bladderpod
Prostrate bladderpod is a regional endemic, perennial forb. It is found in central and southeastern Idaho, in southwestern Wyoming, and northeastern Utah. In Wyoming, it occurs in the Overthrust Belt in Lincoln and Uinta counties. Prostrate bladderpod grows on slopes and rims of limey clays and soft sandstones with a fine gravel surface layer at elevations of 7,200 to 7,700 feet. Current threats to this species are low because the plants grow on steep slopes; however, future oil and gas development and pipeline construction may pose a threat.

Sidesaddle Bladderpod
Sidesaddle bladderpod is a regional endemic of eastern Wyoming and is considered critically imperiled within the state (NatureServe 2011). Its habitat is dry, open and frequently barren soil, rock outcrops, or road shoulders of gravel, shale, or limestone (Fertig 1999). Threats are currently considered low (Fertig 1999). Populations occur within the Newcastle Field Office.

Slender Moonwort
This perennial fern does not have consistent habitat needs with the exception of being found in higher elevations of 4,900 to 9,900 feet. This species is considered critically imperiled in Wyoming. Surveys for this species can be problematic as this fern does not always produce vegetative growth every year (NatureServe 2011). Slender moonwort is threatened by impacts associated with recreational activities. Habitat succession and fire suppression may threaten slender moonwort. However, the relationship of habitat succession and fire suppression to the persistence of slender moonwort is unclear. Slender moonwort populations may be affected by grazing by livestock or wildlife. The specific effects of grazing on the species are unknown, although if grazing by livestock or wildlife species occurs prior to the maturation and release of spores, the capacity for sexual reproduction of affected plants may be compromised. Only nine populations of slender moonwort are known to exist, and the small amount of occupied habitat and few individuals, combined with ongoing threats, make this species vulnerable to extinction. All of the remaining sites that support slender moonwort are small and fragmented, and the various sites are vulnerable to impacts from factors including herbicide use, recreational activities, competition from non-native vegetation, road construction and maintenance, development, timber harvest, and incidental loss from trampling or grazing by wildlife or livestock. Also, all of these populations are particularly susceptible to extinction from random events because of their extremely small size (USFWS 2001).

Small Rockcress
Small rockcress is known from only one location in the southern Wind River Range in Fremont County, Wyoming. The single known population occurs on about six acres of BLM-managed public land near Pine Creek. Small rockcress is found in crevices and on sparsely vegetated, very coarse soil in granite-pegmatite outcrops surrounded by sagebrush grassland. Most granite-pegmatite outcrops in the South Pass area were surveyed in 1986 by the Nature Conservancy-Wyoming Natural Diversity Database (Marriott 1988). Other suitable habitats along the Lander Cutoff were spot-checked. No other populations were located during that survey. More plants were found in the immediate area during a later survey conducted for the USFWS (Dorn 1990). The population size is estimated at 600 individuals. Motorized recreational activity and livestock grazing in the area have been identified as threats to the population. The extremely restricted geographic range of this species makes it highly vulnerable to extinction. A Habitat Management Plan has been developed for the protection of the small rockcress and its habitat. Protective management actions include annual monitoring, road closure and fencing to protect habitat from damage by livestock and off-road vehicles.

Stemless Beardtongue
Stemless beardtongue (*Penstemon acaulis* var. *acaulis*) is a regional endemic restricted to the southern Green River Basin and northern foothills of the Uinta Range in Sweetwater County, Wyoming, and adjacent Daggett County, Utah. This species is restricted to cushion plant/bunchgrass communities within openings in sagebrush grasslands on flats or gentle outwash fans of rocky clay or sandy soil. Prior to 2000, *P. acaulis* was known from only seven main colonies (representing 3 extant occurrences) in Wyoming. Surveys in 2000 documented an additional 14 small colonies on BLM-administered lands east of McKinnon numbering 2770-4220 individuals. The total Wyoming population is currently estimated at less than 10,000 plants in 100 acres of habitat. Two of the Wyoming populations also extend into Utah, where this species appears to be far more abundant. Due to the scarcity of baseline data, long-term trends are not known, although at least some colonies have probably declined in historic times due to habitat degradation. Potential threats at present include loss of habitat to gravel quarrying, trampling associated with off-road vehicle recreation and livestock trailing, high recreation use near Flaming Gorge Reservoir, competition from exotic weeds, and pollution (Fertig and Welp 2001).

Trelease's Racemose Milkvetch
Trelease's racemose milkvetch is a regionally endemic Wyoming species. It grows on barren hills and washes, although little else is known about this species. The Wyoming Rare Plant Technical Committee is

currently compiling information on the Trelease's racemose milkvetch. Populations of Trelease's racemose milkvetch are known to occur in Sublette and Uinta counties (Dorn 1992).

The taxon has been affected by road construction and road maintenance activities. Habitat was eliminated by construction of Interstate 80, which was accompanied by grading and re-contouring of Blacks Fork River valley slopes. The roadcut through Badlands outcrop on Hwy 189 may have reduced or degraded outcrop habitat. It may also have created habitat on the embankment and beside the road shoulders. Those plants on the embankment above the roadbed are secure unless the highway is widened. Those few plants growing beside the road shoulders were directly sprayed with herbicide in 2002 and apparently killed.

Oil, gas, and coalbed methane developments are potential impacts. The placement of exploration wells, oil roads, oil pads, and pipelines avoided the Trelease's racemose milkvetch population on Cretaceous Mountain to date. Further information needs to be gathered whether this site is slated for any further development and the nature and scope of rehabilitation. The highly localized distribution pattern of the taxon means that there can be major losses in its numbers from such developments. Furthermore, the full range of exploration activities and rehabilitation activities may have potential affects, not just oil field development. Off-road recreational use was not observed at any of the sites, but the unconsolidated substrate conditions and uneven topography of species' habitat may be favored by recreationists.

There were no signs of livestock grazing the taxon or indirectly damaging it, though all BLM populations are part of livestock allotments. Most populations and subpopulations are readily accessible to livestock but occupy habitat that corresponds with secondary range, receiving little use. One of the small populations is in an allotment with poor range condition, and it is possible but not proven that its small size reflects trampling activity, changes in erosion patterns, and/or exotic species encroachment in areas of suitable habitat. Placement of salt blocks and stock ponds may concentrate livestock use, and one population recently had a stock pond excavated within 300 feet.

Trelease's racemose milkvetch is an accumulator of selenium, and destruction of seleniferous vegetation has been practiced as a range management technique in some situations. Selenium (Se) is among the few elements that plants absorb in sufficient amounts that can be toxic to livestock. It has a similar atomic structure to sulfur, and is incorporated into cellular components in its place (sulfur-containing amino acids, for example). This substitution of Se for sulfur can cause chronic selenium toxicity resulting in deformity or mortality in birds, fish and mammals. There is no evidence that the taxon has been affected by eradication efforts. In fact, the species has low selenium concentrations relative to the type variety and may hold clues to the evolutionary development of this adaptation (Heidel 2003).

Tufted Twinpod

Tufted twinpod is a BLM Wyoming sensitive perennial forb, as well as a with NHN global and state-imperiled species. Tufted twinpod occurs on dry, rocky calcareous knolls and ridges, shaley hills, and clay banks. This species occurs in openings within sagebrush grassland at elevations of 6,700 to 7,400 feet in sparsely vegetated cushion plant communities. Tufted twinpod is an endemic to the southern Overthrust Belt and lower Green River Basin in Lincoln, Sublette, and Uinta counties in southwest Wyoming. Tufted twinpod may be adaptable to disturbed sites and threats appear minimal. The species occurs on lands managed by Fossil Butte National Monument and the BLM Kemmerer, Pinedale, and Rock Springs Field Offices.

Tufted twinpod is potentially threatened by trampling or soil compaction associated with off- highway vehicle recreation. Populations in the Fossil Butte area may be impacted by the development or expansion of limestone or fossil quarries (Kyte 2000). Some populations may occur within active or expanding oil and natural gas fields and could be vulnerable to surface disturbing activities associated with pipeline or well pad construction or mineral exploration. Most populations are located on rim areas with highly erosive soils that can be readily avoided during construction. This species is not directly affected by grazing, but could be secondarily impacted by competition from exotic plants or soil compaction or erosion if livestock are congregated at stock ponds or salt blocks located in occupied habitat (Fertig 2002).

Uinta Greenthread

Uinta greenthread is restricted to less than 100 square miles in southwestern Sweetwater and southeastern Uinta counties and one location in Summit County, Utah. This species occurs along mountaintop rims on isolated plateaus capped with cobbly, coarse soils formed from Bishop Conglomerate. This species is generally abundant where it occurs; populations range in size from thousands to tens of thousands of individuals. Due to its overall restricted range, disturbance could significantly impact the species.

Whitebark Pine

See species description under federally listed species.

William's Wafer-parsnip

William's wafer-parsnip is a perennial umbel, endemic to limestone habitats in the Bighorn Mountains. A moderate number (21 to 75) of occurrences are documented for William's wafer-parsnip. This species is uncommon (5,000 to 50,000 individuals or 500 to 5,000 occupied acres) in abundance, and distribution is limited to four counties in Wyoming, including Natrona. Populations are thought to be stable in part because habitat is often inaccessible and cattle and sheep apparently do not graze this species. However, limestone quarrying and other ground disturbance may pose a threat to this species.

Winward's Narrow Leaf Goldenweed

Winward's narrow leaf goldenweed is a regional endemic shrub of southwest Montana and northwest Wyoming. In Wyoming it is found in the Yellowstone Plateau, southern Absorka and northern Wind River ranges, and Overthrust Belt in Fremont, Lincoln, Park, Sublette, and Teton counties. Species are found primarily on dry, clay-rich or cobblestone terraces above large streams (Fertig 1999b). Threats include erosion of unstable soils where the plant occurs from OHV use or livestock trampling (NatureServe 2011).

Wyoming Tansymustard

The Wyoming tansymustard is a perennial herb with small, yellow flowers (NatureServe 2011). This species is endemic to the Absaroka Mountains (Park and Fremont counties) and on isolated buttes in Sweetwater County. The Sweetwater County populations are located on both BLM and private lands in the Resource Area. The Sweetwater County populations are interesting in that they are widely disjunct from the main populations in the mountains of northwest Wyoming. The high, north-facing sandstone bluffs at Pine Butte and Lion Bluffs rise from the surrounding dry sagebrush grasslands and provide the cool, moist microsites the species requires. The plants grow close to the base of the bluffs in sandy soil. It is surmised that the species is a relic of a cooler climatic period and has retreated to the only available habitat in the area which suits its needs.

Its limited range, small populations and lack of vigor make the Wyoming tansy mustard very vulnerable to extinction. At Pine Butte, surveys conducted in 1987 and 1991 observed less than 200 individuals in the habitat of under ten acres. The population at the Pine Butte site is relatively inaccessible. Population information is not available for the Lion Bluffs site. This population of the Wyoming tansy mustard is vulnerable because of its location on Quaking Aspen Mountain. The single identified immediate threat to this population is mineral location.

Considerations for Other Wildlife Species

The Forest Service and WGFD also maintain lists of wildlife species considered sensitive or of special concern. In some cases, these species have been included on the BLM Special Status Species (Sensitive Species) list. The species listed below are those which have not been included on the BLM Special Status

Species (Sensitive Species) list. Most of the species on the Forest Service and WGFD lists have documented occurrences within the planning area, but the extent of the populations on BLM-administered lands is unknown. Some species listed as sensitive by Forest Service or as of special concern by the State of Wyoming are not listed by the BLM as a result of significant habitat or range differences. The known status and distribution of those species are discussed below.

River Otter

The northern river otter is a WGFD Species of Greatest Conservation Need (WGFD 2010) and is protected by Wyoming Statute. They are found in largely undisturbed riparian areas and may range up to 40 miles in search of food such as fish, crayfish, frogs, clams, salamanders, snails, turtles, snakes, insects, muskrats, and birds. River otters nest in burrows and caves and are mostly nocturnal. Natural populations of this species occur in the Green River Basin and the western half of Wyoming.

While North American river otters are not endangered, their populations are still threatened by humans. It is still legal to trap river otters in 38 states and anywhere from 20,000 to 30,000 individuals are killed each year for their pelts. Apart from the fur trade, the two largest threats to these animals are habitat destruction and water pollution. Despite the wide variety of habitats in which the North American river otter can be found, they are particularly shy animals and will try to avoid human contact in the wild. As human populations develop areas in which wild otters live, the animals are forced into smaller and smaller territories. They are also incredibly sensitive to pollutants, and otter populations have suffered declines around human settlements and agricultural areas.

Water Vole

The water vole is a Forest Service Sensitive Species and a WGFD Species of Special Concern. It lives in semiaquatic habitats of subalpine meadows and alpine areas. This species lives near water, generally along stream and creek banks or around flooded marshes. The water vole is found more often in old-growth stands than in mature forest stands. Populations of this species are found in areas with a high percentage of exposed soil and a low percentage of canopy cover (Doyle 1987). There is confirmed breeding of water voles in areas in which potential habitat for this species occurs along the periphery of the planning area (Luce et al. 1997).

Heavy grazing by large mammals, whether native ungulates or livestock or a combination of both, can degrade the quality of water vole habitat through direct disturbance of soil and vegetation in riparian areas. Livestock grazing has been cited as likely the greatest anthropogenic threat to water voles in this region. It is important to note that most of these conclusions are based on limited trapping information and observations of general habitat condition, and not on controlled experiments designed to specifically test the effect of livestock on water voles. The emphasis on livestock over free-ranging wildlife probably stems in part from the fact that livestock impacts are more controllable by managers. Livestock grazing negatively impacts populations of small mammals in general, and populations of *Microtus* in particular. Livestock grazing also can shift the small mammal community away from high elevation riparian specialists like the water vole toward species that are habitat generalists.

The specific effect of livestock depends on the intensity and frequency of their grazing in the context of grazing by other large mammals. Infrequent livestock grazing with low stocking rates and long rotations may have little impact on water vole occupancy, especially if native herbivores also use the area lightly. Higher grazing intensities of livestock, native herbivores, or both groups can reduce habitat quality by removing water vole food and cover and compacting soil, which can collapse existing burrows and prevent construction of new ones. Prolonged and intense livestock grazing, even in the absence of grazing by native species, can eliminate water vole habitat by destroying stream banks, widening stream channels, lowering local water tables, eroding soil, and altering nutrient cycling. The negative effects of intense grazing may extend into the winter. Any action that degrades the quality of streams and streamside vegetation has at least some potential to degrade water vole habitat, but there is little research to support specific conclusions. Sediment load is likely to increase in watersheds experiencing construction of roads and trails, increased use of roads and trails, large fires, or timber harvest, but the effect of increased sedimentation on water voles has never been investigated. Fires may occasionally burn through riparian meadows, but the potential negative effects on water voles are not well understood and are likely to be short in duration. It is reasonable to assume that drastic changes to water quantity (e.g., major water withdrawals) or quality (e.g., heavy metal contamination from mine leachate) will have negative effects on water voles (Klaus and Beauvais 2004).

Black Tern
Black terns nest along inland marshes and sloughs with fairly dense cattail (*Typha* spp.) or other marsh vegetation and pockets of open water. These wetlands are often shallow (Dunn and Agro 1995). Circumstantial evidence exists that black terns nest in Lincoln County within the planning area, and they also have been observed in the eastern portion of the planning area (Orabona et al. 2012).

Boreal Owl
The boreal owl is a Forest Service Sensitive Species and a WGFD Species of Special Concern. They inhabit dense stands of mature coniferous trees in areas typically adjacent to small meadows. Because they cannot excavate their own nest sites, boreal owls frequently rely on cavities created by other species such as woodpeckers (Marcot 1995). The boreal owl has been observed nesting near Big Piney (WNDD 2002). It may be a year-round resident of higher-elevation coniferous forests.

Forster's Tern
Forster's terns nest along large marshes, estuaries, inland lakes, and reservoirs (Bergman et al. 1970). They are known to breed on the north end of Fontenelle Reservoir (WNDD 2002). The species has also been observed in the eastern portion of the planning area (Orabona et al. 2012).

Golden-Crowned Kinglet
The golden-crowned kinglet is a Forest Service Sensitive Species. They nest in coniferous forests and are very active birds that frequently hover above the ends of tree branches in search of prey (DeGraaf et al. 1991). Golden-crowned kinglets are year-round residents of Lincoln and Sublette counties. Luce et al. (1997) confirmed nesting of this species in the planning area. Golden-crowned kinglets are also known to winter northeast of Pinedale and in the southeast region (WNDD 2002).

Great Gray Owl
The great gray owl inhabits dense montane coniferous forests. They have been observed and are thought to possibly breed in the planning area (Orabona et al. 2012).

Harlequin Duck
The harlequin duck is a Forest Service Sensitive Species and a WGFD Species of Greatest Conservation Need (WGFD 2010). It breeds along small, clear turbulent streams and rivers with a high abundance of aquatic invertebrates. Nests are constructed under cover on cliffs along the shore and occasionally in tree cavities. The species has been confirmed breeding in the western half of the planning area and has also been observed in the eastern portion (Orabona et al. 2012).

Lewis' Woodpecker
Lewis' woodpecker is a Forest Service Sensitive Species and a WGFD Species of Greatest Conservation Need (WGFD 2010). They use ponderosa pine forests; open riparian woodlands dominated by cottonwood; and mixed-conifer, logged, or burned pine forest. Orabona et al. (2012) documented breeding in the planning area. It is possible that occasional overwintering by this species occurs.

Merlin
The merlin is a Forest Service Sensitive Species and a WGFD Species of Greatest Conservation Need (2010). In Wyoming, the species typically found is Richardson's merlin, the prairie species. Merlin nest in the canopy of large trees, often in association with old nests of other birds. They seem to prefer coniferous forests for nesting but also will use various mature forested habitats. Preferred habitats are usually intermixed with suitable foraging areas, such as shorelines, meadows, and recently cleared areas (DeGraaf et al. 1991). The Richardson's merlin is a year-round resident in Lincoln and Sublette counties, although many birds migrate south for the winter. Orabona et al. (2012) report confirmation of breeding merlin in the planning area. This species has also been known to winter in the southeast region of the planning area (WNDD 2002).

Northern Pygmy Owl
Northern pygmy owls nest in coniferous and mixed forests containing open spaces and clearings. These owls frequently use old woodpecker cavities for their nests (Holt and Peterson 2000). According to Orabona et al. (2012), northern pygmy owls have been confirmed as nesting in the planning area.

Three-Toed Woodpecker
The three-toed woodpecker is a Forest Service Sensitive Species and a WGFD Species of Greatest Conservation Need (WGFD 2010). It nests in older, dense coniferous forests and in areas with natural clearings from disease, fire, or windfall (Yunick 1985). Orabona et al. (2012) confirmed nesting of three-toed woodpeckers in the planning area.

Wyoming Natural Diversity Database and Other Plant Species of Special Concern

The species described below are ranked by the Nature Conservancy's NHN and listed by the WYNDD. These species lack formal federal status or protection, although they are considered locally or regionally rare or imperiled, but they are not contained within the BLM's list of special status species.

California Hesperochiron
California hesperochiron is a low-growing perennial herb found in moist to dry hills and flats, often in alkaline soils, at elevations of 6,700 to 7,000 feet (Dorn 1992; Fertig and Beauvais 1999). It is ranked by the NHN as critically imperiled in Wyoming and globally secure for most of its range. California hesperochiron is distributed along the West Coast states, western Montana and Wyoming, and northeastern Utah. The Wyoming distribution includes only the Evanston area in Uinta County and the Upper Green River Basin in Sublette County (Fertig and Beauvais 1999). Threats to the species have not been identified.

Deep Creek Cinquefoil
Deep Creek cinquefoil is a perennial herb and ranked by the NHN as globally rare to secure, but state critically imperiled as well as being a Species of Concern to WYNDD. Deep Creek cinquefoil is on the edge of its range and occurs on rocky desert hills and ridges in Sweetwater and Uinta counties. Threats and trend status are unknown at this time. The populations are found on land managed by the BLM Kemmerer and Rock Springs Field Offices.

Desert Glandular Phacelia
Desert glandular phacelia is ranked by the NHN as questionably critically imperiled in Wyoming and secure to rare across its range. It grows on semibarren south- or west-facing upper slopes in gray clay shale covered by fragmented slate (Fertig and Beauvais 1999). Less often, desert glandular phacelia may occur on chalky, limey-slate outcrops dominated by cushion plants or in openings within shadscale, green rabbitbrush, and greasewood mixed shrubland (Fertig and Beauvais 1999). Desert glandular phacelia is endemic to the Great Divide Basin and the desert foothills of the Overthrust Belt in southwestern Wyoming in Lincoln, Sweetwater, and Sublette counties (Fertig and Beauvais 1999). Occurrences in the planning area are known in the Ross Butte vicinity and southeastern Lincoln County. The BLM Kemmerer, Pinedale, Rawlins, and

Rock Springs Field Offices and the Flaming Gorge National Recreation Area have known populations of desert glandular phacelia within their jurisdictional boundaries. General threats to desert glandular phacelia include OHV activity and mineral exploration.

Divergent Wild Buckwheat

Divergent wild buckwheat is ranked by the NHN as state critically imperiled and globally secure. It is a low-spreading annual that grows in cushion plant-bunchgrass communities or on the edges of sagebrush grasslands. It prefers barren or semibarren clay, shale, or sandstone hills and washes at elevations of 6,250 to 7,500 feet (Dorn 1992, Fertig and Beauvais 1999). The distribution of divergent wild buckwheat in Wyoming includes the Great Divide and Green River Basins in Sublette, Sweetwater, Lincoln, and Uinta counties (Fertig and Beauvais 1999). Impacts and threats from oil and gas development that could potentially occur in or around populations are unknown (Fertig and Beauvais 1999).

Douglas' Campion

Douglas' campion is a perennial forb ranked by the NHN as globally secure and state critically imperiled as well as being a Species of Concern to WYNDD. Douglas' campion is on the edge of its range and occurs on hills and slopes in western Lincoln County (BLM 2003). Threats and trend status are unknown at this time.

Fullstem

Fullstem is a perennial forb Species of Concern to the WYNDD with a NHN ranking of globally secure, but a state ranking of imperiled to critically imperiled. Fullstem is a regional endemic of southeastern Wyoming and northeast Utah. In Wyoming, fullstem is known only from the southern Green River and Washakie basins in Sweetwater County. Fullstem occurs in cushion plant communities on sparsely vegetated calcareous clay barrens rims and benches or in dry washes on extremely fine clay shales at elevations of 6,350 to 7,400 feet. This species may be threatened by oil and gas development and associated construction.

Garrett's Beardtongue

Garrett's beardtongue is a perennial forb with NHN rankings of globally secure, trinomially rare, and state critically imperiled as well as being a Species of Concern to WYNDD. Garrett's beardtongue is a regional endemic of northeastern Utah and southwestern Wyoming, known in Wyoming from the Green River Basin and northern foothills of the Uinta Range in Sweetwater and Uinta counties. In Wyoming, Garrett's beardtongue is found in rolling semibarren badlands on clay soils, openings within vegetative communities on gentle clay slopes covered with small slate fragments, or on steep clay or talus slopes covered with slate chips below steep cliffs at elevations of 7,600 to 8,400 feet. Threats include impacts from surface disturbances, road construction, and vehicle trampling.

Great Basin Downingia

Great Basin downingia is an annual herb Species of Concern to WYNDD with a NHN rank of globally secure, but a state rank of critically imperiled. This species is wide ranging, with occurrences in Wyoming known from the Laramie basin, Sweetwater River Plateau, and Overthrust Belt in Albany, Carbon, and Uinta counties. Great Basin downingia occurs in moist clay or sandy openings along ditch banks and reservoirs at elevations of 6,160 to 7,600 feet. Little is known about the trend status or threats to the species, but it may be impacted by recreational activities and other disturbances along the margins of its habitat.

Hayden's Milkvetch

Hayden's milkvetch is a perennial herb with globally and trinomially secure rankings, but is a Species of Concern to WYNDD, and has state-imperiled NHN ranking. In Wyoming, Hayden's milkvetch occurs from the Washakie and Great Divide basins in Carbon, Fremont, and Sweetwater counties and the Overthrust Belt in Lincoln and Uinta counties. Hayden's milkvetch grows on clay or sandy soils on rims, upper slopes, and draws associated with sandstone outcrops or springs at elevations of 6,600 to 7,660 feet. Threats and trends are unknown for this species. The populations occur on lands managed by the BLM Kemmerer, Lander, Rawlins, and Rock Springs Field Offices.

Hoary Willow
Hoary willow is ranked by the NHN as globally secure but imperiled in Wyoming. This low-growing shrub is found on wet to saturated soils in floating mats, bogs, fens, and willow thickets around ponds from the foothills to montane zones at elevations of 6,600 to 9,200 feet (Dorn 1992, Fertig and Beauvais 1999). Wyoming populations of hoary willow are known from the Absaroka, Beartooth, Laramie, and Medicine Bow ranges; the Yellowstone Plateau; and the Upper Green River Basin, possibly within the planning area (Fertig and Beauvais 1999). Grazing pressures may be a threat (Fertig and Beauvais 1999).

Juniper Prickly-pear
Juniper prickly-pear is a clump-forming perennial succulent cactus ranked by the NHN as critically imperiled in Wyoming and trinomially rare, yet globally secure throughout its range. It is also a Species of Concern to WYNDD. Juniper prickly-pear is found from eastern Utah and southwestern Wyoming to western Colorado, northern Arizona, and New Mexico. Habitat includes sandy soils of flats, washes, and hillsides in desert shrub, grassland, and open grassy flats in southern pinyon-juniper woodlands. The Wyoming populations are peripheral and occur in sandy or gravelly substrates with desert shrubs at elevations of 6,120 to 6,950 feet. Abundance, trend, and threats to juniper prickly-pear are unknown. Juniper prickly-pear occurs on lands within the Flaming Gorge National Recreation Area, the BLM Kemmerer and Pinedale Field Offices, and the Seedskadee National Wildlife Refuge. Threats to juniper prickly pear are unknown.

Low Spike Moss
Low spike moss is a perennial moss-like herb that occurs in saturated moss-covered zones in wet meadows at elevations of 7,700 to 8,000 feet (Dorn 1992, Fertig and Beauvais 1999). It is ranked by the NHN as globally secure but critically imperiled in the state. Low spike moss has a large range across North America. In Wyoming, populations are known from the Upper Green River Basin in the planning area and from the foothills of the Wind River and Teton ranges in Sublette and Teton counties (Fertig and Beauvais 1999). General threats to low spike moss populations include development of subdivisions and dam construction (Fertig and Beauvais 1999).

Nevada Sweetpea
Nevada sweetpea is a perennial herb Species of Concern to WYNDD and ranked by the NHN as globally and trinomially secure, but critically imperiled within the state. In Wyoming, Nevada sweetpea is known from the north slope of the Uinta Range in Uinta County and a location in Hot Springs County. Nevada sweetpea is found in mesic meadows and willow communities and occurs on land managed by the Wasatch-Cache National Forest and the BLM Kemmerer Field Office.

Moab Milkvetch
Moab milkvetch is a perennial herb ranked by the NHN as globally secure, trinomially rare, but is state-imperiled as well as being a Species of Concern for WYNDD. Moab milkvetch grows on desert hills in Sweetwater and Uinta counties. Threats and trend status are unknown at this time. The populations are found on land managed by the BLM Kemmerer and Rock Springs Field Offices.

Mountain Peppergrass
Mountain peppergrass is ranked by the NHN as critically imperiled in Wyoming but secure throughout most of its range. It is a perennial herb that is found on meadows, slopes, and disturbed areas, such as roadsides, at elevations of 6,800 to 7,000 feet (Dorn 1992, Fertig and Beauvais 1999). The range of mountain peppergrass is from New Mexico to Utah and Wyoming. Wyoming populations are known from one occurrence in the Green River Basin near the Big Piney and Marbleton areas in the planning area (Fertig and Beauvais 1999). This species may be adapted to disturbance and therefore semi-weedy. More research

is needed to investigate this possibility. Roadside populations of mountain peppergrass may be susceptible to herbicides or other disturbances (Fertig and Beauvais 1999).

Narrow-leaved Bladderpod
Narrow-leaved bladderpod is a perennial forb ranked by the NHN as globally secure, trinomially rare, and state critically imperiled, as well as being a Species of Concern to WYNDD. In Wyoming, narrow-leaved bladderpod is found from the Sierra Madre and Uinta Mountains and the Green River Basin in Carbon, Sweetwater, and Uinta counties. It grows in cushion plant or sagebrush and juniper grassland communities on windswept ridges, gravelly hills, rocky knolls, or clay hillsides at elevations of 6,500 to 8,700 feet. Trend status is not known, but abundance is usually low at known sites. Threats to the narrow-leaved bladderpod include surface disturbances along rim areas. Narrow-leaved bladderpod occurs on land managed by the Medicine Bow National Forest and the BLM Kemmerer Field Office.

Rufous-spine Prickly-pear
Rufous-spine prickly-pear is a perennial succulent cactus ranked by the NHN as globally and trinomially secure, but with a state ranking of imperiled as well as being a Species of Concern to WYNDD. In Wyoming, rufous-spine prickly-pear is a peripheral species known from the Green River and Washakie basins in Sweetwater and Lincoln counties. Rufous-spine prickly-pear grows in sagebrush grassland, salt desert shrublands, and vegetated sand dunes on slopes and buttes at elevations of 6,500 to 7,100 feet. Abundance, trend, or threats are not known for the species. Rufous-spine prickly-pear occurs on land managed by the Flaming Gorge National Recreation area and the BLM Kemmerer, Rawlins, and Rock Springs Field Offices.

Sickle Saltbush
Sickle saltbush is a shrub Species of Concern to WYNDD and ranked by the NHN as critically imperiled in the State of Wyoming, even though globally secure. Sickle saltbush grows in sagebrush-dominated communities on desert hills, mesas, draws, and gravel benches with sandy to clayey soil (Dorn 1992, Fertig and Beauvais 1999). The known range of sickle saltbush includes southeastern Washington to northeastern California, east to Montana, Utah, and Nevada. In addition to Uinta County, Sublette and Sweetwater counties also contain known populations (Fertig and Beauvais 1999). Disturbance from mining exploration may impact some populations of sickle saltbush. Management entities with known populations include the BLM Kemmerer, Pinedale, and Rock Springs Field Offices.

Sodaville Milkvetch
Sodaville milkvetch is a perennial forb ranked by the NHN as globally and trinomially secure, but is state-imperiled and a Species of Concern to WYNDD. In Wyoming, sodaville milkvetch is restricted to the Overthrust Belt in Lincoln and Uinta counties. Sodaville milkvetch grows in big sagebrush communities on rocky clay slopes and ridges below rimrock at elevations of 6,540 to 6,800 feet. Threats to the species include OHV use and invasive species.

Swallen Mountain-ricegrass
Swallen mountain-ricegrass is a perennial bunchgrass with BLM sensitive status in the BLM Rock Springs planning area, as well as a Species of Concern to WYNDD. The NHN ranks the species as globally secure, but is state-imperiled and possibly rare in parts of its range. It occurs on sandy to gravely limey-clay soils covered with gravel. Swallen mountain-ricegrass occupies rocky slopes, rims, and mesa summits, often associated with sagebrush grasslands at elevations of 6,500 to 7,900 feet. Swallen mountain-ricegrass is an endemic of east-central Idaho and western Wyoming. Wyoming populations occur only in the western Green River Basin in Lincoln and Sublette counties. Threats to populations include oil and gas development. Known populations occur on lands managed by the BLM Kemmerer, Pinedale, and Rock Springs Field Offices.

White-margined Phlox
White-margined phlox is a perennial herb ranked by the NHN as globally secure and Wyoming State critically imperiled; as well as being a Species of Concern to WYNDD. White-margined phlox is a regional endemic on the edge of its range found on rocky slopes and flats in Lincoln County. Threats and trend status are unknown at this time. The populations are found on land managed by the BLM Kemmerer Field Office.

Casper Field Office

The Casper Field Office is responsible for managing habitat, while the management of special status wildlife and fish species is overseen by state and federal wildlife management agencies. The WGFD manages resident special status wildlife populations and migratory game birds within four regions (Casper, Laramie, Lander, and Sheridan) encompassing the field office. The information included in this section is unique to the Casper Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Casper Field Office. Descriptions following the table provide detailed information of those special status species.

Within the Casper Field Office there are two birds, one mammal, and three plant species that have been designated as listed, proposed for listing, or are identified as candidate species as per the ESA. Within the Platte River System, four animal species and one additional plant species are considered for projects involving water depletion. Although these species are located in Nebraska, losses of water within the Casper Field Office may affect these species' habitats downstream along the Platte River. Several special status species which occur in the field office are also discussed below.

Wildlife

Black-footed Ferret
Black-footed ferrets are located in the Shirley Basin-Medicine Bow Black-Footed Ferret Management Area. The BLM currently manages 145,640 acres of public lands in Natrona County within the black-footed ferret ESA Section 10J Rule area, in accordance with the black-footed ferret experimental release efforts in Shirley Basin. Although black-footed ferrets from the experimental release area currently are not documented in the field office, it is possible that ferrets have dispersed into the area. It is possible that this species could occasionally occur in or expand into the field office. Other black-tailed prairie dog complexes, potentially suitable for black-footed ferret reintroduction, occur at other locations within the field office (WGFD 2005a).

Preble's Meadow Jumping Mouse
The highest potential for occurrence of Preble's meadow jumping mouse is located in four places along riparian areas in Converse and Platte counties within the Casper planning area. This habitat includes varying widths (360 to 394 feet) from stream edge for portions of Cottonwood, Chugwater, Lodgepole creeks and some tributaries (USFWS 2003c) and from 2003 to 2008 was designated by the USFWS as critical habitat. On July 10, 2008, all critical habitat designated in 2003 within the State of Wyoming was removed from the regulations at 50 CFR 17.95 for this species.

White-tailed Prairie Dog
The white-tailed prairie dog occurs in southern and western Natrona County, including on 3,370 acres of BLM-administered land. Some colonies within the southern portion of Natrona County are within the Shirley Basin-Medicine Bow black-footed ferret experimental release area. White-tailed prairie dogs have not drawn as much management attention in the past for animal damage-control efforts as have black-tailed prairie dogs.

Black-tailed Prairie Dog
In the field office, black-tailed prairie dog habitats generally occur in Natrona, Converse, Platte, and Goshen counties; however, most suitable habitat, especially arable lands and drainage bottoms, are located on private and state land. Eight black-tailed prairie dog complexes (44,690 acres within the field office) either completely or partially exist within the boundaries of the field office. For land within the field office administered by the BLM, three of these complexes are greater than 5,000 acres in size and the others are between 800 and 5,000 acres. These complexes may represent important habitats for future black-footed ferret populations.

Prairie dog control within the Casper planning area may be initiated as follows:

- The Animal and Plant Health Inspection Service (APHIS) or their authorized agent carry out prairie dog control actions.
- No prairie dog control measures will be carried out on prairie dog towns that are more than 0.5 mile from private land, unless human health or safety concern is documented, or where resource damage occurs and is documented by the BLM.
- Treatment of prairie dog towns will be considered only if a written request is received from the owner of adjacent property. The BLM will not conduct treatment unless adjacent private lands are treated concurrently.
- No treatment will occur in areas identified for black-footed ferret reintroduction, except when public health and safety risks warrant control.
- Surface-disturbing and disruptive activities should be designated in a manner that avoids prairie dog towns and complexes (CSU). Where this is impractical, the disturbance should be located in a manner where it will have the least amount of impact to prairie dogs.

Bald Eagle
Five bald eagle nests have been identified within the field office. There are 11 known bald eagle roost sites within the field office; however, not all of these roosts occur on public lands. Of the 45,770 acres of bald eagle roost areas in the field office, approximately 14,060 acres (31%) occur on BLM-administered land surface. Approximately 37,290 additional acres of bald eagle roost areas occur on federal mineral estate. An important winter roost for bald eagles is found in the Jackson Canyon ACEC, as well as smaller sites scattered throughout Natrona and Converse counties. Bald eagle habitats are described in detail in the Bald Eagle HMP for the Platte River Resource Area and the Jackson Canyon ACEC (BLM 1992b).

Greater Sage-Grouse
Presently, there are approximately 200 Greater Sage-Grouse leks documented throughout the field office, primarily in Natrona and Converse counties, with the highest densities of leks occurring in larger tracts of sagebrush shrublands. The largest Greater Sage-Grouse lek complexes are found in Bates Hole, the Shirley Basin, the Rattlesnake Hills, the South Bighorns, and the Laramie Range foothills. Occupied habitat is fairly contiguous throughout much of Bates Hole and the Shirley Basin. Habitats within the Rattlesnake Hills and the South Bighorns are more fragmented by changes in habitat type and land use practices. Greater Sage-Grouse habitats in the Laramie Range are primarily limited to the portion of the west slope of the Laramie Range. Large contiguous blocks of sagebrush and grassland communities east of the Laramie Range have, for the most part, been eliminated. Specific wintering concentration areas of Greater Sage-Grouse within the field office are not widely documented to date.

The following discussion of the Greater Sage-Grouse population trend within the field office is summarized from *Greater Sage-Grouse Assessment Input to Bureau of Land Management Casper Field Office Resource Management Plan Revision* (WGFD 2005b). The WGFD and the BLM have annually surveyed and monitored Greater Sage-Grouse leks since the 1950s. Male attendance on leks is utilized by the WGFD to provide an index of relative change in population abundance in response to environmental conditions over time. The number of males observed per lek has decreased by more than 31% since 1958. More recently, the number of males counted per lek increased through the 1980s, peaked in 1992, dramatically declined through the early 1990s, came to an all-time low between 1994 and 1997, and has since recovered to a level similar to the early 1980s. Since data collection was standardized in 1996, the number of males counted on leks has exhibited some recovery.

In 2000, the Wyoming Sage-Grouse Working Group was formed to develop a statewide, multi-agency strategy for the conservation of the Greater Sage-Grouse. This group prepared the *Wyoming Greater Sage-Grouse Conservation Plan* (Wyoming Sage-Grouse Working Group 2003) to provide for coordinated management and direction across the state. In 2004, local Greater Sage-Grouse working groups were formed to develop and implement local conservation plans. The majority of the field office is split between the Bates Hole/Shirley Basin and Northeast local working groups, in which the BLM participates. Both the Bates Hole/Shirley Basin and Northeast local working groups completed conservation plans in 2007-08. Those plans were revised in 2013-14.

Platte River Bird Species

Within the Platte River System, four animal species and one additional plant species are considered for projects involving water depletion. Although these species are located in Nebraska, losses of water within the Casper Field Office may affect these species' habitats downstream along the Platte River.

Four endangered bird species occurring outside of the field office depend on the Platte River system for survival and are potentially affected by federal actions occurring within the field office. Piping plover, Eskimo curlew, interior least tern, and whooping crane are referred to as Platte River bird species because they occur along the Platte River in central Nebraska, downstream from the field office. Since 1978, the USFWS has taken the position that all actions resulting in water depletions to the Platte River system may jeopardize the continued existence of one or more federally listed species and adversely modify designated critical habitats (USFWS 2002c). The primary management challenge to Platte River bird species is water depletion to the Platte River, which could occur from BLM actions in the North Platte watershed portion of the field office. The Platte River Recovery Implementation Program Draft EIS prepared by the US Bureau of Reclamation (USBOR) and the USFWS (USBR and USFWS 2005) provides details about the challenges affecting these species.

Plants

Blowout Penstemon

Within the Casper planning area, blowout penstemon is not known to occur and there is no designated critical habitat. Potential habitat in the form of blowouts and sand dunes does exist throughout the Casper planning area.

Colorado Butterfly Plant

The Casper Field Office contains critical habitat for the threatened Colorado butterfly plant. It was designated in 2005 on 110 acres of private land (Unit 1: Teepee Ring Creek) in Platte County (USFWS 2005a).

Ute Ladies'-tresses

The Ute ladies'-tresses, is a local endemic known to occur in Converse and Goshen counties (Fertig and Heidel 2007); specifically at Bear Creek, Antelope Creek, Wind Creek, and North Stinking Water Creek. However, there is no critical habitat designated by the USFWS within the Casper planning area.

Kemmerer Field Office

The information included in this section is unique to the Kemmerer Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Kemmerer Field Office. Descriptions following the table provide detailed information of those special status species.

Within the Kemmerer Field Office, there are three bird, three mammal, four fish, and two plant species that have been designated as listed, proposed for listing, or are identified as candidate species as per the ESA.

Within the field office, three wildlife species (grizzly bear, black-footed ferret and Canada lynx) are listed as threatened or endangered and one wildlife species (gray wolf) is listed as nonessential/experimental under the ESA (USFWS 2004a). The bald eagle was delisted from threatened status on July 9, 2007 (USFWS 2007), but it is currently considered a BLM sensitive species. A total of 42 species are listed as sensitive in the field office (BLM 2010). No critical habitat occurs in the Kemmerer Field Office.

Wildlife

Black-footed Ferret

Two historic occurrences of black-footed ferrets were in the field office. One observation was made in 1972 in Lincoln County, and one cranium and one mandible were collected in 1979 from Uinta County (BLM 2005c). Currently, there are no known populations of black-footed ferrets occurring within the field office. From 2002 to 2004, approximately 58 black-footed ferret surveys were conducted for projects in the field office. Several prairie dog complexes were identified as potentially suitable for black-footed ferret reintroduction (BLM 2005c).

Canada Lynx

Several occurrences of Canada lynx are documented for the northern edge of the field office. There are 24 lynx analysis units (LAUs) designated for the field office, including two stand-alone LAUs at the south end of the Bridger-Teton National Forest, Commissary Ridge and Dempsey Ridge (BLM 2005d). Habitat has been delineated for the field office in the north, in the two stand-alone LAUs, and in the south as an extension of the Wasatch National Forest LAUs. Some of this habitat is located within LAUs, and some is not. The delineated habitat separate from LAUs, as that which occurs in the northern part of the field office, reflects the fact that the habitat was not of sufficient size to delineate an LAU, but can be recognized and protected as potential habitat on its own.

Gray Wolf

The field office provides suitable habitat for gray wolves because it is mostly undeveloped, and an abundance of prey such as deer, elk, and moose are present. Several gray wolf packs occur within the boundary of the field office from the Pinedale Field Office, generally located on National Forest System land and associated foothill regions (WGFD et al. 2013). Lone gray wolves and small groups of gray wolves have been observed around Cokeville and as far south as Kemmerer (BLM 2004h, Wyoming Game and Fish Department et al. 2013).

Grizzly Bear

Although grizzly bears do not generally occur in the field office, it is possible for them to disperse, especially in the northern areas of the field office and along the eastern front of the Wyoming Range (Bjornlie et al. 2013). Increased distribution of grizzly bears throughout the Greater Yellowstone Ecosystem has translated to more verified sightings in the Kemmerer field office along the Wyoming Range.

Bald Eagle
The Woodruff Narrows roost supports one of the largest wintering populations of bald eagles in Wyoming. From November through February, approximately 25 to 75 birds roost in cottonwood trees and forage on carrion and various other prey species. The Morgan Canyon roost historically supports approximately five to 15 birds that roost in a patch of subalpine fir trees approximately ten acres in size. Eagles utilizing this roost commonly feed on carrion associated with a nearby big game winter range. An additional roost site, identified as the Rock Creek Roost, is located in Nugget Canyon in six mature conifer trees. This roost is located along Twin Creek adjacent to State Highway 30 and an active railroad. It is currently unknown as to whether this is a satellite of the Morgan Canyon Roost or a separate roosting area. Eagles are commonly attracted to this area due to the high incidence of road-killed animals from wildlife collisions with vehicles in the canyon area providing ample carrion on which to forage. Seven bald eagle nest sites have been documented within the field office, although none is located on lands administered by the BLM (BLM 2003e).

Newcastle Field Office

The information included in this section is unique to the Newcastle Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Newcastle Field Office. There are 23 BLM sensitive species that occur within the project area. Of the 24 species, five are mammals, 15 birds, one amphibian, and two plants.

Greater Sage-Grouse
There are 104 known sage-grouse leks in the field office. Big sagebrush shrublands are the second most abundant vegetative type in the planning unit accounting for about 0.25 of the vegetative types. Sage-grouse populations in the Newcastle Field Office have been cyclic in the last 30 years (Figure 3-48). Average peak male attendance has not been higher than 25 with a low of four.

Pinedale Field Office

The information included in this section is unique to the Pinedale Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Pinedale Field Office. Descriptions following the table provide detailed information of those special status species.

Canada Lynx
Extensive potential habitat for this species occurs immediately adjacent to the field office in the Wind River Mountains and the Wyoming Range. Canada lynx inhabiting these areas could be expected to range into the field office.

Western Yellow-Billed Cuckoo
In Wyoming, the western subspecies of the yellow-billed cuckoo is considered uncommon and is found primarily along waterways in the lower Green River Basin. The species has been documented within the field office, but no known nest sites exist (WNDD 2002).

Gray Wolf
The Pinedale Field Office provides habitat to gray wolf populations, with multiple packs using areas within the field Office. These packs are managed by the WGFD in areas within the Wolf Trophy Game Management Area. Wolf collar data has demonstrated variable yet large pack territory size, as well as a high propensity for dispersal from subadult males (WGFD et al. 2013).

Grizzly Bear

Grizzly bears occur in the Pinedale Field Office primarily in forested and foothill habitats of the Wind River and Wyoming Range, with overall distribution in the system increasing 38.3% from 2004 to 2010 (Bjornlie et al. 2013). Expansion and increase of distribution has occurred with grizzly bears in the field office due to protection through management and population recovery.

Greater Sage-Grouse

Lek Monitoring

The following data about the Greater Sage-Grouse populations within the Pinedale Field Office are taken from "*2010 Sage-grouse Job Completion Report, Upper Green River Basin from 6/1/010to 5/31/11*"(Clause 2011). A total of 140 leks are currently documented in the Upper Green River Basin Working Group Area (UGRBWGA). These leks are classified as follows: 120 occupied, four unknown, and 16 unoccupied. During 2010, a total of 122 leks (94%) were checked by survey or count. Lek monitoring efforts in 2010 primarily focused on counts (76%) over surveys (24%). Results from the counts and surveys showed that 75% of the leks were active and 2% were inactive. The average number of males per lek for all active leks declined to 32 in 2010, compared to 44 males per lek in 2009 and 50 males per lek in 2008. This declining trend is a change compared to increasing trends from 2004 to 2007 (27 males per lek in 2004, 37 in 2005, 49 in 2006, and 57 in 2007).

The proportion of leks checked that are confirmed "active" has stayed relatively stable during the past ten years, ranging from 71% to 81%. Although there has been increased lek inactivity and abandonment in areas associated with gas development activity, additional lek monitoring efforts and searches have resulted in locating new or undiscovered leks (34 new leks since 2004) negating the downward trend in the proportion of active leks in the UGRBWGA.

An analysis was completed in 2008 to assess natural gas development impacts to Greater Sage-Grouse in the Pinedale area. This analysis compared leks within a one mile radius of any gas field activity (primarily based on well pads) to leks outside one mile of gas activity but within the same lek complex. Leks within the Pinedale Anticline Project Area (PAPA) that are located within gas development areas showed a 37% decline, compared to a 37% increase documented on leks away from gas development activities. Leks within the Jonah Project Area that are located within gas development areas showed a 47% decline, compared to a 193% increase (n=1) documented on leks away from gas development activities. See the 2008 or 2009 Sage-Grouse Job Completion Report, Upper Green River Basin Working Group Area for this complete analysis and data tables.

In September of 2008 the ROD for the Supplemental EIS on the PAPA included a "wildlife monitoring matrix" component that identifies sage-grouse thresholds and triggers for management intervention. Efforts were taken during 2010 to recommend modifications (for the BLM consideration) to the "matrix" Greater Sage-Grouse monitoring components to better clarify data collection efforts, data analysis, and mitigation thresholds. Results from this matrix monitoring effort will be reported in future years once monitoring criteria modifications and data analysis are made.

There are currently 25 occupied lek complexes in the UGRBWGA containing 140 total leks (includes unknown and unoccupied leks). This equates to an average of 5.6 leks per complex, with a range of one to 22 leks per complex. Lek complex designations are somewhat arbitrary and can show great variation due to number and location of leks within each complex.

During 2010, 23 of 24 lek complexes (96%) were documented as "active". If one lek is active within a complex, the entire complex is classified "occupied". Similar to the trend with lek data, the average number of males per lek complex has recently declined compared to 2007.

Habitat Conditions

Twenty grazing allotments (283,510 acres) (Appendix G) do not meet one or more of the Land Health Standards due at least in part to livestock grazing. The general causes are riparian condition and alterations in the functional/structural groups on upland sites. Poor riparian condition can impact sage-grouse brood rearing, as the birds typically utilize riparian areas heavily in late summer when water is scarce and chicks need lush vegetation and insects as forage. Alteration of functional/structural groups on upland sites is characterized by overabundance of sagebrush as compared to ecological site descriptions, with lower than expected production of mid-stature perennial bunchgrasses, and sometimes a shift in the grass community to rhizomatous grasses. A sagebrush/bunchgrass ecological site is the preferred vegetation condition for sage-grouse nesting habitat (Cagney et al. 2010). As sagebrush increases in abundance and grasses shift from bunchgrass to rhizomatous grass dominance, the grass height and density decreases, causing a decrease in horizontal cover for sage-grouse during nesting and brood rearing periods.

Population Trends and Estimates

No reliable population estimate can be made from data collected during 2010 (or any of the previous years), due to unknown male to female sex ratios and the fact that not all active leks have been located. An increasing population trend during 2004 to 2007 is indicated by an increase in the average number of males per lek and males per complex since 2003. The 2008 to 2010 lek monitoring data indicate a declining trend in the number of males per lek, compared to 2007.

Harvest

The 2009 sage-grouse season was September 19 through September 30, which allowed a 12-day hunting season. This 2009 season was similar to the 2004 to 2008 seasons. A nine-day hunting season was initiated during both 2002 and 2003. Essentially, hunting seasons since 2002 allowed for the season to remain open through two consecutive weekends. From 1995 to 2001 hunting seasons were shortened to a 15 to 16-day season that typically opened during the third week of September and closed in early October. Prior to 1995, the sage-grouse seasons opened on September 1 with a 30-day season. Seasons have gradually been shortened with later opening dates to increase survival of successful nesting hens (as they are usually more dispersed later in the fall) and to reduce overall harvest.

Bag limits from 2003 to 2009 were two per day and four in possession. The first year that bag/possession limits had been this conservative was 2003. Bag limits traditionally (prior to 2003) were three birds per day with a possession limit of nine (changed to 6 birds from 1994-2002). The estimated harvest rates presented in this report are only from Upper Green River Basin Management Area (UGBMA) 3. A portion of UGBMA 7 also lies within the UGRBWGA, but since the majority of this area lies within the Green River Region, the data will be reported in the Southwest Sage-grouse Working Group, Job Completion Report.

The 2009 harvest survey estimated that 460 hunters bagged 1,203 Greater Sage-Grouse and spent 1,177 days hunting. The average number of birds per day was 1.0, the average number of birds per hunter was 2.6, and the number of days spent hunting was 2.6 during 2009. This data indicates there was similar hunter participation and overall harvest during 2009 compared to 2008, and a decrease compared to 2006 and 2007. Harvest rates (# birds/day, # birds/hunter, and # days/hunter) have remained similar the past seven years (2003-2009). From 1995 to 2002, overall harvest and harvest rates significantly declined following altered seasons (shortened and moved to a later date). Since 2003, hunter participation has varied somewhat, although the past four-year period (2006-2009) has shown higher hunter participation than the previous three-year period (2003-2005). Hunter participation in Management Area 3 has reflected similar trends to the sage-grouse population in the UGRBWGA.

Brood Count Surveys

A permanent brood survey route located on Muddy Creek near the Bench Corral elk feedground documented two hens, 0 chicks, and 0 males in 2009. This 2009 survey resulted in 0.0 chicks/hen, lower than the 0.8 chicks/hen in 2008. Muddy Creek surveys for the past eight years documented eight hens, one chick, and two males in 2002; five hens, three chicks, and two males during 2003; 13 hens, 11 chicks, two males in 2004; and 13 hens, 32 chicks in 2005; 19 hens, 33 chicks in 2006; 26 hens, 21 chicks, nine males, ten unclassified in 2007; and 14 hens, six chicks, and nine males in 2008. A new brood survey route was established on the Cottonwood Creek Ranch in 2007 where 1.1 chicks/hen (sample of 110 grouse) was documented. The Cottonwood Creek Ranch survey resulted in 0.47 chicks/hen (sample of 150 grouse) in 2008, and 0.34 chicks/hen (sample of 84 grouse) in 2009. Overall sample sizes have been relatively poor from these permanent brood surveys and fail to provide reliable production data. Most other documented brood count data has come from random searches or opportunistic sightings.

Sage-grouse research has been ongoing in the Upper Green River Basin for the past twelve years, which has provided some nest establishment, nest success, and brood production data. Although during 2008, most of the radio-collared hens had lost their radio signal resulting in no nesting and production data. Approximately 77 radio collared hens were tracked at the beginning of the nesting period and tracked through the brood rearing period during 2009. Results showed 45 chicks alive on August 1 from 72 collared hens being tracked (0.63 chicks/hen). Nest success was 47% and hen survival was 80% (April to July) for this collared sample of hens during 2009.

Wing Collections

A total of 18 sage-grouse wing barrels were distributed throughout Sublette County in 2009 (UGBMA 3 and a portion of 7). Barrels were placed prior to the sage-grouse hunting season opener and were taken down following the closing date. Wing collections were typically made following each weekend of the hunting season (collected twice). Primary feathers from these wings are used to determine age and sex based on molting patterns.

A total of 445 sage-grouse wings were collected from barrels in the UGRBWGA during 2009, which is relatively similar to the collections during the past five-year period, ranging from 402 to 537. Of the 445 wings collected in 2009, 54% were adult birds, 9% were yearling birds, and 37% were juvenile birds. The proportion of harvest by age class in 2008 was lower for adults at 42%, higher for yearlings at 11%, and higher for juveniles at 47%. In 2007, wing collections accounted for 59% adults, 11% yearlings, and 30% juveniles. The overall composition of wings in 2009 indicated a ratio of 0.8 chicks/hen (adult and yearling females), a decline from the survival of 1.3 chicks/hen during 2008, and a slight increase from 0.6 chicks/hen in 2007. During the previous five years (2004-2008) chick survival ranged from 0.6 to 1.8 chicks/hen. This chick/hen ratios from wing collections has provided a good indicator for future grouse population trends, as male lek attendance trends have correlated well with previous year's production (# chicks/hen) data.

Winter Distribution Surveys

Winter sage-grouse surveys were conducted throughout the majority of the UGRBWGA during January of 2010, due to funds secured through the BLM. Winter surveys have been conducted periodically since 2004 in portions of the Upper Green River Basin. This winter data has been used to develop winter concentrations area maps (first map developed in 2008), and will continue to be updated as new data becomes available.

Bald Eagle

Seven bald eagle nests are known to occur scattered throughout the field office. Wintering bald eagles have been observed at the Fontenelle Reservoir, near Pinedale, west of Daniel, southwest of Boulder, and in the southeast area (WNDD 2002).

Fish Species

Water flowing into the Green River drainage is considered a direct contributor to the habitat for four endangered fish species in the upper Colorado River. All water withdrawals from these tributaries are considered to adversely affect these species and require ESA Section 7 consultation with the USFWS. Water depletions and their effect on protected species are discussed in Chapter 4 and in the Pinedale BLM Biological Assessment (2007b).

Colorado River Cutthroat Trout

In the Green River drainage, Colorado River cutthroat trout are restricted to areas above upstream migration barriers; populations are disjunct, and displacement by non-native salmonids has occurred (Bozek and Rahel 1991). According to WGFD data and basin management plans, Colorado River cutthroat trout populations are located in more than ten basins in the field office, although there are more populations upstream from the field office on land administered by the Forest Service (Hirsch et al. 2006). Within the field office, populations or portions of populations occur in the North Piney Creek Basin (1), Dry Piney Creek Basin (2), South Piney Creek Basin (8), LaBarge Creek Basin (4), Beaver Creek Basin (1), Cottonwood Creek Basin (3), Muddy Creek Basin (1), Horse Creek Basin (2), and East Fork River Basin (1) (Hirsch et al. 2006). Within the field office, ten populations either are genetically unaltered or have not been tested but are anticipated to be unaltered. Other important populations occur in the Rock Creek drainage and the Beaver Creek ACEC.

Populations of Colorado River cutthroat trout in these drainages appear to be stable. Population estimates provided by WGFD range in abundance from about 50 fish per mile in Pine Grove Creek in the Dry Piney Basin, to nearly 2,000 fish per mile in Irish Canyon Creek. Ongoing protection of the Colorado River cutthroat trout includes implementation of management objectives outlined in the April 2001 *Conservation Agreement and Strategy for Colorado River Cutthroat Trout in the States of Colorado, Utah, and Wyoming* and a subsequent update in the June 2006 *Conservation Strategy for Colorado River Cutthroat Trout in the States of Colorado, Utah, and Wyoming*. These important management tools have identified measures necessary for conserving the genetic and demographic viability of the cutthroat.

Roundtail Chub

Declines in roundtail chub populations within the field office can be attributed partially to September 1962, when 444 miles of the Green River and tributaries above Flaming Gorge Dam were poisoned with rotenone. Recovery of roundtail chub in this region has probably been hampered by the invasion of non-native fish species following the poisoning (Holden 1991). Within the field office, roundtail chub distribution is not well documented. Suitable habitat likely exists from above Fontenelle Reservoir to Pinedale. Populations are known to occur in several mountain lakes above the town of Pinedale (Cavalli 2006). Once the Green River enters mountainous regions where water temperatures drop, habitat likely becomes unsuitable for roundtail chub. Surveys are needed to determine the present distribution of roundtail chub in the field office.

Sensitive Areas

Ross Butte and Ross Ridge are located along Wyoming Highway 351 in the central portion of the field office. The Ross Butte ecosystem in this area provides habitat for many endemic plant species, including Big Piney milkvetch, Beaver Rim phlox, large-fruited bladderpod, and desert glandular phacelia (Fertig and Beauvais 1999). *The Plant Species of Special Concern of the Ross Butte Ecosystem* report contains the recommendation: "The Ross Butte ecosystem contains one of the highest known concentrations of regionally endemic basin plant species in southwestern Wyoming. Given the growing pressures to develop natural gas and oil resources in southwest Wyoming, the Ross Butte area stands out as a significant potential conservation site" (Laster 2002a).

Rawlins Field Office

The information included in this section is unique to the Rawlins Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Rawlins Field Office. Descriptions following the table provide detailed information of those special status species.

Currently, 18 mammal, bird, amphibian, fish, and plant species in the Rawlins Field Office are federally listed or are candidates and must be taken into consideration for management activities. The BLM has also identified an additional nine state sensitive mammal species, 15 bird species, three amphibian species, five fish species, and eight plants.

Black-Footed Ferret
A nonessential experimental population of black-footed ferrets has been reintroduced within the Rawlins Field Office in the vicinity of the Shirley Basin. Although naturally occurring populations of black-footed ferrets are no longer known within the field office, suitable habitat does exist; therefore, there is always the potential for ferrets to occur (BLM 2007a).

Platte River System Species
The Platte River system species include the least tern, the piping plover, the whooping crane, the Western prairie fringed orchid, and the pallid sturgeon, all of which occur in the Platte River system in association with riverine habitat. The Western prairie fringed orchid is discussed within the vegetation section. Least tern populations are listed as endangered in Nebraska, Colorado, and Montana, but not in Wyoming. The piping plover is listed as threatened, with critical habitat designated in Nebraska and Montana. The pallid sturgeon is listed as an endangered species and is found almost exclusively in the headwaters of the Missouri River (in the vicinity of Fort Benton/Great Falls, Montana) downstream to the Mississippi River near New Orleans, Louisiana. In addition, the pallid sturgeon is found in the Platte River near its confluence with the Missouri River. Any action that results in a depletion of greater than 0.1 acre/feet will result in a May Affect/Likely to Adversely Affect determination. Therefore, any field office actions that may cause water depletion in the Platte River system are carefully considered (BLM 2007a).

Unique Plant Communities

In addition to Special Status Plant Species, the Rawlins Field Office contains rare or unique plant communities that may or may not contain Special Status plants, such as the Muddy Gap cushion plant community. Two other examples of these communities include the alkaline desert wetland communities found in the Chain Lakes area and the Sandhills "sand dune" plant community.

Chain Lakes Alkaline Wetlands
These wetlands are located about 25 miles northwest of Rawlins (Township 23 North, Ranges 92–93 West) and are managed cooperatively by the WGFD and the BLM as the Chain Lakes WHMA. This area is one of the lowest (6,500 feet in elevation) topographic regions within the Great Divide Basin, resulting in numerous perennial and intermittent shallow lakes that are alkaline due to the lack of external water outlets. The annual precipitation of less than seven inches, high evaporative loss rates, and surface salt crusting also contribute to shaping this community. The lakes and adjacent moist soils support a variety of plant species adapted to this environment. These species include Nuttall's alkaligrass, tufted hairgrass, inland saltgrass, alkali cordgrass, mat muhly, Baltic rush, American bulrush, slim sedge, alkali plantain, sea milkwort, Rocky Mountain glasswort, hairy goldaster, buttercup, cinquefoil, and greasewood. This plant community and aquatic habitat are important for local wildlife such as Greater Sage-Grouse, pronghorn, coyote, and small mammals as well as many migratory birds in both the spring and the fall. Commonly observed bird species are avocet, stilt, killdeer, phalarope, sandpiper, swallow, northern harrier, sandhill crane, duck, grebe, and various neotropical birds.

Sandhills (Dunes) Shrubland Community
The Sand Hills are located midway between Rawlins and Baggs in the west half of Township 17 North, Range 90 West. This site consists of deep, predominantly stable sand dunes, on a west-facing slope ranging

from 7,000 to 8,000 feet in elevation that receives ten to 14 inches of precipitation annually. Shrubs are the dominant plant life form, consisting of silver sagebrush, bitterbrush, big sagebrush, prickly-pear cactus, cotton horsebrush, and rabbitbrush, with pockets of serviceberry, snowberry, wild rose, and chokecherry occurring at the middle and higher elevations. Small stands of aspen also are present at higher elevations on north-facing slopes. Common herbaceous species include needle-and-thread, Indian ricegrass, prairie sandreed, thickspike wheatgrass, sand scurfpea, cryptantha, veiny dock, lupine, goosefoot, evening primrose, groundsel, and tansy mustard. This area provides crucial winter range for mule deer and elk, as well as seasonal habitat to many small birds and mammals and to Greater Sage-Grouse and Columbian sharp-tailed grouse.

Cushion Plant Communities

Cushion plants communities are usually referred to by the growth form of vegetation found along windswept ridges on shallow soils. These plants have stems and leaves that are densely compacted near the ground. It is believed that these plants' growth form has adapted to conserve energy under severe environmental conditions such as high winds and extreme cold.

Muddy Gap Cushion Plant Community

This plant community is located 45 miles north of Rawlins (NE corner of Township 27 North, Range 89 West) on the west end of the Ferris Mountains and immediately southeast of Muddy Gap. The uplift limestone formations or "hogback ridges" combined with strong winds, dry climate, and shallow rooting depths form the contributing characteristics of this community. Most of the plant species found here have a cushion plant growth form and nearly all are endemics (known to occur only in Wyoming). Endemic species include bun milkvetch, Wyoming locoweed, and Devil's Gate twinpod, while near-endemic species include summer orophaca and Wyoming miner's candle. Other plant species observed in this area include bluebunch wheatgrass, little bluegrass, black sage, fringed sage, Hood's phlox, Hooker sandwort, stemless hymenoxys, and fleabane.

Laramie False Sagebrush Cushion Plant Communities

Laramie false sagebrush is on the BLM sensitive species list and occupies rocky limestone ridges and gentle slopes between 7,500 and 8,600 feet in elevation. This plant is endemic to southeastern Wyoming and known to occur from numerous cushion plant sites in the Shirley basin region north and northeast of Medicine Bow in Carbon and Albany Counties. The specific locations are on record with the Wyoming Natural Diversity Database (WYNDD) at the University of Wyoming. Other associated plant species include American Rock Cress, Devil's Gate Twinpod, Feverfew, Wyoming locoweed, bluebunch wheatgrass, and Wyoming three-tip sagebrush.

Rock Springs Field Office

The information included in this section is unique to the Rock Springs Field Office, and may not contain all species that occur within the field office boundaries. Please see Table 3-76 and the species descriptions following that table for general information about those species. Please see Table 3-78 for special status species that occur within the Rock Springs Field Office. Descriptions following the table provide detailed information of those special status species.

Table 3-79. Threatened, Endangered, Proposed and Candidate Wildlife Species that May Occur in the Rock Springs Field Office Planning Area

Common Name	Scientific Name	Federal Status	Occurrence in Planning Area
Black-footed ferret	*Mustela nigripes*	Endangered	Historical sightings and habitat exists within prairie dog towns.
Canada Lynx	*Lynx canadensis*	Threatened	Montane Forests Lynx Analysis Units.

Common Name	Scientific Name	Federal Status	Occurrence in Planning Area
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Foothills of the Wind River range and historically occurrence.
Mountain Plover	*Charadrius montanus*	Proposed Threatened	Prairie dog towns and areas of sparse or absent vegetation.
Greater Sage-Grouse	*Centrocercus urophasianus*	Candidate	Sagebrush communities.
Western population yellow-billed cuckoo	*Coccyzus americanus*	Candidate	Habitat within riparian areas west of the Continental Divide.
Gray wolf	*Canis lupus*	Nonessential Experimental Population	Historical occupancy and two recent confirmed sightings (2003).
Colorado River Fish			
Bonytail Colorado Pikeminnow Humpback Chub Razorback Sucker	*Gila elegans* *Ptychocheilus lucius* *Gila cypha* *Xyrauchen texanus*	Endangered Endangered Endangered Endangered	Downstream riverine habitat in the Yampa, Green, and Colorado River Systems.
Platte River Species			
Interior Least Tern Pallid Sturgeon Piping Plover Whooping Crane	*Sternula antillarum* *Scaphirhynchus albus* *Charadrius melodus* *Grus americana*	Endangered Endangered Threatened Endangered	Downstream riverine habitat of the Platte River System.

Source: USFWS, Threatened and Endangered Species, Designated Critical Habitat and Candidate Species List for the BLM's Rock Springs Field Office, August 2010.

Black-footed Ferret

On March 6, 2013 the USFWS block-cleared the entire state of Wyoming, alleviating the federal action agencies from their requirement of conducting presence/absence surveys for black-footed ferrets prior to developing projects, and developed a statewide rule, under 10(j) of the ESA (16 U.S.C. § 1531 et seq.), for black-footed ferrets in collaboration with the WGFD. Prior to that, there had been an effort to map prairie dog colonies and search for the black-footed ferrets in areas not previously block-cleared by the USFWS. Areas of suitable ferret habitat were delineated because of their association with prairie dogs and prairie dog colonies. Since 1968-1992 there have been probable sightings, one questionable and one confirmed (dead ferret caught in a trap) of black-footed ferrets in the Rock Springs Field Office area. Recent reported observations (2007) in the Hiawatha area may be attributed to an escape from a nearby breeding/conditioning facility across the state line in Colorado. Populations of black-footed ferrets (if any) are undetermined in the planning area but highly unlikely. Researchers have concluded that the black-footed ferret has never been very abundant based upon archaeological and historical evidence.

Canada Lynx

Canada lynx (*Lynx canadensis*) habitat is represented by moist boreal forests that have cold, snowy winters and sufficient snowshoe hare (*Lepus americanus*) availability. The predominant vegetation of boreal forest is conifer trees, primarily species of spruce (*Picea spp.*) and fir (*Abies spp.*). A Lynx Analysis Unit (LAU) has been established covering 28,960 acres within the Rock Springs Field Office area that extends from the Wind River Mountains into the foothills. This area contains 12,280 acres of mapped habitat. No Canada lynx Critical Habitat exists in the Rock Springs Field Office area. In all regions within the range of the lynx in the contiguous United States, timber harvest, recreation, and their related activities are the predominant land uses affecting lynx habitat.

Gray Wolf

The gray wolf (*Canis lupus*) has been present in portions of the Rock Springs Field Office area over the past decade, likely, an expansion of their range as a result of a growing population. On January 29, 2007, the USFWS announced the proposal to remove the Northern Rocky Mountain population of gray wolves from the Endangered Species list. Gray wolves in the Northern Rockies have exceeded recovery goals so the USFWS considers them ready to be delisted. In February 2008, gray wolves were determined recovered by the USFWS and were removed from the list of federally endangered and threatened species on March 28, 2008. The U.S. Federal District Court in Missoula, Montana, issued a preliminary injunction on July 18, 2008, that immediately reinstated the ESA protections for gray wolves in the northern Rocky Mountains. After further litigation and data acquisition illustrating the recovery of gray wolves in the northern Rocky Mountains, wolves were successfully delisted in 2012. Following delisting in September 2012, WGFD instituted a wolf hunting season with the biological objective to reduce the wolf population by approximately 11% in the Wolf Trophy Game Management Area (WTGMA) and Seasonal WTGMA (WGFD et al. 2013) and secondly to provide recreational hunting opportunity to Wyoming sportsmen.

Grizzly Bear

The grizzly bear (*Ursus arctos*) historically inhabited most of the Rock Springs Field Office area and was documented around the Sweetwater River and Pacific Creek in historical journals (Dorn). Grizzly bears are listed as threatened under the ESA throughout Wyoming. Under current federal (USFWS) and state (WGFD) management, grizzly bears found in the planning area may be removed or relocated if they cause conflicts with human health and safety or threaten livelihood of producers.

Bald Eagle

Currently, the only known active bald eagle nesting sites are on the Green River above the Big Sandy confluence. No bald eagles are known to nest on BLM-administered lands in the resource area. There are potential nesting opportunities along Flaming Gorge Reservoir, the Henry's Fork River, and other waterways. The pioneering trend for bald eagle nesting began in the upper Green River system and activity moved slowly downstream to an island just outside the field office in 1985. No raptor inventories were conducted on the river until 1990, when an active bald eagle nest was discovered within Seedskadee National Wildlife Refuge.

Colorado and Platte River Threatened and Endangered Species

Species listed as Threatened or Endangered do not occur within the Rock Springs Field Office area but may be affected by depletions of water from the Colorado or Platte River systems. Water depletions are defined simply as diversions less return flows. Depletions include water diverted from a river, as well as evaporation from reservoirs and other impoundments such as stock ponds and wells connected to the aquifer. Depletions represent an annual reduction in the volume of stream flow that would have reached the critical habitat of endangered fish or wildlife species residing in the North Platte River or Colorado River Basin. Amounts of water depletions from projects or activities are reported to the USFWS and tracked leading to mitigation planning, consultation with the USFWS, and/or monetary payment made to the National Fish and Wildlife Foundation and legal protection of instream flows depending on the amount of water depleted.

Colorado River Cutthroat Trout

Colorado River cutthroat trout exist in Currant Creek, Trout Creek, the upper reaches of the Red Creek drainage, and possibly Sculpin Creek and the Little Sandy River.

BLM Special Status Wildlife Species

Similar to the discussion of BLM special status plant species, the IM also lists BLM Wyoming sensitive wildlife species and management policy. The policy emphasizes preventing the need to list species under the ESA, avoiding or minimizing adverse impacts, and addressing these species through planning and management activities. Table 3-78 lists the BLM Wyoming special status wildlife species that may inhabit the Rock Springs Field Office area.

Rock Springs Special Status Species

White-tailed Prairie Dog
Threats that may be significant to conserving white-tailed prairie dog (*Cynomys leucurus*) populations include disease (Sylvatic plague) and control programs (poisoning) and recreational shooting. While the white-tailed prairie dog occurs over much of its historic range, colonies are more widely dispersed and population sizes have declined (Keinath 2004).

Pygmy Rabbit
This smallest member of the *Leporidae* (rabbit) family occurs in portions of many western states including southwestern Wyoming. Pygmy rabbits (*Brachylagus idahoensis*) are sagebrush obligate species that are primarily found in areas with deep soils that support sagebrush (*Artemisia tridentata ssp.*) denser and taller than the surround stands.

Greater Sage-Grouse
Greater Sage-Grouse (*Centrocercus urophasianus*) are found throughout the Rock Springs Field Office area wherever suitable habitat exists. Greater Sage-Grouse (sage-grouse) were historically found in all 23 Wyoming counties, and it was commonly agreed that Wyoming sagebrush habitats supported more sage-grouse than any other state, particularly within the Farson/Eden area (Patterson 1952). However, since the early 1950s when R. L. Patterson conducted the first comprehensive sage-grouse research project in Wyoming within the Eden Valley and Dry Sandy-Pacific Creek areas, sage-grouse populations have been declining. Data collected in 2003 by the WGFD compared to data collected by Patterson (1952) from sage-grouse leks surveys in the planning area have shown a 70% decline in the numbers of males attending leks since 1952. If information from the adjacent private lands is included, the decline reaches 90%. Although no single or combination of causes have been proven, the decline in Greater Sage-Grouse populations is thought to be attributed to a multitude of factors which include, but are not limited to: drought; oil and gas wells and their associated infrastructure; power lines; mammalian and avian predators; and a decline in the quantity and quality of sagebrush habitat resulting from livestock grazing, range management treatments, and development activities (Connelly et al. 2000).

Mountain Plover
Mountain plover (*Charadrius montanus*) breeding habitat in the planning includes shrub-steppe, cushion plant communities, windswept ridges and prairie dog towns. Mountain plovers usually nest on sites where vegetation is sparse or absent. Vegetation at these sites is typically less than six inches tall or less. Nest sites within the shrub-steppe landscape are also confined to areas of little to no vegetation, although surrounded by areas visually dominated by shrubs. Mountain plovers are rarely found near water. Positive indicators for mountain plovers include level terrain, prairie dogs, bare ground, cactus (*Opuntia)* pads, widely spaced plants, and horned larks. It would be unusual to find mountain plovers on sites characterized by irregular or rolling terrain, dense, matted vegetation, grass taller than four inches, wet soils, or the presence of killdeer.

Current habitat models developed by the Wyoming Natural Diversity Database (WYNDD) show a wide distribution of potential habitat across the Rock Springs Field Office area.

3.14.2 Forest Service

General Planning Area Description

Special status species are defined as those species currently listed as threatened or endangered under the Endangered Species Act (ESA, 16 U.S.C. §§ 1531-1534 et seq.), as well as those species that are proposed or candidates for listing under the Act. Special status species also include those designated as sensitive by a Regional Forester (regional forester's sensitive species). The State of Wyoming does not designate species as sensitive. The Wyoming Game and Fish Department maintains a list of Species of Special Concern which does not incorporate sensitive plant species. The Wyoming Natural Diversity Database (http://www.uwyo.edu/wyndd/) studies and documents species of concern in Wyoming including those designated as sensitive by the Forest Service. These species lack formal federal or state status for protection, but populations may be at risk. These species receive consideration during periodic revision of the regional forester's sensitive species list.

Objectives related to management of species listed under the ESA (FSM 2670.22) provide that Forest Service units should:

1. Develop and implement conservation strategies for sensitive species and their habitats, in coordination with other Forest Service units, managing agencies, and landowners.
2. Coordinate management objectives to conserve sensitive species with state and federal agencies and other cooperators as appropriate. Approaches may include collaboratively developing individual species or multi-species conservation strategies, formalizing interagency conservation agreements, and incorporating recommendations into management direction set forth in Land and Resource Management Plans.

Federally Listed Species

The purposes of the ESA are to provide a means for conserving the ecosystems upon which endangered and threatened species depend and a program for the conservation of such species. The ESA directs all Federal agencies to participate in conserving these species. Specifically, section 7 (a)(1) of the ESA charges federal agencies to aid in the conservation of listed species, and section 7 (a)(2) requires the agencies to ensure that their activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitats. Consideration of listed species includes the following:

- **Endangered species:** Species in danger of extinction throughout all or a significant portion of its range.
- **Threatened species:** Species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- **Experimental/Nonessential populations:** Distinct populations that have protections as provided for experimental populations in section 10(j) of the ESA.
- **Candidate species:** A species for which USFWS has sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened. The Candidate designation is utilized by the USFWS when it determines that the species is warranted for listing under the ESA, but the development of a proposed listing rule is precluded by other higher priority listing actions.

Species identified as Candidates by the USFWS, such as the Greater Sage-Grouse, are automatically placed on the list of regional forester's sensitive species. Species that have been delisted under the ESA, because recovery criteria have been met, are automatically added to the sensitive species list for a period of at least five years.

Regional Forester's Sensitive Species

Species designated as sensitive by a regional forester must be recognized by taxonomic experts and must be known or likely to occur on National Forest System lands. A regional forester may designate a species as sensitive based on the following:

- Significant current or predicted downward trends in population numbers or density.
- Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

The intent of designation of species as sensitive by a regional forester is to ensure that these species receive consideration in land management. In so doing, Forest Service actions should not contribute to the need to list a species under the ESA. For further information and analysis on Sensitive Species refer to the Wildlife and Botany Report found in Appendix M.

Management Indicator Species

The National Forest Management Act of 1976 (16 U.S.C. §1600 *et seq.*) forms the foundation for the designation and monitoring of Management Indicator Species (MIS) as a component of Forest Service land and resource management planning. Implementing regulations are provided at 36 CFR 219.19, and in Forest Service Manual 2600:

> *In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality...(36 CFR 219.19(a)(1))*

Forest Service Manual 2620 direction concerning habitat planning provides that:

> *1. Management Indicators: Plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent. (FSM 2620.5)*

It is the policy of the Forest Service (FSM 2670.3) to integrate available scientific information, including Regional species evaluations, species and ecosystem assessments, and conservation strategies, into Forest Service planning and implementation; conduct appropriate inventories and monitoring of sensitive species to improve knowledge of distribution, status, and responses to management activities, coordinate efforts within the Region and with other agencies and partners where feasible; and, to analyze and manage for sensitive species in groups and habitat complexes, when feasible, to realize efficiencies and ecological soundness of multi-species and ecosystem management approaches (Table 3-80).

Table 3-80. Forest Service Region 2 and 4 Sensitive Species Occurring or Potentially Occurring on the Bridger-Teton National Forest, Medicine Bow National Forest or Thunder Basin National Grassland

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Forest Service Regions 2 and 4 Sensitive Species		
MAMMALS (13)		
Bighorn Sheep *Ovis canadensis canadensis*	High elevation alpine habitats with steep escape terrain adjacent to open foraging areas during summer. Habitat overlap on MBNF.	Y
Fisher *Martes pennanti*	Extensive, mature to old-growth spruce-fir forests with high levels of canopy closure on BTNF.	N
American marten *Martes americana*	Spruce fir, lodgepole pine.	N
Spotted Bat *Euderma maculatum*	Desert scrub to coniferous forest, most often in low deserts and juniper woodlands. Forages over meadows, along forest edges, or in open coniferous woodlands. Habitat overlap on MBNF, TBNG.	Y
Townsend's Western Big-eared Bat *Corynorhinus townsendii townsendii*	Strongly correlated with the availability of caves and abandoned mines for roosts. Habitat overlap on MBNF, TBNG.	Y
Fringed myotis *Myotis thysanodes*	Forages in ponderosa pine, oak, shrublands, pinyon/juniper on MBNF, TBNG.	Y
Hoary bat *Lasiurus cinereus*	Conifer forest, woodland on MBNF, shrub areas on TBNG.	Y
Pygmy shrew *Sorex hoyi*	Wetland edges in spruce-fir above 9,000 feet on MBNF.	N
Black-tailed prairie dog *Cynomys ludovicianus*	Grasslands on TBNG.	Y
White-tailed prairie dog *Cynomys leucurus*	Colony at Six-Mile/Platte River on MBNF.	Y
Swift fox *Vulpes velox*	Grasslands on TBNG.	Y
Wyoming pocket gopher *Thomomys clusius*	Sagebrush shrub, grassland near MBNF.	Y
River otter *Lontra canadensis*	Rivers on MBNF.	N
BIRDS (32)		
American bittern *Botaurus lentiginosus*	Marshes on TBNG.	N

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Bald eagle *Haliaeetus leucocephalus*	Lakes, rivers.	Y
Greater Sage-Grouse *Centrocercus urophasianus* (C)	Sagebrush and diverse native grass and forb understory.	Y
Yellow-billed Cuckoo *Coccyzus americanus (C)*	Large areas of dense woody riparian vegetation with cottonwood overstory.	N
Ferruginous hawk *Buteo regalis*	Sagebrush shrub, grassland on MBNF, TBNG.	Y
American Peregrine Falcon *Falco peregrinus anatum*	Vertical cliff habitat, preferentially near high avian prey populations on BTNF, MBNF, TBNG.	Y
Northern harrier *Circus cyaneus*	Grassland, marsh, sagebrush scrub, near water, <7,900 feet on MBNF, TBNG.	Y
Columbian sharp-tailed grouse *T. phasianellus columbianus*	Mountain shrub west of Continental Divide on MBNF.	Y
Northern Goshawk *Accipiter gentilis*	Mature forests with large trees, relatively closed canopies, and open understories for nesting. Foraging areas include forests with a high density of large trees interspersed with shrublands and openings. Habitat overlap on BTNF.	Y
White-tailed ptarmigan *Lagopus leucurus*	Alpine willow. Currently considered extirpated on the MBNF.	N
Short-eared owl *Asio flammeus*	Sagebrush shrub, grasslands, marshes. Might occur only on the Laramie Peak unit of MBNF.	Y
Burrowing owl *Athene cunicularia*	Grasslands on TBNG.	Y
Lewis' woodpecker *Melanerpes lewis*	Ponderosa pine. Occurs on the Laramie Peak unit of MBNF.	N
Black-backed woodpecker *Picoides arcticus*	Spruce-fir, Ponderosa pine and recently burned conifer forest on MBNF.	N
Olive-sided flycatcher *Contopus borealis*	Spruce-fir, lodgepole pine, wetland, forest meadow on MBNF.	N
Purple martin *Progne subis*	Aspen in specific area on west side of Continental Divide on MBNF.	N
Loggerhead shrike *Lanius ludovicianus*	Grassland w/shrubs <8,000 feet. on MBNF, TBNG.	Y
Brewer's sparrow *Spizella breweri*	Sagebrush shrub on MBNF, TBNG.	Y
Grasshopper sparrow Ammodramus savannarum	Grasslands on TBNG.	Y

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Sage sparrow *Amphispiza bellii*	Sagebrush shrub below 6,500 feet on MBNF, TBNG.	Y
McCown's longspur *Calcarius mccownii*	Grasslands on TBNG.	Y
Chestnut-collared longspur *Calcarius omatus*	Grasslands on TBNG.	Y
Boreal Owl *Aegolius funereus*	Large expanses of contiguous forests that are typically structurally complex Engelmann spruce/subalpine fir forest types.	N
Great Gray Owl *Strix nebulosa*	Dense coniferous forest types usually associated with mature or old growth Douglas fir for nesting on BTNF.	N
Flammulated owl *Otus flammeolus*	Ponderosa pine, Douglas fir stands mixed with aspen on BTNF, MBNF.	N
Three-toed Woodpecker *Picoides tridactylus*	Mixed conifer forests of lodgepole pine, Douglas-fir, Engelmann spruce, and subalpine fir; large numbers of recently killed trees provide the best habitat. *Sage-grouse general habitat boundary on BTNF broadly includes this conifer habitat but there is no habitat association with sage-grouse.	N
Harlequin duck *Histronicus histronicus*	Low gradient streams with dense shrubs, braided channels, swift currents, and abundant aquatic insects on BTNF.	N
Trumpeter Swan *Cyngnus buccinators*	Wide variety of freshwater ponds, lakes and (occasionally) rivers; areas with abundant and diverse communities of aquatic plants on BTNF.	N
Common loon *Gavia immer*	Breeding habitat includes secluded, clear-water lakes more than 10 acres in size located between 6,000 to 8,000 feet elevation on BTNF.	N
Long-billed curlew *Numenius americanus*	Grasslands on TBNG.	Y
Mountain plover *Charadrius montanus*	Grassland habitat overlap on TBNG.	Y
Black tern *Chlidonias niger*	Wetlands on TBNG.	Y
REPTILES AND AMPHIBIANS (4)		
Columbia spotted frog *Rana luteiventris*	Subalpine forests, grasslands and sagebrush habitats at elevations from 1,700 to 6,400 feet on BTNF.	Y
Boreal toad *Bufo boreas boreas*	Montane forests between 7,000 and 12,000 feet elevation. Adults are primarily terrestrial and have been observed in a variety of habitats including sagebrush on BTNF.	Y
Northern leopard frog *Lithobates pipiens*	Wide variety aquatic habitats, wetlands on MBNF and TBNG.	Y
Wood frog *Lithobates pipiens*	Sedge, grass meadows, willow hummocks, aspen, lodgepole forests, woodlands on MBNF.	N

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
FISH (13)		
Bonneville Cutthroat trout *Oncorhynchus clarki utah*	Native to Salt Creek and Smith Fork drainages of the Bear River system on BTNF.	N
Colorado River Cutthroat trout *Oncorhynchus clarki pleuriticus*	Native to the Green River drainage on BTNF and Little Snake on MBNF.	N
Northern leatherside *Lepidomeda copei*	Native to Bear Creek and Snake River drainages on the Kemmerer, Greys River and Jackson Ranger Districts on BTNF.	N
Yellowstone/Snake River fine-spotted cutthroat *Oncorhynchus clarki spp*	Native to the Yellowstone and Snake River systems on the Jackson and Buffalo Ranger Districts on BTNF.	N
Mountain sucker *Catostomus platyrhynchus*	Clear, cold creeks, small to medium-sized rivers with sand, gravel, rubble substrate on MBNF.	N
Hornyhead chub *Nocomis biguttatus*	Isolated populations in the Laramie and North Laramie rivers on MBNF.	N
Lake chub *Couesius plumbeus*	Permanent spring flow, usually at the headwaters of small streams on TBNG.	Y
Plains minnow *Hybognathus placitus*	Great Plains streams with fluctuating stream flows, shifting sand substrates on TBNG.	Y
Sturgeon chub *Macrhybopsis gelida*	Great Plains rivers on TBNG.	N
Northern redbelly dace *Phoxinus eos*	Permanent spring seeps, usually at the extreme headwaters of small streams.	Y
Southern redbelly dace *Phoxinus erythrogaster*	Streams and ponds that are clear with sand and silt substrates.	Y
Finescale dace *Phoxinus neogaeus*	Permanent spring seeps, usually at the extreme headwaters of small streams on TBNG.	Y
Flathead chub *Platygobio gracilis*	Big Horn, Tongue, Powder, Little Powder, Belle Fourche, and Cheyenne river systems on TBNG.	Y
INSECTS (1)		
Hudsonian emerald *Somatochlora hundsonica*	Boggy ponds on MBNF.	N
PLANTS (49)		
Agoseris lackschewitzii Pink agoseris	Wet meadow habitat without a sagebrush component on BTNF.	N
Androsace chamaejasme ssp. carinata Sweet-flowered rock jasmine	Exposed rocky ridge crests, slopes with rock outcrops and thin soils of limestone or dolomite substrate at 8,500 to 10,800 feet elevation on BTNF.	N

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Astragalus barrii Barr's milkvetch	In badland islands in sagebrush and grassland matrices. 3,500 to 6,700 feet on TBNG.	Y
Astragalus diversifolius var. diversifolius Meadow milkvetch	Moist, often alkaline meadows and swales in sagebrush valleys at 4,400 to 6,300 feet elevation often described as a playa vegetation type on BTNF.	Y
Astragalus jejunus var. jejunus Starveling milkvetch	Dry barren ridges and bluffs of shale and stone, clay or cobblestones at 6,000 to 7,100 feet elevation on BTNF.	N
Astragalus paysonii Payson's milkvetch	Disturbed areas on sandy soils that have a low cover of forbs and grasses at elevations of 5,850 to 9,600 feet which often occur as a mosaic component of sage shrublands on BTNF.	Y
Aquilegia laramiensis Laramie columbine	Crevices in north facing granite boulders, 6,250 to 8,000 feet on MBNF.	N
Astragalus leptaleus Park milkvetch	Willow carrs/sedge-grass transition to shrub. 8,800 feet on MBNF.	N
Botrychium lineare Narrowleaf moonwort	Grass, stream, forest edges, also upland habitats, 0 to 10,500 feet on MBNF.	N
Carex diandra Lesser panicled sedge	Peatland-fens, pond edge, 6,100 to 8,600 feet on MBNF.	N
Carex incurviformis Seaside sedge	Alpine and subalpine moist tundra and wet rock ledges 10,000 to 12,200 feet on BTNF.	N
Carex livida Livid sedge	Floating mats, bogs, fens, and marls with Carex, hummocks, 9,000 to 10,000 feet on MBNF.	N
Carex luzulina var. atropurpurea Black and purple sedge	Subalpine wet meadows and stream sides at 10,000 to 10,600 feet on BTNF.	N
Cypripedium parviflorum Lesser yellow lady's slipper	Mossy woods, streams and bogs, 4,000 to 6,400 feet on MBNF.	N
Wyoming tansymustard *Descurainia torulosa*	Southern Absaroka Range and the Rock Springs Uplift. Sandy soil at the base of cliffs composed of volcanic breccia or sandstone, under slight overhangs, in cavities in the volcanic rock, or on ledges, 7,700 to 10,500 feet on BTNF.	N
Draba exunguiculata Clawless draba (Gray's peak draba)	Alpine fell fields, 10,000 feet+ on MBNF.	N
Draba globosa Rockcress draba	Moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils from 8,100 to 12,400 feet on BTNF.	N
Draba grayana Gray's draba	Alpine fell fields, 10,000 feet+ on MBNF.	N
Drosera rotundifolia Roundleaf sundew	Acid fens, float mats, bogs, 9,100 to 9,800 feet on MBNF.	N

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Eleocharis elliptica Elliptic spike rush (boreal spike rush)	Thermal seeps/ springs, stock ponds, 6,200 to 7,250 feet on MBNF.	N
Ericameria discoidea var. linearis Narrowleaf goldenweed	Semi-barren, whitish clay flats and slopes, gravel bars, and sandy lakeshores at elevations of 7,700 to 10,300 feet on BTNF.	N
Erigeron lanatus Woolly daisy	Alpine or subalpine limestone talus slopes at 11,000 feet elevation on BTNF.	N
Eriogonum exilifolium Dropleaf (slender leaved) buckwheat	Semi bare sandy bunchgrass communities, seleniferous gumbo, 6,900 to 8,800 feet on MBNF.	Y
Eriophorum altaicum var. neogaeum Whitebristle cottongrass	Fens, 9,500 to 14,000 feet on MBNF.	N
Eriophorum gracile Slender cottongrass	Sedge meadows, floating bogs saturated soil to shallow water, 6,900 to 10,500 feet on MBNF.	N
Festuca hallii Plains rough fescue (Hall's fescue)	Sloped montane meadows, edges open conifer 6,800 to 11,000 feet on MBNF.	N
Ipomopsis aggregata ssp. weberi Scarlet gilia (Rabbit Ears gilia)	Openings in conifer forest slopes, ridges 7,200 to 8,300 feet on MBNF.	N
Kobresia simpliciuscula Simple bog sedge (Kobresia)	Flooded marl wetlands with *Carex simulate,* 6,000 feet on MBNF.	N
Lesquerella paysonii Payson's bladderpod	Carbonate mountain ranges of west-central Wyoming, eastern Idaho, and southwestern Montana. Rocky, sparsely-vegetated slopes, often calcareous substrates at elevations of 5,500 to 10,600 feet. Wide elevation range indicates possible association with sage-grouse habitat on BTNF.	Y
Machaeranthera coloradoensis var. coloradensis Colorado tansyaster	Gravelly places in mountain parks, sparsely vegetated knolls with cushion plants in sagebrush and grassland matrices, 6,800 to 8,500 feet.	Y
Mimulus gemmiparus Rocky Mountain monkeyflower	Granitic seeps, slopes and alluvium in open sites w/ SF and aspen, 8,500 to 10,500 feet on MBNF.	N
Parnassia kotzebuei Kotzebue's grass of Parnassu	Moist seeps, wet tundra on thin clay soil, moist ledges 10,000 to 12,000 feet on MBNF.	N
Parrya nudicaulis Naked-stemmed parrya	Alpine talus, often on limestone substrates at 10,700 to 11,400 feet elevation on BTNF.	N
Penstemon harringtonii Harrington's beardtongue	Open sagebrush moderate slopes calcareous soils, 6,800 to 9,200 feet on MBNF.	N

Species	Habitat Description and Range	Known or Suspected to be Present in Analysis Area?
Physaria integrifolia var. monticola Creeping twinpod	Barren, rocky, calcareous hills and slopes at 6,500 to 8,600 feet elevation on BTNF.	N
Potentilla rupincola Rock cinquefoil (front range cinquefoil)	Mountain gravel soils or shelves/niches cliffs-often granite, 6,900 to 10,500 feet on MBNF.	N
Primula egalikensis Greenland primrose	Wet meadows along streams and calcareous montane bogs from 6600 to 8000 feet. Sagebrush is not a component of this habitat type on BTNF.	N
Ranunculus karelinii Ice cold buttercup	Ridges, peaks, in rocks and scree, low-lying snow banks 10,000 to 14,100 feet on MBNF.	N
Rubus arcticus ssp. acaulis Dwarf raspberry (nagoon berry)	Dense canopy in lodgepole, spruce-fir with *Linnaea borealis*, 7,000 to 10,000 feet on MBNF.	N
Salix candida Sageleaf willow (hoary willow)	Cool, boreal forests and prairies in remnant fen and seeps, 6,600 to 10,600 feet on MBNF.	N
Salix serissima Autumn willow	Calcareous fen meadow, 7,800 to 9,300 feet on MBNF.	N
Saussurea weberi Weber's saussurea	Restricted to the Gros Ventre and northern Wind River ranges on alpine talus slopes and gravel fields at 9,600 to 11,500 feet on BTNF.	N
Selaginella selaginoides Club spikemoss (northern spikemoss)	Mossy banks, wet meadows, marsh wet spruce forests, 7,700 to 8,000 (9,500) feet on MBNF.	N
Sphagnum angustifolium Sphagnum	Fens, acid fens, floating vegetation mats. 7,000 to 12,000 feet on MBNF.	N
Sphagnum balticum Baltic sphagnum	Iron fens, wetter areas of ombrotrophic bogs 7,000 to 12,000 feet on MBNF.	N
Symphyotrichum molle Soft aster	Sagebrush grasslands and mountain meadows in calcareous soils at 6,400 to 8,500 feet elevation. The identification of a Hoback Canyon occurrence has been questioned but unresolved. As such, presence is acknowledged for the project area on BTNF.	Y
Triteleia grandiflora Largeflower triteleia	Grassy areas in sagebrush at edge of aspen, lodgepole to 8,400 feet on MBNF.	Y
Utricularia minor Lesser bladderpod	Shallow fens, wetland, subalpine ponds, 6,600 to 8,600 feet on MBNF.	N
Viola selkirkii Selkirk's violet	Moist, shaded ravines and cold boreal forest 8,500 to 9,100 feet on MBNF.	N

Bridger-Teton National Forest

Introduction

The Bridger-Teton is a 3.4 million acre National Forest located within portions of Fremont, Lincoln, Park, Sublette and Teton Counties in Northwest Wyoming. The Forest includes five primary mountain ranges, including the Gros Ventre, Snake River, Salt River, Wyoming and Wind River mountain ranges. The Forest is sub-divided into six management units that include the Buffalo, Jackson, Greys River, Kemmerer, Big Piney, and Pinedale Ranger Districts.

Approximately 66% of the Forest is comprised of coniferous and deciduous (aspen) community types; the remainder consists of grassland, willow, mountain and sagebrush shrub community types along with rock and lakes. The primary coniferous types are subalpine fir-spruce and lodgepole pine. Of the 430,870 acres of sagebrush shrub community types on the Forest (about 12.4% of the total the BTNF area), mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*) is most common, comprising 88% of all sagebrush community types on the Forest.

Core and general Greater Sage-Grouse habitat has been mapped on the BTNF by the State of Wyoming (Wyoming Governor's Executive Order (WY EO 2011-5)). Additional occupied Greater Sage-Grouse habitat (not within those core and general Greater Sage-Grouse areas mapped and designated by the State) have also been identified and mapped by BTNF personnel based on observation data. Information used to identify the additional occupied Greater-Sage-Grouse habitat included reviews of available observation data, known lek site locations, radio telemetry data from past sage-grouse studies on the BTNF, consultations with the local Upper Snake River Sage-grouse Working Group (USRSGWG) and Forest Service employees on BTNF Ranger Districts, aerial imagery, and the Veg 07 GIS vegetation layer. The aerial imagery used to map habitat boundaries has a spatial resolution of one meter; thus, distinguishing between sagebrush community types (that define sage-grouse habitats) from non-sagebrush community types (conifer, deciduous (aspen), rock, water, etc.) is very concise and accurate. The Veg 07 vegetation layer was also used to assist and validate sage-grouse habitat mapping. Accuracy assessments for predicting vegetation types in the Veg 07 vegetation layer were conducted by the Remote Sensing Applications Center (RSAC) and are described in the Existing Vegetation Mapping Summary: Bridger-Teton National Forest (available on the RSAC Web site at http://fsweb.rsac.fs.fed.us). Per accuracy assessments in the Summary, the Veg 07 mapping layer predicts shrub-land vegetation mapping groups accurately at a rate of 74% to 69%. Table 3-81 below summarizes mapped habitats by category and Ranger District; Figure 3-49 spatially displays locations of mapped habitats on the Forest. Currently, there are two active leks and one satellite lek known to occur on the Forest; one active and one satellite lek are located on the Jackson Ranger District within general habitat and one active lek is located on the Big Piney Ranger District within occupied habitat; no known lek sites on the BTNF are located within core Greater Sage-Grouse habitat.

Table 3-81. Mapped Greater Sage-Grouse Habitat Acres by Category for the Bridger-Teton National Forest

Unit	Core Habitat Acres* on the Bridger Teton National Forest**	General Habitat Acres* on the Bridger Teton National Forest**	Bridger Teton Occupied Habitat Acres* (Outside Core and General)	Total Acres of Mapped Sage-Grouse Habitat*	Sagebrush Community Type Acres* (Within General Habitat)	Sagebrush Community Type Acres* (Within Bridger Teton Habitat)
Buffalo Ranger District	220	33,070	0	33,290	-	-

Unit	Core Habitat Acres* on the Bridger Teton National Forest**	General Habitat Acres* on the Bridger Teton National Forest**	Bridger Teton Occupied Habitat Acres* (Outside Core and General)	Total Acres of Mapped Sage-Grouse Habitat*	Sagebrush Community Type Acres* (Within General Habitat)	Sagebrush Community Type Acres* (Within Bridger Teton Habitat)
Jackson Ranger District	2,700	144,230	5,590	152,510	-	-
Greys River Ranger District	0	1,860	2,920	4,780	-	-
Kemmerer Ranger District	0	7,720	0	7,720	-	-
Big Piney Ranger District	0	34,240	12,740	46,980	-	-
Pinedale Ranger District	3,080	40,900	39,340	83,310	-	-
Total Acres	**6,000**	**262,020**	**60,590**	**328,590**	**76,600 (29% of mapped habitat = sagebrush)**	**41,300 (68% of mapped habitat = sagebrush)**

*Excludes private lands within proclaimed Forest Service boundaries.
**(WY EO 2011-5)

Federally Listed Threatened and Endangered Species

The USFWS provided the most current and up to date list of threatened, endangered, proposed, and candidate species known or suspected to occur on the BTNF on October 26, 2011. Table 3-82 below summarizes those species identified by the USFWS that are known or suspected to occur on the BTNF and their potential to occur within designated Greater Sage-Grouse habitats on the Forest.

Table 3-82. Threatened, Endangered, Experimental, and Candidate Species for the Bridger-Teton National Forest

Species/Status	Species and/or Species Habitat Present Within Designated Sage-Grouse Habitat		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Mammals			
Canada lynx *(Lynx canadensis)* Threatened Species	Possible	No	Canada lynx prefer forest types associated with spruce and subalpine fir, coniferous forest types of mixed age and structural classes. Lynx habitat on the BTNF has been mapped per guidance in the Northern Rockies Lynx Management Direction (NRLMD), but mapped lynx habitats do not include sagebrush community types. No habitat association with Greater Sage-Grouse.

Species/Status	Species and/or Species Habitat Present Within Designated Sage-Grouse Habitat		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Canada lynx *(Lynx canadensis)* **Critical Habitat**	NA	Yes	Critical habitat for the Canada lynx (50 CFR 17.95(a)) has been designated by the USFWS for portions of Fremont, Lincoln, Park, Sublette, and Teton Counties on the BTNF. Critical habitat boundaries include Lynx Analysis Units (LAU) in their entirety, and include all community types within LAU boundaries (including sagebrush community types). However, sagebrush types do not provide preferred habitats for lynx; therefore, there is no habitat association with Greater Sage-Grouse.
Grizzly bear *(Ursus arctos horribilis)* Threatened Species	Probable	Yes	Grizzly bear are partially dependent on movements of big game populations and may occur in large ungulate migration, wintering, or parturition areas that include sagebrush habitats. There is a positive association with Greater Sage-Grouse habitat, and this species is relevant to the assessment.
North American wolverine *(Gulo gulo luscus)* Proposed Threatened Species	Possible	No	Wolverines occur within a wide variety of forest types, but prefer higher elevation alpine and boreal forest community types. Although this species has been observed on occasion searching for carrion within shrub steppe community types at lower elevations, there is little potential for habitat associations with Greater Sage-Grouse.
Avian			
Greater Sage-Grouse *(Centrocercus urophasianus)* Candidate Species	Probable	Yes	Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb (flowering herbaceous plants) understory. Providing habitat for this species is the focus of this assessment.
Yellow-billed cuckoo *(Coccyzus americanus)* Candidate Species	Not Suspected	No	In Wyoming, the yellow-billed cuckoo is dependent on large areas of woody, riparian vegetation that combine a dense shrubby understory for nesting and a cottonwood over-story for foraging. There is no habitat association with Greater Sage-Grouse.
Fish			
Kendall Warm Springs dace *(Rhinichthys osculus thermalis)* Endangered	Yes	Yes	This rare fish species is only known to occur in Kendall Warm Springs located within the Upper Green River drainage on the Pinedale Ranger District. Kendall Warm Springs is located within general Greater Sage-Grouse habitat mapped by the State of Wyoming, and the springs are surrounded by sagebrush community types. There is a positive association with Greater Sage-Grouse habitat, and this species is relevant to the assessment.

Sensitive Wildlife, Fish, and Plant Species

Sensitive species are those species for which population viability is a concern. They are managed under the authority of the National Forest Management Act (PL 94-588) and are administratively designated by the Intermountain Region's Regional Forester. The most recent sensitive species list was updated by Regional

Forester on July 27, 2011. Those sensitive species known and/or suspected on the BTNF (as designated by the Intermountain Regional Forester) are summarized in Table 3-83 below, along with their potential to occur within designated Greater Sage-Grouse habitats on the Forest.

Table 3-83. Affected Environment and Relevancy Table for Sensitive Species in the Bridger-Teton National Forest

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Mammals			
Bighorn sheep *Ovis canadensis canadensis*	Not Suspected	No	This species prefers high elevation alpine habitats with steep escape terrain adjacent to open foraging areas during summer months; bighorn sheep usually winter within mountain meadows at lower elevations within their home ranges. There is no habitat association with Greater Sage-Grouse.
Fisher *Martes pennanti*	Not Suspected	No	This species prefers extensive, mature to old-growth spruce-fir forests with high levels of canopy closure. There is no habitat association with Greater Sage-Grouse.
North American wolverine *Gulo gulo luscus*	Not Suspected	No	Wolverines occur within a wide variety of forest types, but prefer higher elevation alpine and boreal forest community types. Although this species has been observed on occasion searching for carrion within shrub steppe community types at lower elevations, there is little potential for habitat associations with Greater Sage-Grouse.
Gray Wolf *Canis lupus*	Probable	Yes	Gray wolves are habitat generalists and may inhabit a wide variety of habitat types. The main habitat requirements for gray wolves include the presence of abundant prey (i.e., elk) and relatively low levels of human activity. Wolves are partially dependent on movements of big game populations and may occur in large ungulate migration, wintering, or parturition areas that include sagebrush habitats. There is a positive association with Greater Sage-Grouse habitat, and this species is relevant to the assessment.
Spotted bat *Euderma maculatum*	Not Suspected	No	The spotted bat occupies a wide variety of habitats, from desert scrub to coniferous forest, although it is most often observed in low deserts and basins and juniper woodlands. It often occurs in association with canyons, prominent rock features, and permanent water sources. In montane habitats, it forages over meadows, along forest edges, or in open coniferous woodlands. The spotted bat roosts in cracks and crevices in high cliffs and canyons. It also may occasionally roost in buildings, caves, or abandoned mines. However, all recorded occurrences of spotted bats in Wyoming were associated with canyons containing cracks and fissures, high bare rock walls, and rock ridges close to a permanent water source (Hester and Grenier 2005). These habitats are not known to occur within the project area, and there is little potential for habitat associations with Greater Sage-Grouse.

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Townsend's Western big-eared bat *Corynorhinus townsendii townsendii*	Not Suspected	No	Townsend's big-eared bats occur in a wide variety of habitats, but its distribution is strongly correlated with the availability of caves and abandoned mines for roost sites. This species requires caves or abandoned mines during all stages of its life cycle, including maternity roosts, day and night roosts, reproduction, and hibernacula. It usually occurs between 3,675 and 8,300 feet in Wyoming (Hester and Grenier 2005). Caves and abandoned mines that provide habitat for this species are not known to occur within the project area, and there is little potential for habitat associations with Greater Sage-Grouse.
Birds			
Bald eagle *Haliaeetus leucocephalus*	Possible	No	This species requires nesting trees/platforms near large rivers or lakes and available fish and water bird species prey. Bald eagles are known to forage and nest along the Snake River, Green River and Large Lakes in the Wind River Range immediately adjacent to mapped Greater Sage-Grouse habitat. However, there is little potential for habitat associations with Greater Sage-Grouse.
American peregrine falcon *Falco peregrinus anatum*	Probable	Yes (Hunting Habitat)	Nesting requirements include vertical cliff habitat with large potholes or ledges that are inaccessible to land predators and are preferentially located near habitat that has a high avian prey population such as wetlands, large bodies of water, or rivers. Cliff nesting/roosting habitat is not known to occur near or within mapped Greater Sage-Grouse habitats, but individuals are known to hunt along the forest/shrub steppe interface where Greater Sage-Grouse potentially occur (especially along the Wyoming Range East Front on the Big Piney and Kemmerer Ranger Districts). Thus, there is potential for positive associations with Greater Sage-Grouse habitat, and this species is relevant to the assessment.
Boreal owl *Aegolius funereus*	Not Suspected	No	This species inhabits large expanses of contiguous forests that are typically structurally complex Engelmann spruce/subalpine fir forest types. There is no potential for habitat associations with Greater Sage-Grouse.
Great gray owl *Strix nebulosa*	Possible	Yes	This species prefers dense coniferous forest types that are most usually associated with mature or old growth Douglas fir forest for nesting. Great gray owls forage primarily in wet montane meadows. There is a potential association with Greater Sage-Grouse nesting/brood-rearing riparian habitats.
Flammulated owl *Otus flammeolus*	Not Suspected	No	This species is most commonly associated with ponderosa pine forests, but is sometimes found in Douglas fir stands mixed with aspen. Flammulated owls prefer to forage in open and semi-open forest, small grass openings, and the edges of meadows. There is no potential for habitat associations with Greater Sage-Grouse.

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Three-toed woodpecker *Picoides tridactylus*	Probable	Yes	This species is known to occur within a variety of habitats on the BTNF, including mixed conifer forests of lodgepole pine, Douglas-fir, Engelmann spruce, and subalpine fir (Wyoming Partners in Flight 2003). Coniferous forests with large numbers of recently killed trees provide the best habitat for this species. There is no potential for habitat associations with Greater Sage-Grouse.
Harlequin duck *Histronicus histronicus*	Not Suspected	No	Suitable habitat includes very low gradient streams with dense shrubs, braided channels, swift currents, and water with abundant aquatic insects. There is no potential for habitat associations with Greater Sage-Grouse.
Trumpeter swan *Cyngnus buccinator*	Not Suspected	No	Swans nest on a wide variety of freshwater ponds, lakes and (occasionally) rivers. They prefer areas with abundant and diverse communities of aquatic plants. There is no potential for habitat associations with Greater Sage-Grouse.
Northern goshawk *Accipiter gentilis*	Possible	Yes (Hunting Habitat)	This species prefers mature forests with large trees, relatively closed canopies, and open understories for nesting. Nest stands are most usually 30 to 40 acres in size. Foraging areas often include forests with a high density of large trees interspersed with shrublands and openings that provide a variety of prey species that include birds and small mammals. There is potential for positive associations with Greater Sage-Grouse habitat, and this species is relevant to the assessment.
Common loon *Gavia immer*	Not Suspected	No	Breeding habitat for loons includes secluded, clear-water lakes more than 10 acres in size located between 6,000 to 8,000 feet. Lake depths that exceed 6 feet and provide high fish populations are essential. There is no potential for habitat associations with Greater Sage-Grouse.
Greater Sage-Grouse *Centrocercus urophasianus*	Probable	Yes	Suitable habitat consists of plant communities dominated by sagebrush and a diverse native grass and forb (flowering herbaceous plants) understory. Providing habitat for this species is the focus of this assessment.
Yellow-billed cuckoo *Coccyzus americanus*	Not Suspected	No	In Wyoming, the yellow-billed cuckoo is dependent on large areas of woody, riparian vegetation that combine a dense shrubby understory for nesting and a cottonwood over-story for foraging. There is no habitat association with Greater Sage-Grouse.
Amphibians			
Columbia spotted frog *Rana luteiuentris*	Probable	Yes	In Wyoming, the Columbia spotted frog has been found in Bighorn, Sheridan, Johnson, Teton, Sublette, Fremont and Lincoln counties in sub-alpine forests, grasslands and sagebrush habitats at elevations from 1,700 to 6,400 feet. Columbia spotted frogs remain close to water during the breeding season, but may wander far from it afterwards to feed on earthworms, mollusks, and crustaceans. Breeding sites and adjacent foraging areas are known to occur within sagebrush community types and Greater Sage-Grouse habitats on the Forest. There is a positive association with Greater Sage-Grouse habitat, and this species is relevant to the assessment.

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Boreal toad *Bufo boreas boreas*	Probable	Yes	Boreal toads occupy montane forest habitats between 7,000 and 12,000 feet elevation. Breeding occurs in ponds, slow streams, river backwater channels and along lake edges. Adults are primarily terrestrial and have been observed in a great variety of habitats on the Forest, including sagebrush community types and Greater Sage-Grouse habitats. There is a positive association with Greater Sage-Grouse habitat, and this species is relevant to the assessment.
Fish			
Bonneville cutthroat trout *Oncorhynchus clarkii utah*	Probable	Yes	The Bonneville cutthroat trout is native to Wyoming in the Salt Creek and Smith Fork drainages of the Bear River system on the Kemmerer Ranger District. There is a potential association with Greater Sage-Grouse stream-side riparian habitats that provide for Greater Sage-Grouse nesting and brood-rearing.
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	Probable	Yes	The Colorado River cutthroat trout is native to Wyoming in the Green River drainage of the Colorado River system and is known to occur within the Green River and its tributaries. There is a potential association with Greater Sage-Grouse stream-side riparian habitats that provide for Greater Sage-Grouse nesting and brood-rearing.
Northern leatherside *Lepidomeda copei*	Probable	Yes	The species is native to Wyoming in the Bear Creek and Snake River drainages on the Kemmerer, Greys River and Jackson Ranger Districts. There is a potential association with Greater Sage-Grouse stream-side riparian habitats that provide for Greater Sage-Grouse nesting and brood-rearing.
Yellowstone/Snake River fine-spotted cutthroat *Oncorhynchus clarkii spp*	Probable	Yes	The Yellowstone cutthroat trout is native to the Yellowstone and Snake River systems on the Jackson and Buffalo Ranger Districts. There is a potential association with Greater Sage-Grouse stream-side riparian habitats that provide for Greater Sage-Grouse nesting and brood-rearing.
Plants			
Pink agoseris *Agoseris lackschewitzii*	No	No	The wet meadow habitat of pink agoseris does not have a sagebrush component. The habitat for pink agoseris does not overlap with that of Greater Sage-Grouse.
Sweet-flowered rock jasmine *Androsace chamaejasme ssp. carinata*	No	No	The preferred habitat of sweet-flowered rock jasmine is on exposed settings of rocky ridge crests, slopes with rock outcrops and thin soils of limestone or dolomite substrate at 8,500 to 10,800 feet elevation. These areas generally do not have a sagebrush component. The habitat of sweet-flowered rock jasmine does not overlap with that of Greater Sage-Grouse.
Meadow milkvetch *Astragalus diversifolius var. diversifolius*	Yes (historical)	Yes	This species is found in moist, often alkaline meadows and swales in sagebrush valleys at 4,400 to 6,300 feet elevation often described as a playa vegetation type. Recorded from one historical site in Green River basin in 1834, this species has not been found on the BTNF since.

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Starveling milkvetch *Astragalus jejunus var. jejunus*	No	No	This species is found on dry barren ridges and bluffs of shale and stone, clay or cobblestones at 6,000 to 7,100 feet elevation. Because sagebrush is not a component of this habitat type there is no overlap between the habitats of Greater Sage-Grouse and starveling milkvetch
Payson's milkvetch *Astragalus paysonii*	Yes	Yes	This species occurs primarily in disturbed areas on sandy soils that have a low cover of forbs and grasses at elevations of 5,850 to 9,600 feet which often occur as a mosaic component of sagebrush shrublands.
Payson's bladderpod *Lesquerella paysonii*	Possible	Possible	This species is endemic to the carbonate mountain ranges of west-central Wyoming, eastern Idaho, and southwestern Montana. It is found on rocky, sparsely-vegetated slopes, often calcareous substrates at elevations of 5,500 to 10,600 feet. The wide elevation range of this species means that it has a possible association with Greater Sage-Grouse habitat.
Naked-stemmed parrya *Parrya nudicaulis*	No	No	This species is found on alpine talus, often on limestone substrates at 10,700 to 11,400 feet elevation. Sagebrush is not a component of this habitat type. As such, there is no overlap between the habitat of naked-stemmed parrya and Greater Sage-Grouse.
Creeping twinpod *Physaria integrifolia var. monticola*	No	No	Found on barren, rocky, calcareous hills and slopes at 6,500 to 8,600 feet elevation. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of creeping twinpod and Greater Sage-Grouse.
Greenland primrose *Primula egalikensis*	No	No	This species is found in wet meadows along streams and calcareous montane bogs from 6600 to 8000 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of Greenland primrose and Greater Sage-Grouse.
Weber's saussurea *Saussurea weberi*	No	No	Restricted to the Gros Ventre and northern Wind River ranges. Habitat is on alpine talus slopes and gravel fields at 9,600 to 11,500 feet. There is no overlap between the habitat of Weber's saussurea and Greater Sage-Grouse.
Soft aster *Symphyotrichum molle*	Yes	Yes	In Wyoming, this species has been found in the Big Horn Mountains and Hoback Canyon. It prefers sagebrush grasslands and mountain meadows in calcareous soils at 6,400 to 8,500 feet elevation. The identification of the Hoback Canyon occurrence has been questioned, but the issue is unresolved. The presence of soft aster is acknowledged for the project area.
Seaside sedge *Carex incurviformis*	No	No	This species occurs primarily in alpine and subalpine moist tundra and wet rock ledges 10,000 to 12,200 feet elevation. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of seaside sedge and Greater Sage-Grouse.

Species	Species and/or Species Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Black and purple sedge *Carex luzulina var. atropurpurea*	No	No	This species is found in subalpine wet meadows and stream sides at 10,000 to 10,600 feet elevations. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of black and purple sedge and Greater Sage-Grouse.
Wyoming tansymustard *Descurainia torulosa*	No	No	Wyoming tansymustard is restricted to the southern Absaroka Range and the Rock Springs Uplift. Habitat is sandy soil at the base of cliffs composed of volcanic breccia or sandstone, under slight overhangs, in cavities in the volcanic rock, or on ledges. It is found at elevations of 7,700 to 10,500 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of Wyoming tansymustard and Greater Sage-Grouse.
Rockcress draba *Draba globosa*	No	No	Rockcress draba is found in moist, gravelly alpine meadows and talus slopes, often on limestone-derived soils from 8,100 to 12,400 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of rockcress draba and Greater Sage-Grouse.
Narrowleaf goldenweed *Ericameria discoidea var. linearis*	No	No	This species is typically found in semi-barren, whitish clay flats and slopes, gravel bars, and sandy lakeshores at elevations of 7,700 to 10,300 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of narrowleaf goldenweed and Greater Sage-Grouse.
Woolly daisy *Erigeron lanatus*	No	No	This species is found on alpine or subalpine limestone talus slopes at 11,000 feet elevation. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of woolly daisy and Greater Sage-Grouse.

Management Indicator Species

Management Indicator Species (MIS) are identified in the BTNF Plan, and are those species whose population changes are believed to reflect the effects of land management activities. MIS include harvested species, ecological indicator species, Forest Service Sensitive Species, and federally listed threatened and endangered species. Four additional ecological indicators were recently identified by the Forest including bighorn sheep for mountain meadow, boreal toad/boreal chorus frog for wetlands, quaking aspen for aspen, and cutthroat trout for riparian habitats. The potential for MIS species and/or their habitats to occur within Greater Sage-Grouse habitats and the potential for habitat associations with Greater Sage-Grouse are described in Table 3-84 below. Threatened, endangered, and sensitive species that are also MIS are indicated in the table. For further information and analysis on the management indicator species refer to the Management Indicator Species Report found in Appendix M.

Table 3-84. Affected Environment and Relevancy Table for Management Indicator Species in the Bridger-Teton National Forest

Species	Species or Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Mammals			
Bighorn sheep *(Ovis canadensis canadensis)*	Known	Yes	The species is also a listed Sensitive Species and is addressed in Table 3-83
Grizzly bear *(Ursus arctos horribilis)*	Known	Yes	This species is listed as a Threatened Species and is addressed in Table 3-82.
Elk *(Cervus elaphus nelsoni)*	Known	Yes	Elk are habitat generalists that summer throughout the BTNF and winter at and below the lowest elevations on the BTNF. Habitat for elk overlaps with Greater Sage-Grouse habitat and there is a positive association with sagebrush vegetation types; this species is relevant to the assessment.
Mule deer *(Odecoileus hemionus)*	Known	Yes	Mule deer are habitat generalists that summer throughout the BTNF and winter at and below the lowest elevations on the BTNF. Habitat for mule deer overlaps with Greater Sage-Grouse habitat and there is a positive association with sagebrush vegetation types; this species is relevant to the assessment.
Moose *(Alces alces shirasi)*	Known	Yes	Moose summer throughout the BTNF, and prefer willow complexes at lower elevations during winter. Willow complexes can occur in association with sagebrush vegetation types. Habitat for moose can overlap with Greater Sage-Grouse habitat; this species is relevant to the assessment.
Pronghorn antelope *(Antilocarpa americana)*	Known	Yes	This species prefers lower elevation sagebrush and grassland habitats, and summers within these types on the Bridger-Teton. Habitat for pronghorn overlaps with Greater Sage-Grouse habitat and there is a positive association with sagebrush vegetation types. This species is relevant to the assessment.
American marten *(Martes americana origines)*	Suspected	Yes	This species primarily inhabits old-growth coniferous forest dominated by spruce/fir with well-developed understories and abundant coarse woody debris. There is no potential for habitat associations with Greater Sage-Grouse.
Birds			
Bald eagle *(Haliaeetus leucocephalus)*	Possible	No	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Peregrine falcon *(Falco peregrinus anatum)*	Probable	Yes (Hunting Habitat)	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Whooping crane *(Grus Americana)*	No	Yes	This species was extirpated from the Rocky Mountains and does not occur on the BTNF, and there is no potential for habitat associations with Greater Sage-Grouse

Species	Species or Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Brewer's sparrow *(Spizella breweri)*	Known	Yes	The species prefers lower elevation sagebrush shrublands. There is a positive association with Greater Sage-Grouse habitat; this species is relevant to the assessment and positive benefits are anticipated.
Amphibians			
Boreal toad *(Bufo boreas boreas)*	Known	Yes	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Boreal chorus frog *(Pseudacris triseriata)*	Known	Yes	This species inhabits small streams and non-flowing bodies of water, such as marshes, ponds, and small lakes. When not breeding, they are generally found in damp grassy/marshy areas or damp forests near water, but have also been found up to 0.3 miles from water. Because breeding sites are known to occur adjacent to sagebrush vegetation types, there is a positive association with Greater Sage-Grouse habitat and this species is relevant to the assessment.
Fish			
Bonneville cutthroat trout *(Oncorhynchus clarkii utah)*	Probable	No	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Colorado River cutthroat *(Oncorhynchus clarkii pleuriticus)*	Probable	No	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Rainbow trout *(Oncorhynchus mykiss)*	Probable	Yes	Rainbow trout are a non-native trout species, but were historically stocked in many lakes and streams on the BTNF. This species likely occurs within some streams adjacent to sagebrush vegetation types. There is a potential association with Greater Sage-Grouse stream-side riparian habitats that provide for Greater Sage-Grouse nesting and brood-rearing.
Yellowstone/Snake River fine-spotted cutthroat *(Oncorhynchus clarkii spp.)*	Probable	No	The species is also a listed Sensitive Species and is addressed in Table 3-83.
Plants			
Shultz's milkvetch *(Astragalus shultziorum)*	No	No	Distribution of Schultz's milkvetch is centered in Wyoming in the Teton, Salt and Wind River ranges. It is found primarily in subalpine forb communities on shallow, rocky, calcareous soils at elevations of 8,800 to 11,500 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of Greater Sage-Grouse and Shultz's milkvetch.

Species	Species or Habitat Present in Project Area		Habitat, Comments, and Relevancy to Habitat Associations with Sage-Grouse
	Species	Habitat	
Boreal draba *(Draba borealis)*	No	No	Known in Wyoming from the southwestern Absaroka, western Wind River, Gros Ventre, Salt and Wyoming ranges, Jackson Hole and the Yellowstone Plateau on north-facing limestone, dolomite or volcanic slopes, cliffs and riparian areas from 6200 to 8500 feet. Sagebrush is not a component of this habitat type. There is no overlap between the habitat of boreal draba and Greater Sage-Grouse.
Aspen *(Populus tremuloides)*	Yes	Yes	In lower elevations aspen forms a mosaic with sagebrush habitat types (among other habitat types) in Wyoming.

Medicine Bow National Forest

Introduction

The MBNF includes four units in three distinct mountain ranges. The Medicine Bow portion of the Central Rockies includes the northern extension of the Colorado Front Range, which divides to include the Laramie Range on the east (the southern extension is known as the Sherman Mountains) and the Snowy Range of the Medicine Bow Mountains on the west. The Sierra Madre Mountains, which are the northern part of the Parks Range, occupy the westernmost portion of the Forest. The Continental Divide bisects the Sierra Madres. The major river drainages flow from the Continental Divide: the Green River Basin flows west into the Colorado River system, and the western Dakota sub-Basin and Platte River Basin flow east. All of the MBNF is mountainous. Elevations range from 5,050 feet above sea level in the Laramie Range to 12,013 feet at Medicine Bow Peak in the Snowy Range of the Medicine Bow Mountains.

Approximately 80% of the MBNF is forested. Forests are comprised primarily of lodgepole pine (*Pinus contorta*); other forest types include spruce-fir, aspen (*Populus tremuloides*), and ponderosa pine (*Pinus ponderosa*). There are 28 geographic areas within the four units established on the MBNF. The physical and ecological characteristics of these geographic areas are described in the MBMF Land and Resource Management Plan (2003). Of the four larger units on the Forest, only three contain sage steppe habitats designated as 'core' habitats (WY EO 2011-5) for the Greater Sage-Grouse.

No core Greater Sage-Grouse habitat occurs within the Sherman Mountains Unit (Pole Mountain) of the MBNF. Within the Laramie Range unit, 2,640 acres have been designated as core Greater Sage-Grouse habitats within the Boxelder Geographic Area. Within the Sierra Madre Unit, 1,290 acres of core habitats occur within the Northeast Sierra Madre Geographic Area (770 acres); South Savery Geographic Area (100 acres); Beaver Creek Geographic Area (130 acres); and, the North Savery Geographic Area (300 acres). Within the Snowy Range, designated core Greater Sage-Grouse habitats occur within the Pennock Mountain Geographic Area (280 acres) and the Platte River Geographic Area (350 acres). In general, these habitats occur in areas of ecological transition where sage steppe is interspersed by rock or outcrops as they transition to primarily lodgepole pine forest types. No leks of the Greater Sage-Grouse are known to occur on the MBNF.

Table 3-85 depicts National Forest System acreage within the four primary geographic units on the MBNF and the designated Greater Sage-Grouse core habitat acres within each of the respective units. Of the 1.26 million acres of National Forest System lands within the four units, 4,560 acres (<0.4%) are designated as core habitat for the Greater Sage-Grouse.

Table 3-85. Geographic Units and Core Greater Sage-Grouse Habitat in the Medicine Bow National Forest

Unit	Unit Acres	Core Acres
Laramie Peak	437,780	2,640
Sherman Mountains	55,580	0
Sierra Madre	362,220	1,290
Snowy Range	406,740	630
Total	**1,262,320**	**4,560**

Federally Listed Species

The Wyoming Ecological Services Field Office of the USFWS previously provided the MBNF with correspondence, dated May 23, 2011, indicating listed species likely to occur within or in proximity to the Forest (Wyoming Ecological Services Field Office 2011a). This list was subsequently revised to incorporate the relisting decision for the Preble's meadow jumping mouse (*Zapus hudsonius preblei*). This revised list was communicated to the Forest on October 24, 2011. Listed species pertinent to subsequent analyses related to the incorporation of land and resource management plan conservation measures for the Greater Sage-Grouse are identified within Table 3-86 below.

Relevance to sage and sage steppe conservation on the MBNF was assessed on the basis of species habitat association or the likelihood that species occurs on the MBNF. The table below depicts these associations and their relevance to the Greater Sage-Grouse assessment.

Table 3-86. Endangered Species Act Species within Region 2 of the Forest Service, Medicine Bow National Forest

Species	Habitat	Relevance
Listing Status: Endangered		
Mammals		
Black-footed ferret *Mustela nigripes*	Restricted distribution, Shirley Basin, Wyoming. Prairie dog colonies.	No habitat association and occurrence.
Birds		
Piping plover *Charadrius melodus*	Platte River system.	No habitat association.
Whooping crane *Grus americana*	Platte River system.	No habitat association.
Least tern *Sternula antillarum*	Platte River system.	No habitat association.
Amphibians		
Wyoming toad *Bufo baxteri*	Restricted distribution, plains lakes, Albany Co., Wyoming.	No habitat association.
Fishes		
Humpback chub *Gila cypha*	Colorado River System.	No habitat association.

Species	Habitat	Relevance
Bonytail chub *Gila elegans*	Colorado River System.	No habitat association.
Colorado pikeminnow *Ptychocheilus lucius*	Colorado River System.	No habitat association.
Pallid sturgeon *Scaphirhynchus albus*	Colorado River System.	No habitat association.
Razorback sucker *Xyrauchen texanus*	Colorado River System.	No habitat association.
Plants		
Osterhout milkvetch *Astragalus osterhoutii*	Restricted distribution, badland shales, Grand County, Colorado.	No habitat association and occurrence.
Blowout penstemon *Penstemon haydenii*	Sand blowouts, sand ridges associated with dune habitats	No habitat association.
Penland beardtongue *Penstemon penlandii*	Restricted distribution, badland shales, Grand County, Colorado.	No habitat association and occurrence.
North Park phacelia *Phacelia formosula*	Restricted distribution, North Park, Colorado.	No habitat association and occurrence.
Listing Status: Threatened		
Mammals		
Canada lynx *Lynx canadensis*	Boreal spruce-fir forests to sage steppe in linkage areas.	Yes, relevant to analyses.
Preble's meadow jumping mouse *Zapus hudsonius preblei*	Riparian grass – shrub zones.	Yes, relevant to analyses.
Fishes		
Greenback cutthroat trout *Oncorhynchus clarkii stomias*	Coldwater streams.	No habitat association.
Plants		
Western prairie fringed orchid *Platanthera praeclara*	Tall grass, calcareous prairies and sedge meadows, Platte River System.	No habitat association and occurrence.
Ute ladies'-tresses orchid *Spiranthes diluvialis*	Moist meadows, stream terraces, oxbows, elevations 4,300 to 6,850 feet.	Yes, relevant to analyses.
Listing Status: Candidate		
Birds		
Greater Sage-Grouse *Centrocercus urophasianus*	Sage, sage steppe.	Yes, relevant to analyses.
Yellow-billed cuckoo (Western race) *Coccyzus americanus (Candidate)*	Cottonwood riparian.	No habitat association and occurrence.

Regional Forester's Sensitive Species

The intent of designation of a species as a regional forester's sensitive species is to ensure that these species, identified as being at risk, receive adequate consideration during programmatic and site-specific project planning. Sensitive species of native plant and animals must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. That is, there should be no impacts to regional forester's sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species (FSM 2672.1). A complete list of species designated as sensitive may be accessed online at http://www.fs.fed.us/r2/projects/scp/sensitivespecies/index.shtml.

Regional forester's sensitive species for the MBNF, pertinent to subsequent analyses related to the incorporation of Land and Resource Management Plan measures to conserve the Greater Sage-Grouse, are identified within Table 3-87 below.

Table 3-87. Terrestrial Wildlife Species, Medicine Bow National Forest

Species	Habitat*	Relevance
Mammals		
Grizzly bear *Ursus arctos horribilis*	Various habitats in Greater Yellowstone Area.	No occurrence.
Rocky Mountain Bighorn Sheep *Ovis canadensis canadensis*	Shrublands, rock outcrops, alpine. Three herds on forest.	Yes, relevant to analyses.
Desert bighorn sheep *Ovis canadensis nelsoni*	Shrublands, rock outcrops, alpine. Does not occur on the Forest.	No occurrence.
Pygmy shrew *Sorex hoyi*	Wetland edges in spruce-fir above 9,000 feet.	No habitat association.
Fringed myotis *Myotis thysanodes*	Forages in ponderosa pine, oak, shrublands, pinyon/juniper.	Yes, relevant to analyses.
Spotted bat *Euderma maculatum*	Juniper shrub, desert sagebrush grasslands. Not known to occur on the Forest.	Yes, relevant to analyses.
Townsend's big-eared bat *Corynorhinus townsendii*	Summer foraging habitat over live canopy, shrublands.	Yes, relevant to analyses.
Black-tailed prairie dog *Cynomys ludovicianus*	Grasslands. Does not occur on the Forest.	No occurrence.
White-tailed prairie dog *Cynomys leucurus*	Colony at Six-mile/Platte River.	Yes, relevant to analyses.
Gunnison's prairie dog *Cynomys gunnisoni*	Dry grasslands at high altitudes. Does not occur on the Forest.	No occurrence.
Wyoming pocket gopher *Thomomys clusius*	Sagebrush shrub, grassland. Not known on forest.	No occurrence.
Water vole *Microtus richardsoni*	Alpine, subalpine, and foothills riparian. Does not exist on forest (USDA 2010).	No occurrence.
Swift fox *Vulpes velox*	Grasslands. Does not occur on the Forest.	No occurrence.

Species	Habitat*	Relevance
Kit fox *Vulpes macrotis*	Grasslands. Does not occur on the Forest.	No occurrence.
River otter *Lontra canadensis*	Rivers.	No habitat association.
American marten *Martes americana*	Spruce-fir, lodgepole pine.	No habitat association.
Wolverine *Gulo gulo*	Spruce-fir, alpine, lodgepole pine, rock/cliff/cave.	No habitat association.
Common hognosed skunk *Conepatus leuconotus*	Sparsely timbered or brushy areas. Does not exist on the Forest (USDA 2010).	No occurrence.
Birds		
American bittern *Botaurus lentiginosus*	Marshes. Does not occur on MBNF.	No habitat association and occurrence.
Trumpeter swan *Cygnus buccinator*	Marshes. Does not occur on MBNF.	No habitat association and occurrence.
Harlequin duck *Histrionicus histrionicus*	Mountain rivers, lakes. Does not occur on MBNF.	No habitat association and occurrence.
Bald eagle *Haliaeetus leucocephalus*	Lakes, rivers.	No habitat association.
Northern goshawk *Accipiter gentiles*	Spruce-fir, aspen, lodgepole pine, riparian.	No habitat association.
Ferruginous hawk *Buteo regalis*	Mountain shrub, forest meadow, sagebrush shrub, 4,500 to 7,500 feet elevation.	Yes, relevant to analyses.
American peregrine falcon *Falco peregrinus anatum*	Rock/cliff/cave, 50 to 200 feet high, sagebrush shrub, near rock/cliff/caves, 4500 to 9000 feet elevation.	Yes, relevant to analyses.
Northern harrier *Circus cyaneus*	Grassland, marsh, sagebrush shrub near water, <7,900 feet.	Yes, relevant to analyses.
Columbian sharp-tailed grouse *Tympanuchus phasianellus columbianus*	Mountain shrub west of Continental Divide.	Yes, relevant to analyses.
Greater prairie-chicken *Tympanuchus cupido*	Grasslands. Does not occur on the MBNF.	No occurrence.
Lesser prairie-chicken (Candidate) *Tympanuchus pallidicinctus*	Dry grasslands. Does not occur on MBNF.	No occurrence.
Gunnison sage-grouse (Candidate) *Centrocercus minimus*	Sagebrush shrub. Does not occur on the MBNF (USDA 2010).	No occurrence.
Greater Sage-Grouse (Candidate) *Centrocercus urophasianus*	Sagebrush shrub.	Yes, relevant to analyses.
White-tailed ptarmigan *Lagopus leucurus*	Alpine willow. Currently considered extirpated on the MBNF.	No habitat association and occurrence.

Species	Habitat*	Relevance
Mountain plover *Charadrius montanus*	Grasslands. Does not occur on the MBNF.	No occurrence.
Long-billed curlew *Numenius americanus*	Grasslands. Does not occur on the MBNF.	No occurrence.
Black tern *Chlidonias niger*	Wetlands. Does not occur on the Forest.	No habitat association and occurrence.
Yellow-billed cuckoo (Candidate) *Coccyzus americanus*	Cottonwood riparian. Does not occur on the MBNF.	No habitat association and occurrence.
Burrowing owl *Athene cunicularia*	Grasslands. Does not occur on the MBNF.	No occurrence.
Boreal owl *Aegolius funereus*	Spruce-fir, lodgepole pine.	No habitat association.
Flammulated owl *Otus flammeolus*	Aspen, ponderosa pine stands in southern portion of Sierra Madre.	No habitat association.
Short-eared owl *Asio flammeus*	Sagebrush shrub, grasslands, marshes. Might occur only on the Laramie Peak unit.	Yes, relevant to analyses.
Black swift *Cypseloides niger*	Wet cliff faces. Does not occur on the Forest.	No habitat association and occurrence.
Lewis' woodpecker *Melanerpes lewis*	Ponderosa pine. Occurs on the Laramie Peak unit.	No habitat association.
Black-backed woodpecker *Picoides arcticus*	Spruce-fir, ponderosa pine and recently burned conifer forest.	No habitat association.
American three-toed woodpecker *Picoides tridactylus dorsalis*	Spruce-fir, lodgepole pine, aspen.	No habitat association.
Olive-sided flycatcher *Contopus borealis*	Spruce-fir, lodgepole pine, wetland, forest meadow.	No habitat association.
Purple martin *Progne subis*	Aspen in specific area on west side of Continental Divide.	No habitat association.
Loggerhead shrike *Lanius ludovicianus*	Grassland w/shrubs <8000 feet.	Yes, relevant to analyses.
Brewer's sparrow *Spizella breweri*	Sagebrush shrub.	Yes, relevant to analyses.
Cassin's sparrow *Aimophila cassini*	Grasslands. Extreme southeast Wyoming.	No occurrence.
Grasshopper sparrow *Ammodramus savannarum*	Grasslands. Does not occur on the Forest.	No occurrence.
Sage sparrow *Amphispiza bellii*	Sagebrush shrub below 6500 feet.	Yes, relevant to analyses.
McCown's longspur *Calcarius mccownii*	Grasslands. Does not occur on the Forest.	No occurrence.

Species	Habitat*	Relevance
Chestnut-collared longspur *Calcarius omatus*	Grasslands. Does not occur on the Forest.	No occurrence.
Amphibians		
Boreal toad *Anaxyrus boreas boreas*	Wetlands, less common in densely forested areas.	No habitat association.
Plains leopard frog *Lithobates blairi*	Permanent water, including ponds along transient streams.	No occurrence.
Columbia spotted frog *Lithobates luteiventris*	Only known from Bighorn and Shoshone National Forest.	No occurrence.
Northern leopard frog *Lithobates pipiens*	Wide variety aquatic habitats, wetlands.	Yes, relevant to analyses.
Wood frog *Lithobates sylvatica*	Sedge, grass meadows, willow hummocks, aspen, lodgepole pine forests, woodlands.	No habitat association.
Fishes		
Bluehead sucker *Catostomus discobolus*	Large rivers, west slope Colorado.	No occurrence.
Flannelmouth sucker *Catostomus latipinnis*	Large rivers, west slope Colorado.	No occurrence.
Mountain sucker *Catostomus platyrhynchus*	Clear, cold creeks, small to medium-sized rivers with sand, gravel, rubble substrate.	No habitat association.
Rio Grande sucker *Catostomus plebeius*	Endemic to the Rio Grande basin in Colorado.	No occurrence.
Lake chub *Couesius plumbeus*	Permanent spring flow, usually at the headwaters of small streams.	No occurrence.
Rio Grande chub *Gila pandora*	Endemic to Rio Grande basin in Colorado.	No occurrence.
Roundtail chub *Gila robusta*	Only occurs in Colorado River basin.	No occurrence.
Plains minnow *Hybognathus placitus*	Great Plains streams with fluctuating stream flows, shifting sand substrates.	Yes, relevant to analyses.
Sturgeon chub *Macrhybopsis gelida*	Great Plains rivers.	No occurrence.
Pearl dace *Margariscus margarita*	Clear, cold-water streams with some gravel.	No habitat association and occurrence.
Hornyhead chub *Nocomis biguttatus*	Isolated populations in the Laramie and North Laramie rivers.	No occurrence.
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	Cold-water streams.	No habitat association.
Rio Grande cutthroat trout *Oncorhynchus clarkii virginalis*	Cold-water streams.	No habitat association and occurrence.

Species	Habitat*	Relevance
Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri*	Cold-water streams.	No habitat association and occurrence.
Northern redbelly dace *Phoxinus eos*	Permanent spring seeps, usually at the extreme headwaters of small streams.	No occurrence.
Southern redbelly dace *Phoxinus erythrogaster*	Clear streams and ponds with sand and silt substrates.	No occurrence.
Finescale dace *Phoxinus neogaeus*	Permanent spring seeps, usually at the extreme headwaters of small streams.	No occurrence.
Flathead chub *Platygobio gracilis*	Big Horn, Tongue, Powder, Little Powder, Belle Fourche, and Cheyenne River systems.	No occurrence.
Mollusks		
Rocky Mountain capshell snail *Acroloxus coloradensis*	Littoral zones of mesotrophic lakes <9,400 feet. Known only from CO, and MT.	No habitat association.
Pygmy mountain snail *Oreohelix pygmaea*	Does not occur on the Forest.	No occurrence.
Cooper's mountain snail *Oreohelix strigosa cooperi*	Known only on Black Hills National Forest.	No occurrence.
Insects		
Susan's purse making caddisfly *Ochrotrichia susanae*	Wetlands. Does not occur on the MBNF.	No occurrence.
Ottoe skipper *Hesperia ottoe*	Tall-grass prairie. Does not occur on the MBNF.	No occurrence.
Hudsonian emerald *Somatochlora hudsonica*	Boggy ponds.	No habitat association.
Regal fritillary *Speyeria idalia*	Tall-grass prairie. Does not occur on the MBNF.	No occurrence.
Nokomis fritillary butterfly *Speyeria nokomis nokomis*	Wetlands. Known range south and west of Wyoming.	No habitat association.

Table 3-88 below depicts plant species designated as Regional Forester's Sensitive Species within Region 2 of the Forest Service. Relevance to sage steppe conservation on the MBNF assessed on the basis of species habitat association or the likelihood that species occurs on the MBNF. Species known within the Pole Mountain unit excluded due to lack of designated core Greater Sage-Grouse habitats. Assessment further narrowed to include only those species known or suspected to occur within the Laramie, Sierra Madre, and Snowy Range Mountain Units of the MBNF.

Table 3-88. Region 2 Sensitive Plant Species, Medicine Bow National Forest

Species	Habitat	Relevance
Laramie columbine *Aquilegia laramiensis*	Crevices in north facing granite boulders, 6,250 to 8,000 feet	No habitat association.

Species	Habitat	Relevance
Park milkvetch *Astragalus leptaleus*	Willow cars, sedge-grass transition to shrub at 8,800 feet	No habitat association.
Narrowleaf moonwort *Botrychium lineare*	Grass, stream, forest edges, also upland habitats up to 10,500 feet	No habitat association.
Lesser panicled sedge *Carex diandra*	Peatland-fens, pond edge, 6,100 to 8,600 feet	No habitat association.
Livid sedge *Carex livida*	Floating mats, bogs, fens, and marls with carex, hummocks, 9,000 to 10,000 feet	No habitat association.
Lesser yellow lady's slipper *Cypripedium parviflorum*	Mossy woods, streams and bogs, 4,000 to 6,400 (10,000) feet	No habitat association.
Clawless draba (Gray's peak draba) *Draba exunguiculata*	Alpine fell fields, 10,000+ feet	No habitat association.
Gray's draba *Draba grayana*	Alpine fell fields, 10,000+ feet	No habitat association.
Roundleaf sundew *Drosera rotundifolia*	Acid fens, float mats, bogs, 9,100 to 9,800 feet.	No habitat association.
Elliptic spike rush (boreal spike rush) *Eleocharis elliptica*	Thermal seeps/springs, stock ponds, 6,200 to 7,250 feet. (9,100 feet)	No habitat association.
Dropleaf (slender leaved) buckwheat *Eriogonum exilifolium*	Semi-bare sandy bunchgrass communities, seleniferous gumbo, 6,900 to 8,800 feet	Yes, relevant to analyses.
Whitebristle cottongrass *Eriophorum altaicum var. neogaeum*	Fens, 9,500 to 14,000 feet	No habitat association.
Slender cottongrass *Eriophorum gracile*	Sedge meadows, floating bogs saturated soil to shallow water, 6,900 to 10,500 feet	No habitat association.
Plains rough fescue (Hall's fescue) *Festuca hallii*	Sloped montane meadows, edges, open conifer 6,800 to 11,000 feet	No habitat association.
Scarlet gilia (Rabbit Ears gilia) *Ipomopsis aggregata ssp. weberi*	Openings in conifer forest slopes, ridges 7,200 to 8,300 feet in Wyoming	No habitat association.
Simple bog sedge (Kobresia) *Kobresia simpliciuscula*	Flooded marl wetlands with *Carex simulata* 6,000 feet in Wyoming	No habitat association.
Colorado tansyaster *Machaeranthera coloradoensis var. coloradensis*	Gravelly places in mountain parks, dry tundra, sandstone/limestone, 8,400 to 8,500 feet	Yes, relevant to the analysis.
Rocky Mountain monkeyflower *Mimulus gemmiparus*	Granitic seeps, slopes and alluvium in open sites w/ spruce-fir and aspen at 8,500 to 10,500 feet	No habitat association.
Kotzebue's grass of Parnassu *Parnassia kotzebuei*	Moist seeps, wet tundra on thin clay soil, moist ledges at 10,000 to 12,000 feet	No habitat association.

Species	Habitat	Relevance
Harrington's beardtongue *Penstemon harringtonii*	Open sagebrush moderate slopes calcareous soils at 6,800 to 9,200 feet	No occurrence.
Rock cinquefoil (front range cinquefoil) *Potentilla rupincola*	Mountain gravel soils or shelves, niches cliffs-often granite at 6,900 to 10,500 feet	No habitat association.
Ice cold buttercup *Ranunculus karelinii*	Ridges, peaks, in rocks and scree, low-lying snow banks at 10,000 to 14,100 feet	No habitat association.
Dwarf raspberry (nagoon berry) *Rubus arcticus ssp. acaulis*	Dense canopy in lodgepole, spruce-fir w/ *Linnaea borealis* at 7,000 to 10,000 feet	No habitat association.
Sageleaf willow (hoary willow) *Salix candida*	Cool, boreal forests and prairies in remnant fen and seeps at 6,600 to 10,600 feet	No habitat association.
Autumn willow *Salix serissima*	Calcareous fen meadow at 7,800 to 9,300 feet	No habitat association.
Club spikemoss (northern spikemoss) *Selaginella selaginoides*	Mossy banks, wet meadows, marsh wet spruce forests at 7,700 to 8,000 (9,500) feet	No habitat association.
Sphagnum *Sphagnum angustifolium*	Fens, acid fens, floating vegetation mats at 7,000 to 12,000 feet	No habitat association.
Baltic sphagnum *Sphagnum balticum*	Iron fens, wetter areas of ombrotrophic bogs 7,000 to 12,000 feet	No habitat association.
Largeflower triteleia *Triteleia grandiflora*	Grassy areas in sagebrush at edge of aspen, lodgepole to 8,400 feet in Wyoming*	Yes, relevant to analyses.
Lesser bladderpod *Utricularia minor*	Shallow fens, wetland, subalpine ponds, 6,600 to 8,600 feet	No habitat association.
Selkirk's violet *Viola selkirkii*	Moist, shaded ravines and cold boreal forest 8,500 to 9,100 feet	No habitat association.

*Ladyman, J.A.R. (2007).

Though habitat for *Triteleia grandiflora* may occur on the MBNF, this species is known only from within the Yellowstone Ecosystem in northwest Wyoming. One record dating from 1929 cites the occurrence of this species on the MBNF (Ladyman 2007). *Penstemon harringtonii,* though associated with sagebrush habitats, is known only from Colorado.

Management Indicator Species

The National Forest Management Act of 1976 (16 U.S.C. § 1600 *et seq.*) forms the foundation for the designation and monitoring of Management Indicator Species (MIS) as a component of Forest Service land and resource management planning. Implementing regulations are provided at 36 CFR 219.19, and in Forest Service Manual 2600.

The Forest Service Manual defines MIS as "...plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (United States Department of Agriculture [USDA]-Forest Service 1991). The National Forest Management Act (NFMA) requires that MIS be selected as part of the forest plan to estimate the effects of planning alternatives on fish and wildlife populations (USDA 2003). Therefore, MIS are used as barometers to evaluate the effects of forest management on wildlife within the Forest.

The MIS selected in the 2003 Revision of the MBNF Land and Resource Management Plan were chosen for their ability to "resolve uncertainty about management effects" with an emphasis on management issues (USDA 2003). All management indicator species are known to occur across the MBNF. Relevance to sage and sagebrush steppe conservation on the MBNF was assessed on the basis of species habitat association on the MBNF are depicted in Table 3-89 below.

Table 3-89. Management Indicator Species, Medicine Bow National Forest

Species	Indicator of:	Habitat	Relevance
Snowshoe hare *Lepus americana*	Adequacy of habitat to support prey for predators	Conifer habitats with dense understory	No habitat association
American marten *Martes americana*	Landscape fragmentation and coarse woody debris	Spruce-fir, lodgepole pine forest types	No habitat association
Northern goshawk *Accipiter gentiles*	Late seral stage lodgepole pine and aspen	Aspen, lodgepole pine forest types	No habitat association
Golden-crowned kinglet *Regulus satrapa*	Fragmentation within a forest stand	Spruce-fir, lodgepole pine forest types	No habitat association
Three-toed woodpecker *Picoides tridactylus*	Snags, old forest, recent forest burns	Spruce-fir, lodgepole pine forest types	No habitat association
Lincoln's sparrow *Melospiza lincolnii*	Riparian zone, herbivory in willow community	Riparian vegetation	No habitat association
Wilson's warbler *Wilsonia pusilla*	Riparian zone, herbivory in willow community	Riparian vegetation	No habitat association
Common trout *Oncorhynchus sp.,*	Water quality	Coldwater streams	No habitat association

The MBNF lacks any substantial area of sage or sage steppe habitats. In aggregate, core Greater Sage-Grouse habitats comprise less than 0.4% of National Forest System lands on the MBNF. Given the minimal acreage of this habitat type on the Forest, and the distribution of these habitats in isolated parcels, sage and sage steppe habitats did not warrant consideration in terms of identification of management indicator species during revision of the 2003 MBNF Land and Resource Management Plan. Consequently, none of the designated MIS on the MBNF provide any utility in terms of tracking any subsequent implementation of Greater Sage-Grouse conservation measures. For further information and analysis on the management indicator species refer to the Management Indicator Species Report found in Appendix M.

Thunder Basin National Grassland

Introduction

The TBNG is comprised of over 553,000 acres of National Forest System lands with intermingled areas of private and state ownership. The administrative boundary of the TBNG encompasses over 1.7 million acres within portions of Campbell, Converse, Niobrara, and Weston counties. Table 3-90 depicts National Forest System acreage on the TBNG and designated Greater Sage-Grouse core habitat acres. Of the over 0.5 million acres of National Forest System lands that comprise the TBNG, 217,770 acres (~39%) have been designated as core Greater Sage-Grouse habitats by the State of Wyoming.

Table 3-90. Acreage and Designated Greater Sage-Grouse Core Habitat Acres in the Thunder Basin National Grassland

Unit	Core Habitat Acres	General Habitat Acres	Total Acres of Sage-Grouse Habitat
Thunder Basin National Grassland	217,770	336,100	**553,870**

The TBNG management plan also designates where and how much habitat will be managed for in high, medium and low structure. These are spelled out within each geographic area direction. In this direction it is stated that "A substantial amount of this should be located where it would optimize Greater Sage-Grouse habitat and associated species."

With the exceptions of relatively small inclusions such as open pit coal mines, timbered escarpments, and water bodies, all of the TBNG is considered occupied Greater Sage-Grouse habitat. Of the 553,860 acres of National Grassland surface, 217,770 acres have been designated by the State of Wyoming as core Greater Sage-Grouse habitat. The remaining acreage on the grassland (336,100 acres) has been designated as general Greater Sage-Grouse habitat. That is, the entirety of the TNBG is considered to be occupied Greater Sage-Grouse habitat. Wyoming big sagebrush (*Artemisia tridentata*) comprises the vegetative dominant species on approximately 438,500 acres within the grassland. Other shrublands, including silver sagebrush (*Artemisia cana*) and greasewood (*Sarcobatus vermiculatus*), occupy an additional 31,000 acres on the grassland.

Table 3-91 below depicts National Forest System acreage within the primary geographic units on the TBNG and the designated Greater Sage-Grouse core habitat acres within each of the respective units. Of the over 0.5 million acres of National Forest System lands that comprise the TBNG, 217,770 acres (~39%) have been designated as core Greater Sage-Grouse habitats by the State of Wyoming.

Table 3-91. Primary Geographic Units and Greater Sage-Grouse Core Habitat in the Thunder Basin National Grassland

Geographic Area	Range of High Structure Sagebrush
Broken Hills	55,100 to 62,980 acres
Cellers Rosecrans	42,380 to 48,430 acres
Fairview Clareton	27,640 to 32,250 acres
Hilight Bill	25,200 to 30,230 acres
Spring Creek	17,060 to 19,500 acres
Upton Osage	11,310 to 12,920 acres
Total Range	**178,690 to 206,310 acres**

Federally Listed Species

The purposes of the ESA are to provide a means for conserving the ecosystems upon which endangered and threatened species depend and a program for the conservation of such species. The ESA directs all federal agencies to participate in conserving these species. Specifically, section 7 (a)(1) of the ESA charges federal agencies to aid in the conservation of listed species, and section 7 (a)(2) requires the agencies to ensure that their activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitats.

The Wyoming Ecological Services Field Office of the USFWS previously provided the TBNG with correspondence, dated June 9, 2011, indicating listed species likely to occur within or in proximity to the Grassland (Wyoming Ecological Services Field Office 2011b).

Table 3-92 identifies species listed under the ESA within Region 2 of the Forest Service that may occur within or in proximity to the TBNG. Relevance to sage and sage steppe conservation on the TBNG was assessed on the basis of species habitat association or the likelihood that species occurs on the TBNG.

Table 3-92. ESA Species: Relevance to Sage and Sagebrush Steppe Conservation in the Thunder Basin National Grassland

Species	Habitat	Relevance
Status: Endangered		
Plants		
Blowout penstemon *Penstemon haydenii*	Sand blowouts, sand ridges associated with dune habitats	No habitat association and occurrence
Mammals		
Black-footed ferret *Mustela nigripes*	Restricted distribution, Shirley Basin, Wyoming. Prairie dog colonies.	No habitat association and occurrence.
Status: Threatened		
Plants		
Ute ladies'-tresses orchid *Spiranthes diluvialis*	Moist meadows, stream terraces, oxbows. Elevations 4300 to 6850 feet.	Yes, relevant to analyses
Status: Candidate		
Birds		
Greater Sage-Grouse *Centrocercus urophasianus*	Sage, sage steppe	Yes, relevant to analyses

At present, no listed vertebrates are known to occur on the TBNG. The USFWS has previously determined that the black-tailed prairie dog (*Cynomys ludovicianus*) was not warranted for listing (74 FR 63343). A similar listing decision (76 FR 27756) was reached for the mountain plover (*Charadrius montanus*). The TBNG Land Resource Management Plan describes a designated Management Area (3.63) specifically as black-footed ferret reintroduction Habitat. This management area encompasses 47,442 of National Grassland surface and has management direction specifically designed to maintain and enhance black-footed ferret habitat. This area overlaps designated Greater Sage-Grouse core area habitat Resolution of possible management conflicts will likely be an issue as efforts to conserve the Greater Sage-Grouse are advanced.

To meet the goals and objectives of this management area, management activities are implemented to conserve short-grass prairie habitats and black-tailed prairie dogs. Current management activities being used within this management area include prescribed fire; mowing; installation of temporary fencing to facilitate the growth of vegetative buffers; the dusting of prairie dog burrows to combat bubonic plague; designation of prairie dog shooting closures; installation of signage; trapping and translocation of prairie dogs encroaching on private land; application of rodenticides where other methods have proven ineffective; and, the installation of raptor perches to encourage predation of prairie dogs in proximity to private lands.

Regional Forester's Sensitive Species

The intent of designation of a species as a regional forester's sensitive species is to ensure that these species, identified as being at risk, receive adequate consideration during programmatic and site-specific project planning. Sensitive species of native plants and animals must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for federal listing. That is, there should be no impacts to regional forester's sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species (FSM 2672.1). A complete list of species designated as sensitive within Region 2 of the Forest Service may be accessed online at http://www.fs.fed.us/r2/projects/scp/sensitivespecies/index.shtml.

Regional forester's sensitive species for the TBNG, pertinent to subsequent analyses related to the incorporation of Land and Resource Management Plan measures to conserve the Greater Sage-Grouse, are identified within Table 3-93, and Figure 3-50 displays Core Habitat for Greater Sage-Grouse within the Thunder Basin National Grassland.

Table 3-93. Region 2 Sensitive Wildlife Species in the Thunder Basin National Grassland

Species	Habitat*	Relevance
Mammals		
Grizzly bear *Ursus arctos horribilis*	Various habitats in Greater Yellowstone area	No occurrence
Rocky Mountain bighorn sheep *Ovis canadensis canadensis*	Shrublands, rock outcrops, alpine. Three herds on MBNF	No occurrence
Desert bighorn sheep *Ovis canadensis nelsoni*	Shrublands, rock outcrops, alpine.	No occurrence
Pygmy shrew *Sorex hoyi*	Does not occur on TBNG	No occurrence
Fringed myotis *Myotis thysanodes*	Forages in ponderosa pine, oak, shrublands, pinyon-juniper	Yes, relevant to analyses
Spotted bat *Euderma maculatum*	Does not occur on TBNG	No occurrence
Townsend's big-eared bat *Corynorhinus townsendii*	Summer foraging habitat over live canopy, shrublands	Yes, relevant to analyses
Northern long-eared bat *Myotis septentrionalis*	Live and dead trees, caves, mines	Yes, relevant to analyses

Species	Habitat*	Relevance
Black-tailed prairie dog *Cynomys ludovicianus*	Grasslands	Yes, relevant to analyses
Black-footed ferret Mustela nigripes	Prairie dog colonies	Yes, relevant to analyses
White-tailed prairie dog *Cynomys leucurus*	Colony at Six-mile/Platte River	No occurrence
Gunnison's prairie dog *Cynomys gunnisoni*	Dry grasslands at high altitudes. Not known on Grassland.	No occurrence
Wyoming pocket gopher *Thomomys clusius*	Sagebrush shrub and grassland. Not known on Grassland.	No occurrence
Water vole *Microtus richardsoni*	Alpine, subalpine, and foothills riparian	No occurrence
Swift fox *Vulpes velox*	Grasslands.	Yes, relevant to analyses
Kit fox *Vulpes macrotis*	Grasslands	No occurrence
River otter *Lontra canadensis*	Does not occur on TBNG	No occurrence
American marten *Martes americana*	Does not occur on TBNG	No occurrence
Wolverine *Gulo gulo*	Does not occur on TBNG	No occurrence
Common hognosed skunk *Conepatus leuconotus*	Does not occur on TBNG	No occurrence
Birds		
American bittern *Botaurus lentiginosus*	Marshes	No habitat association and occurrence
Trumpeter swan *Cygnus buccinators*	Marshes	No habitat association and occurrence
Harlequin duck *Histrionicus histrionicus*	Mountain rivers, lakes	No habitat association and occurrence
Bald eagle *Haliaeetus leucocephalus*	Lakes, rivers	Yes, relevant to analyses
Northern goshawk *Accipiter gentiles*	Spruce-fir, alpine, lodgepole pine, riparian	No habitat association
Ferruginous hawk *Buteo regalis*	Mountain shrub, forest-meadow, sagebrush shrub, 4,500 to 7,500 feet elevation	Yes, relevant to analyses
American peregrine falcon *Falco peregrinus anatum*	Rock/cliff/cave from 50 to 200 feet high, sagebrush shrub near rock/cliff/cave, 4,500 to 9,000 feet elevation	Yes, relevant to analyses

Species	Habitat*	Relevance
Northern harrier *Circus cyaneus*	Grassland, marsh, sagebrush shrub	Yes, relevant to analyses
Columbian sharp-tailed grouse *T. phasianellus columbianus*	Mountain shrub west of the Continental Divide	No occurrence
Greater prairie-chicken *Tympanuchus cupido*	Grasslands	No occurrence
Lesser prairie-chicken (Candidate) *Tympanuchus pallidicinctus*	Dry grasslands	No occurrence
Gunnison sage-grouse (Candidate) *Centrocercus minimus*	Sagebrush shrub	No occurrence
Greater Sage-Grouse (Candidate) *Centrocercus urophasianus*	Sagebrush shrub	Yes, relevant to analyses
White-tailed ptarmigan *Lagopus leucurus*	Alpine willow. Currently considered extirpated.	No habitat association and occurrence
Mountain plover *Charadrius montanus*	Grasslands	Yes, relevant to analyses
Long-billed curlew *Numenius americanus*	Grasslands	Yes, relevant to analyses
Black tern *Chlidonias niger*	Wetlands	Yes, relevant to analyses
Yellow-billed cuckoo (Western race) *Coccyzus americanus(Candidate)*	Cottonwood riparian	No occurrence
Burrowing owl *Athene cunicularia*	Grasslands.	Yes, relevant to analyses
Boreal owl *Aegolius funereus*	Spruce-fir, lodgepole pine	No habitat association
Flammulated owl *Otus flammeolus*	Aspen, ponderosa pine stands in southern portion of Sierra Madres	No habitat association
Short-eared owl *Asio flammeus*	Sagebrush shrub, grasslands, marshes	Yes, relevant to analyses
Black swift *Cypseloides niger*	Wet cliff faces	No habitat association and occurrence
Lewis' woodpecker *Melanerpes lewis*	Ponderosa pine. Occurs on the Laramie Peak unit.	No habitat association
Black-backed woodpecker *Picoides arcticus*	Spruce-fir, ponderosa pine and recently burned conifer forest	No habitat association
American three-toed woodpecker *Picoides tridactylus dorsalis*	Spruce-fir, lodgepole pine, aspen	No habitat association
Olive-sided flycatcher *Contopus borealis*	Spruce-fir, lodgepole pine, wetland, forest meadow	No habitat association
Purple martin *Progne subis*	Aspen in specific area on west side of Continental Divide	No habitat association

Species	Habitat*	Relevance
Loggerhead shrike *Lanius ludovicianus*	Grassland w/shrubs <8,000 feet	Yes, relevant to analyses
Brewer's sparrow *Spizella breweri*	Sagebrush shrub	Yes, relevant to analyses
Cassin's sparrow *Aimophila cassini*	Grasslands, extreme southeast Wyoming	No occurrence
Grasshopper sparrow *Ammodramus savannarum*	Grasslands	Yes, relevant to analyses
Sage sparrow *Amphispiza bellii*	Sagebrush shrub below 6,500 feet	Yes, relevant to analyses
McCown's longspur *Calcarius mccownii*	Grasslands	Yes, relevant to analyses
Chestnut-collared longspur *Calcarius ornatus*	Grasslands	Yes, relevant to analyses
Reptiles		
Massassauga rattlesnake *Sistrurus catenatus* (Candidate)	Grasslands	No occurrence
Black Hills redbelly snake *Storeria occipitomaculata pahasapae*	Forest meadow in Black Hills.	No occurrence
Amphibians		
Boreal toad *Anaxyrus boreas boreas*	Wetlands, less common in densely forested areas	No habitat association
Plains leopard frog *Lithobates blairi*	Permanent water, including ponds along transient streams	No occurrence
Columbia spotted frog *Lithobates luteiventris*	Only known from Bighorn and Shoshone National Forest	No occurrence
Northern leopard frog *Lithobates pipiens*	Wide variety aquatic habitats, wetlands	Yes, relevant to analyses
Wood frog *Lithobates sylvatica*	Sedge, grass meadows, willow hummocks, aspen, lodgepole pine forests, woodlands	No habitat association
Fish		
Bluehead sucker *Catostomus discobolus*	Large rivers, west slope Colorado	No occurrence
Flannelmouth sucker *Catostomus latipinnis*	Large rivers, west slope Colorado	No occurrence
Mountain sucker *Catostomus platyrhynchus*	Clear, cold creeks, small to medium-sized rivers with sand, gravel, rubble substrate	No habitat association
Rio Grande sucker *Catostomus plebeius*	Endemic to the Rio Grande basin in Colorado	No occurrence

Species	Habitat*	Relevance
Lake chub *Couesius plumbeus*	Permanent spring flow, usually at the headwaters of small streams	Yes, relevant to analyses
Rio Grande chub *Gila Pandora*	Endemic to Rio Grande basin in Colorado	No occurrence
Roundtail chub *Gila robusta*	Only occurs in Colorado River basin	No occurrence
Plains minnow *Hybognathus placitus*	Great Plains streams with fluctuating stream flows, shifting sand substrates	Yes, relevant to analyses
Sturgeon chub *Macrhybopsis gelida*	Great Plains rivers	No occurrence
Pearl dace *Margariscus margarita*	Clear, cold-water streams with some gravel	No habitat association and occurrence
Hornyhead chub *Nocomis biguttatus*	Isolated populations in the Laramie and North Laramie rivers	No occurrence
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	Cold-water streams	No habitat association
Rio Grande cutthroat trout *Oncorhynchus clarkii virginalis*	Cold-water streams	No habitat association and occurrence
Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri*	Cold-water streams	No habitat association and occurrence
Northern redbelly dace *Phoxinus eos*	Permanent spring seeps, usually at the extreme headwaters of small streams	Yes, relevant to analyses
Southern redbelly dace *Phoxinus erythrogaster*	Streams and ponds that are clear with sand and silt substrates	Yes, relevant to analyses
Finescale dace *Phoxinus neogaeus*	Permanent spring seeps, usually at the extreme headwaters of small streams	Yes, relevant to analyses
Flathead chub *Platygobio gracilis*	Big Horn, Tongue, Powder, Little Powder, Belle Fourche and Cheyenne river systems	Yes, relevant to analyses
Mollusks		
Rocky Mountain capshell snail *Acroloxus coloradensis*	Littoral zones of mesotrophic lakes <9,400 feet. Known only from Colorado and Montana	No habitat association and occurrence
Pygmy mountain snail *Oreohelix pygmaea*	Does not occur on the Forest/Grassland	No occurrence
Cooper's mountain snail *Oreohelix strigosa cooperi*	Known only on Black Hills National Forest	No occurrence
Insects		
Susan's purse making caddisfly *Ochrotrichia susanae*	Wetlands	No habitat association and occurrence

Species	Habitat*	Relevance
Ottoe skipper *Hesperia ottoe*	Tall-grass prairie	No habitat association and occurrence
Hudsonian emerald *Somatochlora hudsonica*	Boggy ponds	No habitat association and occurrence
Regal fritillary *Speyeria idalia*	Tall-grass prairie	No habitat association and occurrence
Nokomis fritillary butterfly *Speyeria nokomis nokomis*	Wetlands. Known range south and west of Wyoming.	No habitat association and occurrence
Plants		
Barr's milkvetch *Astragalus barrii*	Badlands, grasslands, scoria and calcareous substrates. 3,700 to 5,700 feet	Yes, relevant to the analysis
Common twinpod *Physaria didymocarpa var. lantana*	Sagebrush, shrublands, open Ponderosa pine woodlands. 3,300 to 9,000 feet	No occurrence

Management Indicator Species

The National Forest Management Act of 1976 (16 U.S.C. § 1600 *et seq.*) forms the foundation for the designation and monitoring of Management Indicator Species (MIS) as a component of Forest Service land and resource management planning. Implementing regulations are provided at 36 CFR 219.19, and in Forest Service Manual 2600.

The Forest Service Manual defines MIS as "...plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (Forest Service 1991). The NFMA requires that MIS be selected as part of the forest plan to estimate the effects of planning alternatives on fish and wildlife populations. So, MIS are used as barometers to evaluate the effects of forest management on wildlife within the Forest.

The MIS selected in the 2002 revision of the TBNG Land and Resource Management Plan include the Greater Sage-Grouse, the black-tailed prairie dog and the plains sharp-tailed grouse. They are systematically monitored over time to assess the effects of management activities on their populations and habitat, and the populations of other species with similar habitat needs. For further information and analysis on the management indicator species refer to the Management Indicator Species Report found in Appendix M.

Greater Sage-Grouse

Greater Sage-Grouse have been documented as year-round residents of TBNG. The primary habitat they use is sagebrush shrubland habitats, with some use of adjacent habitat for movement and minimal foraging. Sagebrush is essential for Greater Sage-Grouse during all seasons of the year. This relationship is perhaps tightest in the late fall, winter, and early spring when Greater Sage-Grouse are dependent on sagebrush for both food and cover. Quality habitat is described as a sagebrush stand with 6% to 40% canopy cover of sagebrush and a tall and dense understory of native grasses and forbs (Northeast Wyoming Greater Sage-Grouse Working Group 2006). During the spring and summer, succulent forbs and insects become important additional food sources. Greater Sage-Grouse require an extensive mosaic dominated by sagebrush of varying densities and heights along with an associated diverse native plant community dominated by high levels of native grasses and forbs (Wyoming Sage-Grouse Working Group 2003). The amount of potential Greater Sage-Grouse habitat (sagebrush and grassland mixture) currently available to Greater Sage-Grouse on TBNG is estimated at 438,000 acres (Forest Service 2002a).

Greater Sage-Grouse leks are monitored in March and April through lek counts. This information is then provided to the WGFD for compilation. A key outcome of this compilation is the mean Greater Sage-Grouse males per lek value. This can then be compared trends within the Northeast Wyoming Working Group area and State-wide trend (Figure 3-51).

Figure 3-52 shows that the fluctuations in male attendance per lek on TBNG is consistent with what appears to be happening across both northeast Wyoming, and state-wide. The graph above shows that in 2011 the TBNG was at a 16 year low for its average males per lek. The Northeast Wyoming Working Group Area was at a 15 year low, and the State-wide average was at a 14 year low.

Population estimates for Greater Sage-Grouse are based upon using this average number of males attending leks per year as an index to calculate the *minimum population estimate*. This estimate is generated using the following formula:

MPE = [(Total Males/Complexes Checked) x 3] x Total Complexes over Survey Period

Based on this measure, the *minimum* estimated population of Greater Sage-Grouse on the TBNG in 2011 was estimated at 917 birds. This population estimate reflexes a 13 year population low. Figure 3-52 displays the estimated Greater Sage-Grouse populations over the last 14 years.

Black Tailed Prairie Dog

Black-tailed prairie dogs historically ranged throughout the Great Plains in short-grass and mixed-grass prairies. This species is also a common resident in the short- and mid-grass habitats of eastern Wyoming (Cerovski et al. 2004). In mixed grass prairies, colonies frequently originate in areas that have been disrupted by previous soil disturbances such as cultivation, water developments, pipelines, and range ripping or furrowing. Areas grazed by livestock also represent potentially suitable locations for prairie dogs to colonize, especially when those sites have been heavily grazed by concentrated animals.

Black-tailed prairie dogs are highly social, diurnal burrowing rodents that typically feed on grasses and forbs. Prairie dogs form colonies that are the main unit of a prairie dog population. Many species such as the black-footed ferret, mountain plover (*Charadrius montanus*), burrowing owl (*Athene cunicularia*), and swift fox (*Vulpes velox*) are dependent on prairie dogs during a portion of their life cycle. The black-tailed prairie dog is selected as a MIS for low structure grasslands.

Population monitoring for prairie dogs has been found to be difficult to track over time. It has become the accepted norm to use acres of occupied habitat as a surrogate to direct population monitoring. Estimated total active acres of prairie dog colonies within the TBNG from 1996-1997 and from 2001-2011 are illustrated in Figure 3-53. Colony acreages experienced a significant reduction from 1997 through 2000 due to plague outbreak. Declines of the black-tailed prairie dog have occurred from 2001 through the present due to plague outbreak. In 2006 the number of estimated acres of active prairie dogs fell to nearly the 2004 numbers due to continuing plague. All active prairie dog colonies on TBNG are mapped annually. However, acreage numbers have increased since 2006, and are currently at 9,860 acres.

Plains Sharp-Tailed Grouse

The plains sharp-tailed grouse are most often found in grasslands with a diversity of structural stages, including an abundance of high structure grasslands. Interspersed shrubs and shrub communities also contribute to habitat suitability for this species. Habitats that are grazed lightly by livestock and/or periodically rested from annual livestock grazing generally benefit sharp-tailed grouse. This species was selected as an MIS for high-structure grasslands.

Sharp-tailed grouse population trends are also monitored through lek counts on TBNG. The total number of males observed on leks is used to indicate population fluctuations. Leks are observed during late March and early April as this is usually the peak attendance period. Ten sharp-tailed grouse leks were surveyed in 2011 with a total of 97 males. Most males observed were on leks that occur on National Forest System lands. With the 2011 survey information there is a decreasing trend of sharp-tailed grouse on National Forest System lands (Figure 3-54). There was a sharp decline in population numbers in 2011. This could be due to a long hard winter and late cold spring. Habitat for sharp-tailed grouse appears to be good condition.

3.15 Transportation and Access Management

3.15.1 Bureau of Land Management

General Planning Area Description

Transportation management involves the infrastructure and legal rights to provide people the opportunity to use and travel to and through specific lands within the planning area. The emphasis of the following discussion is on BLM's travel management program, which includes providing means for legal access and maintenance and development of various transportation facilities. The BLM's transportation program manages legal access to and across public lands utilized for recreation, renewable and nonrenewable energy development, range management, public access, and communication site management. Management encompasses all forms of transportation, including mechanized and motorized vehicles such as bicycles, motorized ATVs, cars and trucks, and pedestrian and equestrian modes of access as well.

Road networks within the planning area comprise a series of county roads, BLM-maintained roads, two-track trails, and snowmobile trails. The use of these roads and trails is an integral part of public land management, as these roads are used for both recreational and non-recreational purposes. OHV use is a popular method to explore public lands. It also provides access for non-motorized recreational purposes, such as fishing, hiking, mountain biking, horseback riding, and primitive camping opportunities. Map 3-20—Transportation System displays the road and trail system in the planning area.

Access is acquired using several different tools, including purchase, exchange, reciprocal ROW, donation, and condemnation. ROW reservations are used to establish and record access roads across private land. Cooperative agreements with landowners are used on occasion, but do not provide long-term legal public access.

The BLM-managed transportation system is extensive and complements the public road system. These roads are primarily improved dirt roads. Not all of the roads are maintained. Roadways managed by the BLM are often used to access private interests. A network of roads built and maintained primarily by the oil and gas industry provides transportation routes across the planning area. Section 9113 of the BLM Manual determines the functional classification of roadways, which also determines design speeds. BLM roads are classified as:

- **Collector Roads.** These roads normally provide primary access to large blocks of land and connect with or are extensions of the public road system. Collector roads accommodate mixed traffic and serve many uses. Within the BLM-managed system, collector roads carry the highest volume of traffic.
- **Local Roads.** Normally, these roads serve a smaller area than collector roads and connect to collector roads or public road systems. Local roads carry lower volumes and fewer traffic types, and serve fewer uses. Commonly, local roads in mountainous terrain are single lane.
- **Resource Roads.** Normally, these roads are spur roads that provide point access and connect to local or collector roads. They carry a very low volume and accommodate only one or two types of uses.

Design for these roadways follows the standards set by the American Association of State Highway and Transportation Officials (AASHTO) "Policy on Geometric Design of Highways and Streets." Maintenance is primarily BLM's responsibility; however, some roads are jointly maintained with the Forest Service.

Rail travel through Wyoming began with the construction of the Union Pacific Railroad in the late 1860s. The federal government subsidized developing rail lines with substantial land grants that were, in turn, developed for mineral, agricultural, and tourist potential. Passenger service declined dramatically in the 1980s and currently there is not regularly scheduled passenger rail service in the region. However, the railroad is still the largest carrier of bulk freight in Wyoming, shipping coal, agricultural products, and other goods. Rail lines traverse BLM–administered lands throughout the planning area.

Off-Highway Vehicles

For legislative purposes, 43 CFR 8340 defines an OHV as "any motorized vehicle capable of or designated for, travel on or immediately over land, water or other terrain." The majority of OHV use on public lands occurs on unpaved roads and two-track trails. In the planning area, the most common vehicles used are four-wheel drive trucks, ATVs, and sport utility vehicles. Snowmobile use is another popular OHV activity. The national objectives for OHV management are to provide for OHV use while protecting natural resources, promoting safety of all users, and minimizing conflicts among the various users of public lands.

Typical recreational OHV activities within the planning area include casual ATV and motorcycle trail riding, hunting, and snowmobiling. OHV use, in itself, has become a popular method to exploring public lands.

Off-road vehicle means any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: (1) any nonamphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used in times of national defense emergencies.

- **Open area** means an area where all types of vehicle use is permitted at all times, anywhere in the area subject to the operating regulations and vehicle standards set forth in subparts 8341 and 8342 of this title.
- **Limited area** means an area restricted at certain times, in certain areas, and/or to certain vehicular use. These restrictions may be of any type, but can generally be accommodated within the following type of categories: Numbers of vehicles; types of vehicles; time or season of vehicle use; permitted or licensed use only; use on existing roads and trails; use on designated roads and trails; and other restrictions.
- **Closed area** means an area where off-road vehicle use is prohibited. Use of off-road vehicles in closed areas may be allowed for certain reasons; however, such use shall be made only with the approval of the authorized officer.

Snowmobiles are a form of OHV, unless their use or users are specifically excluded from the OHV definition (43 CFR 8340.0-5). However, unlike the other OHVs, the impact to the land surface is less direct. Specifically, the land surface is disturbed through snow compaction, and subsequent impacts to vegetation and soils below the snow. All OHVs can be disruptive to certain resources, including wildlife.

Travel Management Areas (TMA) are delineated for those areas with an OHV designation of Limited to Designated Roads and Trails, Open, and Closed. Travel management has been addressed at the site–specific planning level for some areas of the field offices. Transportation and travel management in these areas will be re-evaluated for compliance with new BLM policies and to ensure user and program needs are met. Existing transportation plans will remain in effect until the re-evaluations are completed. Comprehensive Travel and Transportation Management Plans (CTTMP) will be completed for each TMA within five years of signing of the ROD for the RMP Amendments.

Certain environments are more susceptible to OHV damage, including crucial winter ranges, wildlife breeding areas, riparian habitats, and areas with steep slopes or sensitive soils. Typical seasonal closure restrictions for wildlife habitats may not apply to tasks performed in support of a permit or authorization issued by the BLM. In addition, other government entities that require entry to perform tasks related to management, maintenance and control of wildlife may be exempt from the seasonal closure rule.

OHV use will continue into the future, however, the lack of appropriate signage, a shortage of law enforcement personnel, the increase in OHV use throughout the planning area, and a general lack of understanding of land use ethics have increased inappropriate uses of OHVs on federal lands and represent management challenges for the BLM. OHV damage includes driving off established roads and trails, pioneering unauthorized roads and trails, and associated damage to vegetation and soils.

Casper Field Office

The Casper Field Office transportation program is aimed at managing access to and across public lands. The main objectives of this program are to provide legal public access to public lands, provide legal access for BLM staff, maintain existing roads and access easements, and close roads as necessary. Access is acquired through purchase, exchange, reciprocal ROWs, donation, and condemnation. Transportation includes access to public lands and infrastructure management. Local dependence on public land to meet transportation needs occurs mostly in terms of access to those public lands. Public lands also provide for transportation of commodities through ROWs.

The Casper Field Office is centrally located in Wyoming and is a hub for the minerals industry. Interstate 25 (I-25) is the main transportation route through the Casper Field Office and provides a link to I-80 and I-90 located to the south and north, respectively. Primary and secondary highways connect most communities in the region, and a series of county roads provide public access to remote areas of the Casper Field Office. Natrona County International Airport is located in Casper and is the major air link to the region. In addition, several municipal airports, a military airport (Guernsey Airport), and several private airstrips are located within the region. The Casper area is served through a single line of the Burlington Northern & Santa Fe Railroad Company.

The existing RMP identifies five areas in need of travel and transportation management plans to address access and transportation program issues. Physical access may be limited by the landscape of the field office and the patchwork land ownership; vehicle access may certainly be hampered or unavailable.

Access

Most access program activities within the Casper Field Office are coordinated with federal, state, local, and as appropriate, tribal agencies. The BLM currently manages 18 easements acquired for public access, and the Casper Field Office plans to acquire 16 more easements or cooperative agreements for access across private lands. Much of the transportation infrastructure for the Casper Field Office is already in place, and no need for additional major transportation facilities has been identified. Most efforts on transportation infrastructure are used for reconstruction of older or damaged facilities and routine maintenance.

Off-Highway Vehicles

Within Casper Field office, almost all of the OHV use is limited to existing roads and trails. This designation was created to allow OHV use without increasing the number of acres disturbed. OHV users are not to travel off the roads and trails except during the performance of necessary tasks such as the retrieval of game. Each year new trails are being created by a wide range of OHV users including, but not limited to, recreational users. Once a new trail becomes established it is considered by the public to be an existing route.

OHV use limited to existing roads and trails is allowed on 1,162,240 acres of public land within the field office. Use described as limited to designated roads and trails on 196,820 acres is allowed in the following areas:

- Sand Hills MA. [Transportation plan completed. (Motorized use including OHV in the Sand Hills MA is limited to the designated roads and trails.)]
- Jackson Canyon ACEC.
- Alcova Fossil Area ACEC.
- Portions of the South Bighorns/Red Wall area, as mapped in the Casper Field Office GIS database.
- Portions of the Bates Hole area, as mapped in the Casper Field Office GIS database (Transportation plan in progress).

Approximately 2,660 acres are currently closed to OHV use in the field office:

- The natural area of the Muddy Mountain EEA. (Current management allows for 4.5 miles of marked snowmobile trails and designation of cross-country skiing areas).
- Historic trail sites along the Oregon Trail, except the Ryan Hill and Bessemer Bend sites which are designated as limited to designated roads and trails.
- Historic trail sites along the Bozeman Trail.
- Goldeneye Wildlife and Recreation Area: Transportation plan completed. (OHV travel in the area is limited to the designated access road only).

While these designations provide for a wide variety of OHV use, the majority of recreational OHV use occurs in areas with legal and physical access to large blocks of public lands. The majority of OHV use currently is located in the South Bighorns, in and around the Muddy Mountain EEA, along the North Platte River, and in areas of Bates Hole.

The Poison Spider OHV Park (290 acres) is the only designated open OHV use area in the field office. The area has become a popular venue for local OHV enthusiasts and is open to all forms of OHVs. The popularity and use of OHVs has grown substantially. Areas that were once infrequently visited are now popular places for recreational touring, snowmobiling, and other OHV-related activities. However, off-road or other inappropriate use of these vehicles can cause undue environmental degradation and increased conflicts among user groups.

To determine the authorized road network for the areas listed below, the Casper Field Office will complete a Transportation Plan within five years of completing this RMP. Certain environments are more susceptible to OHV damage, including crucial wildlife habitats, riparian areas, and areas with steep slopes or sensitive soils. Within the field office, OHV use in the South Bighorns includes the Red Wall area, Bates Hole as defined by the MAs, North Platte River from Casper to Alcova; and the Muddy Mountains, including the area between the EEA and Jackson Canyon, are of special concern because of the sensitive nature of these areas. In addition, the Sand Hills are particularly vulnerable to OHV-related impacts; however, this area currently has limited public access.

Kemmerer Field Office

The Kemmerer Field Office transportation program manages legal access to and across public lands utilized for recreation, renewable and nonrenewable energy development, range management, public access, and communication site management.

The primary components of the transportation network and facilities in the field office include roads, railroads, and airports. A large number of the BLM system roads that currently provide access to public lands were first built and maintained by the oil and gas industry. These roads are chiefly improved dirt roads. Not all roads are maintained. Roadways managed by the BLM within the Kemmerer Field Office are limited to four easements. The key components of the transportation network within the field office are presented in Map 3-20—Transportation System.

The transportation infrastructure within the field office is closely related to historic trails, as many automobile routes and railroads eventually paralleled some of the trail routes. At the beginning of the twentieth century, there was a dramatic increase in Wyoming roadways as a result of increased automobile use and the burgeoning oil and gas industry. The highways of this era were named rather than numbered and frequently followed rail lines and rivers.

The field office is crossed by several primary and secondary highways that connect most communities, as well as a series of county roads that provide the general public access to remote locations within the field office. U.S. 30 South from Granger to Evanston to Salt Lake City was the original Abraham Lincoln Memorial Highway. U.S. 30 North traveling through Kemmerer was never designated historically as the Lincoln Highway. U.S. 89 runs north-south through the northwest edge of the field office from the Idaho State line on the south end to Alpine Junction in the north, where it passes out of the field office. U.S. 189 runs south to north-northeast, passing through Kemmerer and a large part of the field office. I-80 crosses the southern portion of the field office, entering from the west at the Idaho border. It runs roughly west-southwest to east-northeast, passing though Evanston and Lyman before exiting the field office, approximately 15 miles east of Granger.

The field office is home to several public and private airports. The towns of Evanston, Afton, Kemmerer, Fort Bridger, and Cokeville have small municipal airports. Scheduled commercial air service is available in Rock Springs, Salt Lake City, and Jackson Hole. Many small airstrips, located on public and private lands, are scattered throughout the region. For the most part, these facilities were developed by local ranchers to support their ranch operations. Those on public land are available for use by the public.

Access

Much of the transportation infrastructure necessary within the field office is in place, but the need for additional major road facilities has not been identified. Highways in the field office generally are considered to be in good condition and have excess capacity (most of the attention to infrastructure is aimed at reconstruction of aging or dilapidated facilities and routine maintenance) (BLM 1997c). Management challenges identified for the transportation management program in the Kemmerer Field Office are based, in part, on historic activities and existing conditions and trends. Management challenges include the lack of legal public access to some parcels of public land; unrestricted access to areas that may pose a threat to public health and safety (e.g., abandoned mine lands) or significant resource values (e.g., NHTs and crucial winter range); and maintenance of current legal public access routes to public lands. Many legal public access routes are not identified by information and/or directional signs; increased road use based on anticipated increases in oil and natural gas activity and recreational use demand; expansion of the road network to support anticipated increases in oil and natural gas operations in compliance with multiple-use concepts within the FLPMA; roads that are no longer needed; and road design and construction considering other resource programs to minimize impacts.

Off-Highway Vehicles

The majority (1.4 million acres) of the Kemmerer Field Office is designated as limited for OHV use. This designation was created to allow OHV use without increasing the number of acres disturbed. Recreational users are not permitted to travel off of roads and trails except during the performance of necessary tasks as long as the off-road travel does not exceed 300 feet of the existing trail. If off-road distances beyond 300 feet are required for dispersed uses or to perform necessary tasks, exceptions can be granted through a letter of authorization.

Parts of the hill climb area in Section 33, T15 North, R114 West are open for OHV use (60 acres). The Oakley Draw and Leavitt Bench/Crooked Canyon areas will be designated limited to existing roads and trails pending resource surveys and travel management planning to support an open designation.

Off-trail motor vehicle travel is not allowed in the Rock Creek/Tunp or Bear River Divide prescriptive management areas. Motor vehicle travel is seasonally limited in the following crucial big game winter range areas: Slate Creek, Rock Creek, and Bridger Creek. The Raymond Mountain WSA and Green Hill are closed to motorized vehicles and OHV use.

The trail to Commissary Ridge from the Commissary Ranch development (T24N, R116W, Sections 15, 20) is closed to motorized vehicle and OHV use. A 0.25 mile segment of the NHT Oregon/California trail on the west slope of the Bear River Divide is closed to motorized vehicle and OHV use. Riparian and wetland areas are closed to motor vehicle and OHV use except for designated road crossings. Special status plant species populations are closed to motor vehicle and OHV use.

The field office is generally open to snowmobiling in the winter months. Snowmobile use in Pine Creek Canyon is limited to the groomed trail. Snowmobile use is limited to times when favorable snow conditions exist prior to January 1 in the following crucial big game winter range areas: Slate Creek, Rock Creek, and Bridger Creek. The Raymond Mountain WSA is closed to snowmobile use and the cross-country ski trail is closed to snowmobile use.

In the field office, 23 miles of groomed snowmobile trails exist and will continue to be groomed. The Viva Naughton Trailhead provides access to 343 miles of groomed trails in the Wyoming range.

While these designations provide for a wide variety of OHV use, and there are a number of travel routes on public lands throughout the field office, the majority of recreational OHV use occurs in areas with legal and physical access in conjunction with large blocks of public lands. The popularity and use of OHVs has grown substantially in a relatively short period of time. Areas that were once infrequently visited are now popular places for recreational touring and other OHV-related activities. However, off-road or other inappropriate use of these vehicles can cause environmental degradation and increased conflicts among user groups. The Green Hill is an area of conflict between OHV users and residents of the adjacent neighborhood. Another OHV conflict area exists within the boundary of Raymond Mountain WSA where two small roads remain open for use and are used by four wheelers to enter into the WSA, and then travel illegally throughout the WSA.

Newcastle Field Office

Off-Highway Vehicles

Due to the nature of existing uses in the Newcastle Field Office and scattered land pattern that exists, all public land outside the Whoopup Canyon ACEC (which is closed to vehicle use) is designated as limited to existing roads and trails. This designation was established to provide access to public lands while protecting the landscape and resources from off-road vehicle damage. The BLM retains the authority to permit the construction of new roads or trails to accomplish program goals and for administrative use. Of the BLM-administered public land in the planning area, 60% has legal access; however, only 38% has reasonable vehicle access.

Vehicle travel off existing roads and trails can be authorized to accomplish necessary tasks if such travel does not result in resource damage or encourage additional use on a regular basis. Random off-road travel and creating new roads or trails not specifically authorized by the BLM is not permitted.

Pinedale Field Office

Transportation activity within the field office is associated with recreational and non-recreational use of the land. This section describes the current transportation and access structure of this area.

Basic Transportation Structure

U.S. Highways 191 and 189 traverse the field office in a north-south direction. State Highways 235, 350, 351, 352, 353, and 354 are all within the area. State Highway 351 is a major east-west access through the field office. The road systems for Sublette and Lincoln counties consist of limited paved roads and a network of unpaved roads.

Access

Access across private land to public lands is a continuing issue within the field office. BLM's policy is to acquire access only when needs are identified through land use planning as being essential for the management of BLM-administered lands and resources. Needs are ranked with other access needs throughout the State of Wyoming to determine how the limited resources for acquisition are used. To establish joint agency cooperation when acquiring access to public lands, the BLM has a memorandum of understanding (MOU) with the Wyoming Board of Land Commissioners, Forest Service, and the WGFD.

Off-Highway Vehicles

The varied landscape; large areas of public land with roads and trails open to OHVs; and numerous landforms along the northern, eastern, and western boundaries of the field office (composed of the foothills and approaches to the Wyoming Range and Wind River Range) provide numerous opportunities for OHV use. This varied landscape and the proximity of and access to the National Forest System lands in the BTNF have contributed to the popularity of this type of vehicle use.

The three OHV designations within the field office are open, limited, and closed. OHV designations within the field office apply to all OHVs, with the exception of non-motorized mechanized vehicles and emergency vehicles. The majority of OHV use within the boundaries of the field office takes place on existing roads and trails. OHV use appears to have increased in some areas during the past 15 years as is evidenced by the expansion of trails by ATVs and motorcycles. Some localized trail expansion is related to the growth in use by racing-type ATVs and motorcycles. The current demand for general OHV use is not exceeding the capacity of areas open to OHV use.

Motorcycles and ATVs designed for high speeds and racing use are becoming more popular in the area, but the use season is fairly short, running from May through September (BLM 1988a, Wyoming Department of State Parks 2002).

Snowmobiles are a common recreational OHV used in the field office. However, most recreational snowmobile use occurs on higher-elevation National Forest System lands. The use season on BLM-administered lands runs from about December through April. The eastern side of the field office, along the lower slopes of the Wind River Range, has a segment of the Continental Divide Snowmobile Trail system that provides opportunities for spectacular, scenic views of the surrounding mountains and dense forests. To the west, many access points to the Wyoming Range also provide OHV recreational opportunities for viewing scenery and enjoying deep snow.

It is difficult to estimate the degree to which road expansion from OHV use will take place in the future, but roads and trails now extend to most areas of interest. Roads and trails on BLM-administered lands are frequently used as transportation routes to access National Forest System lands. The Irish Canyon access to the Bridger National Forest is becoming extremely popular for snowmobile use because the route is part of the Continental Divide Snowmobile Trail System and extends into the BTNF (Hudson 2002). OHV use for antler collecting has become increasingly popular in the past decade. In addition to these uses, interest in developed mountain bike and motorized OHV routes has increased.

OHV Use/Resource Conflicts

Increased OHV use during the past ten to 15 years has created some identifiable concerns with the management of OHV activities. The most notable concern may be the occurrence of OHV use in some areas in which repeated motorized travel on erodible soils and/or steep slopes may be causing degradation of water quality, loss of vegetation, and alteration of the visual landscape. Another identified concern is the effect of motorized activities on wildlife in crucial winter habitat.

Areas in the field office that experience high levels of OHV use are as follows:

- The east side of the Wyoming Range in the vicinity of Red Canyon, Miller Mountain, Bald Mountain, and South Muddy Creek where hunting-related OHV use is creating trails on erodible soils and near riparian areas, and is degrading visual quality.
- The Blue Rim area where OHV use conflicts with resource values in an area containing sensitive resources that may be vulnerable to degradation.
- Portions along the south and western slopes of the Wind River Range where the creation of trails is degrading visual quality.
- Ridgetops in areas that are heavily hunted and where multiple trails have been created by hunters driving up to look over the edge for game.
- Near the communities of Big Piney-Marbleton and Pinedale where the creation of trails on erodible soils is causing visual impacts and contributing to soil erosion.
- Throughout the field office in areas of intensive or important seasonal use by wildlife.

OHV Noise Considerations

OHV noise can be considered intrusive and unpleasant to other recreational users. Areas of vehicle use in the field office range from WSAs and sparsely populated rural areas to more densely populated small urban communities and highways. In WSAs, expected ambient sound levels would typically be about 30 to 40 decibels (dB). Small urban communities away from main highways and county roads experience outdoor sound levels that are typically lower than 50 dB (Cunniff 1977, Harris 1991). An approximate noise level range for the more popular brands of OHVs is between 80 and 108 dB (Oregon Off-Highway Vehicle Association 2002). Approximate examples of other common sound levels are as follows: a bedroom at night, 30 dB; a residential area at night, 40 dB; a typical office, 50 dB; conversational speech, 60 dB; a vacuum cleaner at a distance of six feet, 70 dB; a concrete mixer at a distance of 50 feet, 80 dB; and a jackhammer at a distance of 50 feet, 100 dB (Bell 1973, Cunniff 1977, Harris 1991).

Rawlins Field Office

Transportation activity within the field office is associated with a variety of resource uses, including mineral extraction, livestock grazing, and recreation. The level of access to these resources can affect their potential levels of use. This section addresses the current roadway network, access issues, and trends associated with the field office transportation system.

The Rawlins Field Office roadway network includes a spectrum of roads for varying purposes. There are two interstate highways through the field office: I-25, which runs north-south through Cheyenne and Wheatland in the far eastern part of the area; and I-80, running westward from Nebraska to generally bisect the field office. For the most part, U.S. highways are co-located on interstate highways, with U.S. 87

following I-25 and U.S. 30 following I-80. An important exception is the divergence of U.S. 30 from I-80 between Laramie and Walcott, where it is co-located with U.S. 287. This route is less subject to the blizzard conditions that sometimes occur in this segment of I-80. As would be expected on the basis of population, state highways are much more numerous in the portion of the field office east of Rawlins. West of Rawlins, State Highway 789 is the only state highway, and other routes are typically unpaved.

Numerous smaller roads are laced throughout the field office, which connect more remote locations within the field office to the larger collector roads. These roads are used for recreational purposes, to provide access for the development and maintenance of oil and gas wells, and for range management improvements. Most of these roads are not paved; they are composed of dirt, gravel, or sand. These roads include those that are maintained by the BLM, by counties, and by private corporations. The larger collector roads are not maintained by the BLM.

Access

The checkerboard land ownership pattern and other non-BLM-managed inholdings create problems for accessing land and resources administered by the BLM. Some easements exist to allow access across private lands to public lands, but there are several locations where public access to public land is not available due to the lack of such easements or contiguous BLM-managed public land. For example, access to the Overland Trail is hampered because of noncontiguous BLM-managed land. In addition, public access to streams and reservoirs is often restricted by the absence of lands with legal public access adjacent to the water.

Energy- and recreation-related vehicular traffic on the public lands is increasing. This is due to further energy development and recreational use by the general public. With the greater use and demand on the existing transportation network, additional legal access would be required to provide for and enhance travel to and from the public lands.

Off-Highway Vehicles

Off-highway vehicle (OHV) use is closely related to several environmental resource issues addressed in other sections of this chapter. All information in this section was gathered from the Recreation Planner for the Rawlins Field Office and from BLM sources, which included the Great Divide Resource Area RMP and BLM's Recreation Management Information System (RMIS) (Clair 2002a, 2003, and 2004; BLM 1990c; BLM 2003f).

Designated Off-Highway Vehicle Use Areas

OHV use is managed according to designations finalized in the Rawlins RMP. These designations prescribe the available management environment in which OHV users can travel. Potential OHV designations are open, closed, or limited. In addition, the RMP prescribes that OHV use throughout the field office be limited to existing roads and vehicle routes, except in six specified areas that contain different designations. These six areas and their OHV use classifications are as follows:

- **Dune Ponds Cooperative Management Area.** The Dune Ponds CMA is an "open" OHV use area, except in vegetated areas, which are restricted to existing roads and vehicle routes.
- **Adobe Town WSA.** In this area, located in the southwest corner of the field office, motorized vehicle use is limited to designated roads and vehicle routes.
- **Encampment River Canyon.** Located just north of the MBNF and south of State Highway 70 near the town of Encampment, this area is closed to motorized vehicle use, including over-the-snow vehicles, from December 1 to April 30.

- **Encampment River Trail.** Bisecting the Encampment River Canyon area referred to above, the portions of the Encampment River Trail that cross BLM-administered public land are closed to all types of motorized vehicle use year-round.
- **Ferris Mountains WSA.** Located near the northern boundary of the field office and southeast of the intersection of U.S. Highway 287 and State Highway 220, this area is closed to all types of motorized vehicle use year-round.
- **Pennock Mountains Wildlife Habitat Area.** Located east of Saratoga, Wyoming, this area is closed to all human presence and motorized vehicle use, including over-the-snow vehicles, from November 15 through April 30.

Off-Highway Vehicle Use and Trends

OHVs are used for a variety of purposes. In the RMIS, OHVs are separated into four categories: all-terrain vehicles (ATV), cars/trucks/sport utility vehicles (SUV), motorcycles, and snowmobiles. Snowmobile use, although technically considered OHV use, was not included in the OHV categories in RMIS but will be addressed in this section. Table 3-94 shows the estimated number of participants and visitor days associated with OHV use in the field office.

Table 3-94. Participants and Visitor Days Associated with Off Highway Vehicle Use in the Rawlins Field Office

Activity	Fiscal Year 2001		Fiscal Year 2002		Fiscal Year 2003	
	Number of Participants	Number of Visitor Days	Number of Participants	Number of Visitor Days	Number of Participants	Number of Visitor Days
OHV—ATV	4,800	1,600	5,000	1,667	5,132	1,711
OHV—Cars/Trucks/SUVs	33,984	16,838	35,134	17,457	36,156	17,908
Snowmobiling	1,200	600	1,250	625	1,283	642

Source: BLM Recreation Management Information System.

The most commonly used of the four OHV categories in the field office is the cars/trucks/SUVs category. ATV use is rapidly growing in popularity. Cars/trucks/SUVs are used by more than 80% of OHV participants, and nearly 85% of visitor days include car/truck/SUV use.

OHV designations in the field office for the majority of public lands are "limited to existing roads and vehicle routes." However, the number of unauthorized roads pioneered within the field office is expanding rapidly. Even authorized activities can lead to unauthorized roads and vehicle routes. A concern is that, in all of the above uses, OHV users often leave existing roads and vehicle routes and create new two-tracks, thereby contributing to vegetation loss, soil compaction, soil erosion, and wildlife harassment. In addition, use of existing roads and vehicle routes when they are muddy causes rutting and erosion whether the roads/vehicle routes are two-tracks or improved and such use creates public safety hazards to drivers that follow. Within the field office, OHV use in the Sand Hills and Dune Ponds areas is of special concern because of the fragile nature of these areas. The Dune Ponds area receives a number of visitors because of its proximity to the Seminoe Reservoir and the population center of Rawlins.

Over the past 25 years, ownership of OHVs has become commonplace. A lack of understanding of land use ethics has increased inappropriate uses of OHVs on federal lands. Shortage of law enforcement personnel and a rapid increase in OHV use throughout the field office make it difficult to enforce OHV designations.

This situation generally occurs more often in areas of higher recreational use, but there is evidence of rapid route proliferation throughout the field office.

Rock Springs Field Office

There are 224.57 miles of federal highways in the field office. Interstate 80 is a four-lane federal highway and is maintained year round by the Wyoming State Highway Department. The highway is closed several times each year (1-2 day periods) during the winter due to icy road surface and/or blowing and drifting snow. This highway ROW is 400 feet in width. The policy of the Sweetwater County Planning and Zoning Commission is to allow no development within 1,000 feet of the Interstate. Signs and displays must be at least 600 feet from the highway boundary, and junkyards must be at least 1,000 feet away (23 CFR 750, 751).

State highways within the field office include Wyoming 28, 430, 530, 370, 371, 372, and 373. There are 245.42 miles of state highway in the field office. Right -of-way widths vary, but are normally 200 to 400 feet in width. County roads total 950.25 miles and are mostly unpaved. The majority of these roads were constructed under authority of R.S. 2477 (43 U.S.C. 932, repealed October 21, 1976). Wyoming State statutes limit total right-of-way width for county roads to 66 feet; however, the running surface of many of these roads is from 30 to 100 feet in width. A Notice of Filing was made on these roads by the counties, and the BLM issued documents recognizing the width as 50 feet on each side of the centerline. BLM roads total 452.73 miles. These roads are generally one-lane roads which vary in width from 14 to 24 feet.

The Rock Springs Municipal Airport is located on a mesa eight miles east of Rock Springs. There are two lighted paved runways, a commercial airport terminal, and numerous hangars. The main runway is 10,000 feet by 150 feet, and the crosswind runway is 5,243 feet by 75 feet. There is no control tower; however, there is an FAA Flight Service Center located at the airport. The Sweetwater County Planning and Zoning Commission has designated a protective zone around the airport which limits the height of any facility which might be constructed in that area.

The City of Green River owns an airstrip located approximately four miles south of the city. The runway is 6,000 feet long and 125 feet wide, with 25-foot landing strips on either side of a 75-foot sagebrush grass center. The airstrip is bladed once a year by the City of Green River and receives only incidental use. There are tie-downs at the strip. Strong cross winds in the area prohibit regular use of this field. There are several heliports in the field office including the BLM heliport north of Rock Springs, and the hospital heliport within the city limits. River access is provided by several boat ramps located along the Green River near Flaming Gorge Recreational Area and the Fontenelle Recreation Area.

The Union Pacific Railroad, which provides freight service to the area, generally parallels I-80. Spur lines serve the coal and trona mines and the SF Phosphates Ltd. fertilizer plant southeast of Rock Springs. The width of the mainline railroad is 200 feet.

Access

Access within the field office is generally good, although on waters other than the Green River, access is limited. Complicating access is the land pattern created by the Union Pacific Railroad Grant which created a checkerboard land pattern 20 miles on each side of the railroad ROW. Due to cooperation between the existing landowners and leaseholders, restriction of access has not been a major problem in the checkerboard within the Rock Springs Field Office.

Off-Highway Vehicles

The field office currently uses two OHV designation plans that were developed for the Big Sandy and Salt Wells Resource Areas. The designations have been instituted for resource protection of soils, vegetation, wilderness, wildlife, and water. Only the Sand Dunes OHV play area carries an open OHV designation: dune buggies, sand dragsters, and motorcycles are free to explore the entire 10,390-acre Greater Sand Dunes OHV play area. Visitation to this area runs around 3,620 ORV visits per year. All other areas are either closed or limited with various restrictions.

Four-wheel drive use by hunters is the biggest OHV impact in the field office. Recreational use of these vehicles in the field office is estimated at 6,170 visitor days per year. Other types of off-road vehicles which are commonly used in the field office include snowmobiles, motorcycles, jeeps, all-terrain vehicles, dune buggies, and mountain bikes. Use of mountain bikes is becoming more popular. Hundreds of miles of dirt, gravel, and two-track roads are available for riding.

Snowmobile use is on the increase, especially in the Wind River Front Area. This is the only area of sufficient snow depth to encourage snowmobile use. Snowmobile season runs from December to March and is not solely a recreational endeavor as many ranchers, resort owners, and summer residence owners use snowmobiles to perform chores and access their property. Snowmobiles cause very little resource damage unless they are misused to chase wintering wildlife.

The Continental Divide Snowmobile Trial runs for about eight miles on the field office across the northern boundary near the BTNF. There is one organized snowmobile club in Rock Springs that has "adopted" a portion of this trail. Other snowmobile use occurs on unplowed roads or cross country. Most snowmobile users come from Rocks Springs, Pinedale, Lander, and Green River.

3.15.2 Forest Service

General Planning Area Description

The goal of the Forest Service transportation system is to provide safe, sustainable access to and sometimes through National Forests and Grasslands in a fiscally and environmentally sound manner. Travel management is a critical link in all programs essential to the stewardship of the National Forests and Grasslands. Travel is fundamental to what the Forest Service does, whether it is associated with recreation, wildlife, timber, range, water, fire, minerals, or any other program.

Forest Highways, National Forest System Roads (NFSR), National Forest System Trails (NFST), and airfields on National Forest System lands are the major components of the Forest Service transportation system. The National Forests and Grasslands work with private entities, as well as national, regional, state, local, and Tribal governments to provide access and create an effective transportation system. At times, the checkerboard landownership can create opportunities or challenges for the movement of people and commodities to and through the Forests Service system. The agency may use easements, ROWs, condemnation, or other reciprocal agreements, among other tools, to gain access where necessary.

The forest and grassland LRMPs guide decisions on overall access and transportation management philosophy and objectives. Specific travel management decisions are more appropriately made at the project level since they relate to specific on-the-ground activities. Whether or not changes in a travel plan would require a forest plan amendment depends on how the changes affect the forest plan decisions. Forests should follow forest planning process guidelines in assessing the need for a plan amendment. At a minimum, travel management direction and decisions need to be consistent with the forest plan and applicable current laws, rules, and regulations.

Some of the primary goals nationally for maintaining access to and through the National Forests and Grasslands are:

- Ensure safe access; safety is paramount on every transportation system.

- Manage the transportation system to accommodate forest plan desired future uses and management of natural resources.
- Provide "seamless" transportation to, and sometimes through, the National Forests.
- Improve rural economic diversity to benefit the economies of some small communities located close to the National Forests that rely heavily on the adjacent forest resources.

One of the primary forms of travel in the planning area is the recreational use of OHVs. For legislative purposes, 42 CFR 840 defines an OHV as "any motorized vehicle capable of or designated for, travel on or immediately over land, water, or other terrain." The majority of OHV use on public lands occurs on unpaved roads and two-track trails. In the planning area, the most common vehicles used are four-wheel drive trucks, ATVs, and sport utility vehicles. Snowmobile use is another popular OHV activity. The national objectives for OHV management are to provide for OHV use while protecting natural resources, promoting safety of all users, and minimizing conflicts among the various users of public lands.

The Forest Service, Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule – 36 CFR Parts 212, 251, 261, and 295, Effective December 9, 2005, states:

> *The final rule will prohibit the use of motor vehicles off the designated system, as well as use of motor vehicles on routes and in areas that is not consistent with the designations." This rule includes seasonal closures and motorized vehicle classifications. This rule applies to all forest users regardless of disability. Once travel management is completed on a unit, the legal motorized route system is available to the public on a Motor Vehicle Use Map (MVUM). This map is the authority of where the public may legally drive their motorized vehicle.*

As of January 1, 2002, the State of Wyoming passed the Wyoming Off-Road Recreation Vehicles State Statute, which guides how OHVs may be used on public lands. The Statute regulates the recreation aspects of ATVs and Off Highway Motorcycles (OHM) within the state of Wyoming. The Wyoming State Off-Road Vehicle Program works closely with the Forest Service and other public land management agencies to identify roads, routes, trails, and open areas to classify designations for enrollment in the State Trails Program. All Forest Service roads and motorized trails in the affected areas are enrolled in the State Trails Program. All OHV owners are required to purchase and display a decal in order to ride the enrolled routes. The Forest Service in turn provides the motorized opportunities, enforces the program, and may apply for funds from the State in order to conduct maintenance and expand the motorized system. Further discussion regarding travel management and designated motorized routes may be found in the Transportation and Access section of this document.

The existing roads within the Forests and Grassland vary in maintenance level which is described below. Each NFSR has a designated maintenance level with maintenance levels ranging from a low of "1" (closed to motorized vehicles) to a high of "4" (moderate degree of user comfort and aggregate surfaced). Combined maintenance levels may exist on the same road.

> **Maintenance Level 1-** *Assigned to intermittent service roads during the time they are closed to vehicular traffic.* The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage structures and runoff patterns. Planned road deterioration may occur at this level.
>
> Roads receiving Maintenance Level 1 may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. While being maintained at Level 1 they are closed to vehicular traffic, but may be open and suitable for non-motorized uses. The roads are single lane with native surfaces that maybe grown in with vegetation.

Most Level 1 roads are in good condition because they are closed to vehicular traffic. Basic custodial maintenance is preformed to prevent damage to adjacent soil and water resources and limit the size of the disturbed area connected by the road corridor. Maintenance also helps preserve the basic road prism for future resource management and maintains the road closures to vehicular traffic.

Maintenance Level 2 - *Assigned to roads open for use by high clearance vehicles.* Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses including hauling logs from timber sales. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles. Maintenance is conducted at a minimal level and may only occur for purposes of drainage control. These roads are on native material, single lane and prone to rutting and can be very erosive. All regulatory and warning signs installed on Level 2 NFSR's shall be consistent with the Manual on Uniform Traffic Control Devices (MUTCD).

Maintenance level 3 - *Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car.* User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Maintenance level 4 - *Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds.* Most roads are double lane and aggregate surfaced with some roads that are single lane. These roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Level 3 and 4 NFSR's receive regular annual maintenance and are subject to the Highway Safety Act, which states that they shall comply with MUTCD in conjunction with the Sign and Poster Guidelines for the Forest Service.

Bridger-Teton National Forest

The BTNF consists of approximately 3.4 million acres. It is critical to have a transportation system that meets agency management objectives and operations while still being safe and functional. This forest hosts an estimated 2.7 million visitors per year, and an effective transportation system is vital in allowing these visitors to experience the sites and opportunities the Forest provides (Forest Service 2003, National Visitor Use Data). Roads and trails under Forest Service jurisdiction that provide access to the BTNF lands are considered either NFSR or NFST. It is important to note that there is an extensive network of unauthorized roads and trails that has evolved over many years and still exists on the Forest. As part of the 2005 Travel Management Rule, the BTNF is in the process of inventorying unauthorized roads that may include but are not limited to old timber sale roads, old mining roads, and user created routes. Road and trail use has increased dramatically on the BTNF over the past several years. The forest plan and all other applicable laws and regulation will continue to be used to identify changes necessary to the Forest transportation system to meet agency goals and objectives.

There is increasing demand for OHV use in the Forest and more places where OHVs are capable of going. With that, there is more illegal use. This has had a negative effect on wildlife, non-motorized recreation opportunities, soil, and vegetation, effectively reducing the acreage of sagebrush in desired condition. Much of the existing system of motorized trails was not designed for this use and trails do not meet standards for protecting resources or visitor experience.

Motorized travel is currently limited to designated routes (roads and trails) in accordance with the Travel Management Rule of 2005. New or modified management practices may develop as a result of further analysis. Through site specific NEPA projects and land transactions, the transportation system may be modified as necessary to provide for Forest management, public health and safety, and access to public lands.

Medicine Bow National Forest

The NFSR provides access for resource management, public access, and motorized recreation. The transportation plan on the Forest was developed to assist with multiple-use management of timber resources, mining, recreation, grazing, and access to private property. Many of the roads on the Forest have been in existence and maintained for over fifty years for the management of the natural resources. They were built with drainage structures (e.g., rolling dips, culverts, low water crossings, and leadoff ditches) surfaced, ditched, and the vegetation cleared. The NFSR surfaces are aggregate or built on native materials. All roads that traverse through core and general sage-grouse areas are located west of the Snowy Range Mountains with no core or general areas on the Laramie Ranger District.

There are four open roads in the general habitat area identified on the Laramie Peak Unit. They are: 696 (Elkhorn), 690 (Brumley Mountain), 658 (LaBonte Canyon), and 610 (Devil's Pass). NFSR 696 and NFSR 610 are open year-round. NFSR 690 is closed from August 16 to December 31 to provide a better success rate during hunting season. NFSR 658 is closed at the Forest Service boundary from November 15 through April 30 for resource protection. All of the roads provide important and rare public access to popular developed and dispersed recreation during the spring, summer and fall months.

There is no legal public access to the Deer Creek Range on the Laramie Peak Unit; therefore, the existing two-track routes are closed to motorized use. However, during hunting season, those carrying Wyoming State Hunter Management Area hunter tags may access the area and use the routes during their hunting activities.

Some Level 2 and Level 3 roads traverse the core sage-grouse areas on the MBNF, and all of the roads effecting core sage-grouse areas on the Sierra Madre portion of the Forest are Level 2 roads. With the infrequent maintenance that these Level 2 roads receive, they typically have low traffic volumes throughout of the year with a potential increase during big game hunting seasons. These roads are all located along the Forest boundary and are typically connected to roads that access adjacent federal, state or private lands.

Level 2 and Level 3 roads cross core sage-grouse areas on southern part of the Snowy Range portion of the Forest. NFSR 492 is a Level 3 road that accesses the Six-mile campground off of State Highway 130 and crosses core sage-grouse areas from the highway onto National Forest System lands.

NFSR 491 crosses core sage-grouse areas on the northern portion of the Snowy Range and is a Level 3 road. This road is accessed from lands owned by the State of Wyoming and has a seasonal closure due to its location adjacent to the Pennock Mountain Habitat Management Area. The affected roads on the Snowy Range portion of the Forest would typically have low traffic volumes during the year with increased use only during big game hunting seasons.

The travel management section of the EIS proposes to decommission some of the roads crossing core sage-grouse areas. Roads planned for decommissioning are typically duplicate access routes, user created routes and routes where unacceptable resource damage is occurring.

All Forest Service open roads can be used by OHVs when proper licenses and state laws are adhered to, and at this time there are few motorized trails developed on the Sierra Madre or Snowy Range portions of the Forest that are affected by core sage-grouse areas. The majority of ORV use occurs on NFSRs, user created routes, and a few developed trails. The main potential use in core sage-grouse areas would be from OHVs using Level 2 forest roads.

OHV use on Level 2 roads may be more prevalent in these areas than full sized vehicles due to roughness and poor road conditions that are typical for this area. Use along the routes in core sage-grouse areas would be typically permittees, and the public, with limited use by Forest Service personnel.

The MBNF Revised Land and Resource Management Plan, 2003 outlines several Standards and Guidelines limiting transportation and access as they affect sage-grouse. They are the following:

- Prohibit new disturbances such as construction, drilling, new recreation facilities, logging or other concentrated intense activities [from March 1 through June 30]. **Standard**
- During project design, maintain or increase security areas composed of blocks of hiding cover >250 acres over 0.5 mile from any roads or motorized trails that are open to motorized use. **Guideline**
- During project analysis and design, evaluate current and desired open road density at the geographic area scale and design projects, including road management to provide adequate security areas for wildlife and limit disturbances during parturition, nesting, and fledging periods. **Guideline**

No new construction or reconstruction is conducted on roads during the sage-grouse timing restrictions as described in the above standards and guidelines. Travel management for Laramie Peak reduced road density and new motorized trails were established outside of sage-grouse areas.

Thunder Basin National Grassland

The TBNG and surrounding areas include numerous small tracts under public management (State, BLM, and Forest Service), interspersed by private inholdings. State highways and major County roads provide the backbone of arterial roads that connect major communities.

Two major north-south transportation routes traverse the western and eastern portions of the national grassland. State Highway 59 runs along the western edge of the grassland, and provides connections (south to north) between Douglas, Wright, and Gillette, and the Spring Creek geographic area of the TBNG. State Highway 585 and U.S. Highways 18/85 together traverse the eastern edge of the TBNG, running from (north to south) Sundance to Newcastle to Cheyenne (eventually). State Highway 450 traverses east-west across the TBNG, connecting these two major north-south routes, and also serving as the main connection for travel between Wright and Newcastle. An additional transportation route, U.S. Highway 16 services the Newcastle-Osage-Upton corridor, traversing in a northwest direction from Newcastle to U.S. Highway 90.

The TBNG road system provides numerous connections between the major highways listed above and other major County roads. These connections are listed in Table 3-95.

Table 3-95. Major Road Connections with the Thunder Basin National Grassland Road System

Major U.S., State, or County Route	Connected Forest Service Roads (Maintenance Level 3 Only)
U.S. Highway 16	1276, 1248, 1325, East Upton Road (914.03)
State Highway 59	Steckley Road (942), Jacobs Road (944), Stienle Road (13.40), Dull Center Road (13.38)
State Highway 585	East Upton Road (914.03)

Major U.S., State, or County Route	Connected Forest Service Roads (Maintenance Level 3 Only)
State Highway 450	1108.e, School Creek Road (968), 1107,1105.G, 1105, Field Ranch Road (1257.B), Cellars Loop (923.03; via WY-56), 1256, 1240.G, 1235
County Road 83	Corder Creek Road (1619), Payne Road (934), 1109, School Creek (968), 934.G, 934.F
County Road 7C	1257F, C
County Road 7A	Keyton Rd. (937), 1263.H, Frog Creek (938), 1235, Dull Center Road (13.38)
County Road 62	Bacon Creek Road (925)
County Road 58	1242
County Road 56	Cellars Loop Road (923.03), Field Ranch Road (1257.B)
County Road 54	1263H
County Road 39	Dull Center Road (13.38)
County Road 34	Steckley Road (942)
County Road 17	1269
County Road 14	Dull Center Road (13.38)

The majority of roads on the TBNG under Forest Service jurisdiction do not provide major or primary connections between large communities. However, approximately 57 miles of road under Forest Service jurisdiction are considered to serve an arterial function, serving as a primary route to access major TBNG areas utilized for ranching, mineral resource operations, recreation, and/or administrative purposes (Table 3-96).

Table 3-96. Arterial and Collector Roads on the Thunder Basin National Grassland

Road Name	Length (miles) (Forest Service)	Function
Arledge Road	8	Arterial
Bacon Creek Road	8	Arterial
Cellars Loop	17	Arterial
Dull Center Road	29	Arterial
East Upton Road	14	Arterial
Payne Road	5	Arterial
School Creek Road	3	Arterial
Steckley Road	24	Arterial
Stienle Road	12	Arterial
West Cellers	7	Arterial
Beckwith Road	4	Collector
Bobcat/Cow Creek Road	4	Collector
Clay Spur	1	Collector

Road Name	Length (miles) (Forest Service)	Function
East Bill/Cow Creek Road	20	Collector
Keyton Road	10	Collector
Phillips Road	11	Collector
Rochelle Hills Road	13	Collector
York Road	9	Collector

An additional 67 miles of road serve as collector roads, primarily serving as access routes to the multiple local roads (roughly 1,400 miles) that serve individual oil and gas installations, ranches, windmills, etc. Many local roads are serviced directly by Forest Service arterial roads or by major county or state highways. Roads that were considered to have an arterial function on the TBNG were rated "high", collector roads as "moderate", and local roads as "low" to determine an overall transportation value for each road.

Several maintenance Level 3 roads on the TBNG were rated as high or moderate value for multiple uses, including recreational use, rangeland management, and mineral development. The majority of these roads are located in the south-central and northeastern portions of the TBNG, as well as in the southern Spring Creek area. These roads, along with their use value ratings, are presented in Table 3-97.

Table 3-97. High Value Roads by User Type for the Thunder Basin National Grassland

Road Names (ID #)	Relative Value		
	Mineral Development	Recreation	Range Management
Dull Center Road (13.38) Beckwith Road (1618) York 4351 (900) School Creek Road (968) Steckley Road (942) Phillips Road (973)	High	High	High
Rochelle Hills Road (933) Keyton Road (937)	Moderate	High	High
Arledge Road (913) East Upton Road (914.03) Cellars Loop (923.02) 924 (Unnamed)	Low	High	High
Payne Road (934) Bobcat/Cow Creek Road (959)	High	High	Moderate
Clay Spur (917)	Moderate	High	Moderate

Level 2 roads are typically two track roads which have low traffic volumes and are suited for high clearance vehicles. They are not designed, maintained, or suited for passenger vehicles. Currently, there are 1,584 of Level 2 roads equating to approximately 1,400 miles on the TBNG. The Level 2 roads connect at some point to other Level 2 or Level 3 roads, a county road or a state highway. These roads are considered to be local roads. The use on the roads is primarily from hunting, ranching activities, and mineral industry/commercial activities. Maintenance is scheduled only as needed, approximately once every five years. Some of these roads are under Road Use Permits (RUP) as needed by commercial users to access oil and gas wells or other commercial activity. The RUP requires the commercial user to complete the maintenance on the road as necessary.

Maintenance on system roads on the TBNG occurs year-round and is completed by forest engineering road crews, county government road and bridge departments, and commercial users. Each year the Forest roads engineer plans out which roads will be maintained. Typically, all Level 3 roads are maintained annually. Level 2 roads are maintained on a priority level and special requests submitted by the district. Maintenance by counties is done through agreements on those roads that may cross national grassland and are connected to the county road system but are not easements held by the counties. Other maintenance occurs through authorizations given to various commercial users of the roads specifically if the commercial use requires a maintenance level above and beyond what the public requires and if the commercial activity is the primary user of the road.

Various public safety issues and concerns on the road system mainly stem from the various types of traffic on the roads. Types of traffic can vary from OHVs, dirt bikes, passenger vehicles (on crown and ditch roads), and four-wheel drive vehicles. In the high mineral activity areas there are hauling trucks, heavy equipment, work-over rigs, and an increase in the number of 4x4 trucks. There is also quite a bit of local rancher traffic to access range allotments, haul cattle, and other activities associated with that industry. Given the nature of the grasslands, these roads are essentially open year round and do not have a particular season that is off limits to the public.

Current Management Practices

The TBNG Plan (2001) outlines several Standards and Guidelines limiting transportation and access activities as they affect sage-grouse. They are the following:

- Help reduce disturbances to nesting sage-grouse, prohibit the following activities within 2.0 miles of active display grounds from March 1 to June 15: **Standard**
- Reduce disturbances to nesting sage-grouse, do not authorize the following activities within 2.0 miles of active display grounds from March 1 to June 15: **Guideline**
- Help prevent reproductive failure, limit noise on sage-grouse display grounds from nearby facilities and activities to 49 decibels (10 dBA above background noise) from March 1 to June 15: **Guideline**
- Prohibit development or operations of facilities within two miles of a sage-grouse display ground if these activities would exceed a noise level of more than ten decibels above the background noise level (39 dBA), at 800 feet from the noise source, from March 1 to June 15: **Guideline.**

The Thunder Basin National Grassland Travel Management Plan (Forest Service 2009a) designated open roads and trails for motorized use, limiting motorized use to those routes. The designated routes are shown on Map 3-20.

3.16 VEGETATION

3.16.1 Bureau of Land Management

General Planning Area Description

Vegetative resources within the planning area are diverse and unique in some areas. The precipitation, elevation, and temperature extremes, combined with soil and geology variability, create a variety of vegetation habitat types. The desert areas provide habitat for a variety of hearty plants tolerant of low precipitation, temperature extremes, and saline soils. High elevation areas support plants adapted to very low temperatures, an extremely short growing season, and high snow accumulation. Since the planning area contains part of the Continental Divide, it tends to support a mixture of plains and intermountain plant species, with wind and climate factoring strongly into the evolution of local plant communities. The planning area supports a variety of vegetation types, each of which is susceptible to fire occurrence as a result of fuel loading or as a natural condition of the environment. The habitat of most interest to this planning effort is the sagebrush community; which is where the sage-grouse key habitat areas are predominately located. This community occurs throughout the planning area, covering 13,786,020 acres, nearly 40% of the lands in the planning area.

This discussion focuses on vegetation distribution and vegetation types within the planning types at three levels. The top level divides the planning area into four vegetation provinces. These were taken from Bailey (1995), who describes the ecoregions of the United States. The middle level uses vegetation map zones aggregated from Geographical Analysis Program (GAP) satellite imagery interpretation. The map zones allow quantitative measurements of broad vegetation types. The lowest level describes the individual plant communities depending on the specific issues and level of detail required. Threatened, endangered, candidate, and special status plant species are discussed in the Special Status Species section of Chapter 3. Map 3-21—Vegetation Communities shows the distribution of vegetation types throughout the planning area.

Ecological Provinces

Baileys' (1995) description of North American ecoregions places the planning area in four different vegetation provinces. These include the Intermountain Semi-Desert Province (342), Great Plains Dry Steppe Province (331), Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest Province (M331) and Black Hills Coniferous Forest Province (M334). The following subsections provide an overview of each of these vegetation provinces.

Intermountain Semi-Desert Province

The Intermountain Semi-Desert Province is contained within the intermountain basins of Wyoming and northern Colorado. The chief vegetation type, sagebrush steppe, is made up of sagebrush, saltbush, and a mixture of grasses and forbs. Willows, rushes, and sedges dominate the wetter valley bottoms, while greasewood and inland saltgrass dominate drier streams and ephemeral washes (Bailey 1995; Knight 1994). The higher elevations may contain pockets of aspen in the wetter areas and juniper/limber pine stands in the drier areas.

This area is sometimes considered a cold desert, as the summers are hot and the winters can be extremely cold. The growing season is short, and the annual precipitation varies between five and 14 inches. Annual snowfall averages between 20 and 60 inches (Martner 1986). Winter snow accumulation and runoff provide available moisture for spring plant growth. Snow distribution patterns caused by wind, topography, and existing vegetation function to develop pockets of highly productive sites within the drier, less productive surrounding areas.

This area lies predominantly at elevations below 8,000 feet. Forest and alpine areas dissect this vegetation province; these areas provide winter habitat for many wildlife species. Livestock and wildlife grazing are the primary uses of the area.

Great Plains Dry Steppe Province

Mixed- and shortgrass prairies east of the central Rocky Mountains dominate the Great Plains Dry Steppe Province. Typical grasses in these areas include buffalo grass, grama grasses, wheatgrasses, and needle grasses. Deeper soils in wetter areas may support taller grasses, such as Indian grass and little bluestem. Scattered shrub colonies may dot the landscape with big sagebrush, sand sagebrush, and rabbitbrush. Wet riparian areas provide habitat for cottonwood, sumac, willow, and alder (Bailey 1995; Knight 1994).

This area lies in the rain shadow of the Rocky Mountains. Winters are cold and dry, and summers are warm, with frequent thunderstorms (Martner 1986; Bailey 1995). Cheyenne has a moderate growing season of 138 days, but Laramie, 40 miles west, has a much shorter growing season of only 93 days. The annual precipitation of the area is between ten inches in the far west and 16 inches east of Cheyenne. The average annual snowfall is between 60 and 80 inches (Martner 1986).

Within the planning area, the Great Plains Dry Steppe Province dominates the ecology of the Laramie Basin and the prairie east of the Laramie Range to Nebraska. The Laramie Basin varies in elevation between 7,000 feet and 7,500 feet, whereas the elevation of the far southeast portion of the planning area ranges between 5,500 feet and 7,000 feet. Most of this area is privately owned and is used for grazing of livestock, irrigated cropland, or dryland farming.

Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province

The Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province is a transition from grass- and shrub-dominated areas to shrub- and tree-dominated areas. Brome and fescue grasses, mountain mahogany, sagebrush, aspen, and juniper dominate the 8,000 to 9,000-foot elevations. The middle elevations of pine and spruce forest lie between 8,500 feet and 12,000 feet. Alpine tundra occurs only in the planning area above 10,000 feet and is dominated by short grasses and cushion-type forbs, as well as by krummholz patches of spruce and fir. Riparian vegetation also varies according to elevation; however, willows and water-tolerant grasses, sedges, and rushes often dominate from the foothills to the alpine (Bailey 1995; Knight 1994).

The climate of these areas is quite variable and dynamic as a result of factors such as elevation, aspect, slope, and topographical change. Eastern and southern slopes are generally drier and warmer than are western and northern slopes. As the elevation rises, the mean temperature drops and the growing season gets shorter. Annual precipitation generally increases from 14 inches in the foothills to over 60 inches in the alpine area. Winter mountain snowpack may reach over 200 inches per year and provides a reservoir for lower elevation water users (Martner 1986; Knight 1994).

Mountain ranges dominated by the Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province are well distributed throughout the planning area. They include the Snowy Range, the Sierra Madre, the Laramie Range, the Shirley Mountains, the Freeze Out Mountains, the Seminoe Mountains, and the Ferris Mountains. These areas provide summer forage for wildlife and livestock as well as important habitat for many nongame mammals, birds, and fish. Higher elevation provides areas of increased diversity and productivity within large areas of lower precipitation and often harsher environments.

Black Hills Coniferous Forest Province

The Black Hills coniferous forest province is an evergreen forest dominated by ponderosa pine and lodgepole pine. Ponderosa pine is found in abundance along the lower part of the montane zones. Lodgepole pine is found in the Rockies but in smaller numbers than the ponderosa pine. Typical deciduous trees include aspen, ash, birch, bur oak, elm and hackberry. Sagebrush is the common shrub. The Black Hills have an altitude between 5,000 to 6,600 feet on average with the highest point being 7,242 feet. The annual precipitation and temperature range from 15 to 26 inches, and 37F (3C) to 48F (9C), respectively. The wildlife that use this habitat varies from the large ungulates (e.g. elk, mule deer, etc.) to small rodents (e.g. red squirrel and black-tailed prairie dog) (Bailey 1995).

General Vegetation Zones and Communities

The vegetation zones illustrated in Map 3-21 represent combinations of plant community classes taken directly from the GAP satellite imagery analysis. The classes combined for each zone, the zone's total area, the dominant vegetation, and a description of the area where the vegetation occurs are also provided in Table 3-98.

Distinct plant communities within the planning area are influenced by characteristics such as soil depth, texture, and salt content; climate variables, particularly temperature, total and seasonal distribution of precipitation, and wind; and topographic features, most importantly elevation, aspect, and slope. Plant communities respond to other environmental influences such as wildlife foraging, rodent burrowing, and ant hills.

Plants themselves also influence soil chemistry and soil resistance to wind and water erosion. The following plant community overviews explain the diverse and complex nature of vegetation communities in the planning area.

Agriculture/Town

This highly modified vegetation zone is mapped within the planning area. It includes areas that are settled, farmed with or without irrigation, or mined. It also includes areas mapped by GAP as forest-dominated riparian that in reality are primarily hayfields with only linear cottonwood stands remaining. With the exception of mined areas, little or none of this vegetation zone occurs on land managed by the BLM.

Barren

The barren vegetation zone occurs in diverse locations, all of which are inhospitable to vegetation. These locations range from exposed areas on mountaintops, to rocky outcrops and granite rock piles, to basin soils (e.g. sand dunes, badlands, etc.) that do not support plants for various reasons. This zone also includes areas mapped as open water that are primarily large deep reservoirs not supporting plant life.

Woodland Communities

Aspen

Quaking aspen communities in the planning area occupy the transitional zones between the sagebrush-dominated communities and the coniferous forests. Aspen are also present along streams, in draws, or on the leeward areas of hills and ridges where snow collects. Aspen colonies typically reproduce asexually, producing clones in which separate trees are connected by root suckers. Therefore, several acres of aspen may be interconnected through their roots (Barns 1966). The soils of these areas are usually well-developed deep loam and sandy loam soils with good drainage and high organic matter.

Acting as snow traps, aspen stands are able to support higher productivity and more diverse herbaceous plants than are the adjacent coniferous or sagebrush communities. Aspen stands also provide protective cover essential to mountain watersheds. Understory plants commonly include mountain brome, lupine, columbine, Indian paintbrush, elk sedge, Columbia needlegrass, Kentucky bluegrass, wildrye, licorice-root, elkweed, bedstraw, yarrow, bluebells, yampah, fairy bells, arnica, snowberry, serviceberry, Oregon grape, wood rose, Scouler's willow, and common juniper.

Aspen respond well to fire, and fires typically stimulate repressed colonies to increase root sucker regeneration. This may diversify the age structure of the stand and increase herbaceous production. The occurrence of spring and fall fires has produced the best results.

Wildlife use aspen in the fall, winter, and spring for both cover and forage. The open cover of aspen stands provides mule deer fawning areas and elk calving areas. High forb and grass production as well as shade draw wildlife and cattle into these areas during summer grazing seasons. Birds use these areas for important nesting sites, and other nongame species also rely on this habitat. Lower elevation aspen stands at edges of sagebrush are important areas of wildlife biodiversity for many small birds, raptors, and owls. A diversity of age classes and stand densities is important in maintaining diverse wildlife communities supported by aspen.

River bottom cottonwood forests occur along the North Platte River bottom and are dominated by plains cottonwood and narrowleaf cottonwood. The vegetation type is very similar to riparian woodlands; however, these areas are drier and usually have a natural understory dominated by upland grasses and forbs in areas where agriculture is absent.

Limber and Whitebark Pine Woodland Communities

Although limited in size, this vegetation type is important for wildlife because of the nutritious, fleshy seeds. This is one of the most threatened forest/woodland types in the West due to the lack of fire and encroachment by other conifer species (primarily subalpine fir) and disease outbreaks; primarily white pine blister rust. Limber and whitebark pine occurs in the Absaroka, Teton, and Wind River ranges. Grouse whortleberry, heartleaf arnica (*Arnica cordifolia*), Ross' sedge, and Wheeler's bluegrass (*Poa wheeleri*) are common dominant understory components; common juniper and russet buffaloberry (*Shepherdia canadensis*) are occasional dominants.

Limber and whitebark pine ecosystems have a mixed-severity fire regime of widely ranging fire intensities and frequencies. Mixed-severity fires create complex landscapes of dead whitebark pine stands intermingled with live stands of different ages. The fire regime of whitebark pine is Fire Regime III. The Biophysical Setting (BpS) is the Rocky Mountain Subalpine—Montane Limber-Bristlecone Pine Woodland (LANDFIRE 2007).

Forest Communities

Within the planning area, lower-elevation forest communities are found on northern and eastern slopes, whereas higher-elevation communities are more extensive and are found on all slopes. The forest communities contain several vegetation types, including lodgepole pine, subalpine fir, Douglas fir, and Engelmann spruce. Dominant conifer species are an indication of elevation, slope aspect, soil characteristics, and climate.

Fire Regimes are a conditional class referring to the level of departure from the natural historic fire frequency and severity in an area, the associated change in vegetation, and the composition and structure of fuels. It also refers to the ecological risk of losing key ecosystem components. The vegetation in the planning area can be categorized into fire regime groups II, III, IV, and V. Fire regime group II includes shrub communities that experience a fire return interval of 0 to 35 years at a stand replacement severity. Fire regime group III consists of the shrubland and mixed conifer communities that have a fire return interval of 35 to 100+ years and experience mixed severity fires. Fire regime group IV occurs in the lodgepole stands in which the fire return interval is also 35 to 100+ years but which has a stand replacement severity. Fire regime group V occurs in spruce-fir stands that experience a fire return interval of greater than 200 years at a stand replacement severity.

Biophysical Settings are vegetation layers that use historical disturbance regimes and current biophysical environments to depict how the landscape may have been before Euro-American settlement (LANDFIRE 2011).

Lodgepole Pine

The most common tree in the mountains of northern Colorado, Wyoming, and much of the Northern Rockies is lodgepole pine. These forests occur in the middle elevations of the area mountain ranges, between 8,000 and 10,000 feet (Knight 1994). Lodgepole pine is one of the most important commercial species in this area. The average lifespan of Rocky Mountain lodgepole pine is 150 to 200 years. This species often occurs in dense, pure stands with little understory. As the stand ages, shade-tolerant conifer species (e.g., spruce and fir) become established in the understory.

Lodgepole is dependent on fire for regeneration. Cones often retain seeds until fire or cutting causes opening and dispersal of seeds. Lodgepole are often the first trees to become established after fires (BLM 1989a). Historically, fires would be stand-replacing events. If fire does not occur, the stand may become dominated by shade-tolerant conifer species such as subalpine fir and Engelmann spruce.

The lodgepole pine forest canopy does not allow for a very diverse understory plant community. Plants that occur here are pine reedgrass, Wheeler bluegrass, heartleaf arnica, bedstraw, wortleberry, common juniper, wood rose, wax currant, and russet buffalo berry. Lodgepole pine will grow in mixed stands of aspen, Englemann spruce, subalpine fir, Douglas fir, and ponderosa pine (Knight 1994). Lodgepole pine forests are present in many mountain areas of the planning area and are managed for wildlife habitat, watershed maintenance, and timber production.

Ponderosa Pine

Ponderosa pine occurs at lower elevations on the eastern slopes of mountains, where summer precipitation levels may be higher and the growing season is longer and warmer. Ponderosa pine forests are often open woodlands and support a mixed-grass or shortgrass understory. Some notable stands of ponderosa pine in the planning area are on the eastern slopes of the Laramie Range, Shirley Mountains, and Seminoe Mountains.

Douglas Fir

Douglas fir is an important commercial species in this area and generally occurs with other conifers, primarily lodgepole pine, Engelmann spruce, and subalpine fir. The GAP data greatly underestimates the Douglas fir, with most of the acres included in other forest types. Douglas fir is the most likely to be found dominating on its own in stands with an understory of bunchgrasses in drier areas or shrubs, grasses, and forbs in more mesic zones.

Understory species include whitestem gooseberry (*Ribes inerme* var. *klamathense*), common juniper, mountain snowberry, spike fescue (*Leucopoa kingii*), bluegrasses (*Poa* spp.), heartleaf arnica, northern bedstraw, oxford ragwort (*Senecio streptanthifolius*), starry Solomon's-seal, Oregon-grape, prickly rose, sheep fescue (*Festuca ovina*), weedy milkvetch (*Astragalus miser*), silvery lupine (*Lupinus argenteus*), Pacific anemone (*Anemone multifida*), arrowleaf balsamroot (*Balsamorhiza sagittata*), rock clematis (*Clematis columbiana* var. *tenuiloba*), fernleaf biscuitroot (*Lomatium dissectum*), and mountain ninebark.

Mature Rocky Mountain Douglas fir is generally more fire resistant than spruces, true firs, and lodgepole pine. In northwestern Wyoming, cool, dry Rocky Mountain Douglas fir likely burned every 50 to 100 years. Recent research shows that Fire Regime III is appropriate for this type. The BpS is either the Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland or the Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland, dependent on precipitation (LANDFIRE 2007).

Spruce-Fir
Subalpine fir and Englemann spruce are co-dominant species within this type. The whitebark and limber pine association, Douglas fir, blue spruce, and lodgepole pine are also associated with these communities (BLM 1989a). Mixed conifer forests are often dense, with a large amount of accumulated litter and little understory growth (BLM 1989a).

Engelmann spruce is a valuable commercial species in this area; the other main component in this type, the subalpine fir, is of lesser commercial value. Spruce-fir stands generally do not produce enough forage for livestock but do provide browse and cover for large and small wildlife species. The subalpine fir component is the most susceptible of any of the conifer species in the area to insects and disease.

The spruce and subalpine fir habitat types generally experience high-intensity stand-replacing fires at intervals of 100 years or more. The spruce-fir stands are Fire Regime IV. The BpS for this forest type is either Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland or the Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland, dependent on precipitation (LANDFIRE 2007).

Other Conifer Woodland Communities
Juniper
Juniper woodlands in the Colorado River watershed area often have Utah juniper as the single tree species and can have pinyon pine (*Pinus edulis*) mixed in with it. These sites occur on rocky, fractured bedrock areas at elevations between 5,700 and 7,500 feet with annual precipitation between ten and 15 inches. In other areas, on foot-slopes adjacent to conifer forests, Rocky Mountain juniper occurs in association with limber pine. These sites may occur in association with basin and mountain big sagebrush steppe in shallow, poorly developed soils at elevations between 7,500 and 8,500 feet. Annual precipitation in these areas is between 16 and 20 inches. Both types of juniper woodlands have understory vegetation that may include bluebunch wheatgrass, needle-and-thread, slender wheatgrass, Idaho fescue, Wyoming big sagebrush, mountain big sagebrush, snowberry, mountain mahogany, bitterbrush, and common juniper.

Juniper-dominated communities often become decadent because the dominant species pumps most of the soil water into the atmosphere, resulting in a monoculture of juniper. At this point, prescribed fire in these areas does not result in an effective burn, because the fine fuels on the ground do not carry the fire into the trees. However, when these communities do eventually burn, they may sustain dangerous high-intensity wildfire during high winds in the hot season. After juniper woodlands burn, production of herbaceous vegetation responds very well.

The juniper communities provide valuable yearlong cover and forage for elk and mule deer as well as many nongame species. Six species of juniper dependent passerine birds are known to use these juniper communities for perching, foraging, migration nesting, escape or thermal cover, or other various stages of their life cycles (Fitton 1989).

Grassland
Three grassland types occur in the planning area: mixed-grass prairie, shortgrass prairie, and desert grassland. These grasslands are characterized below.

Mixed-Grass Prairie
Because of the altitude and prevalence of sandy soils, the Laramie Basin is an isolated pocket of mixed-grass prairie. Summers in this area are cool, which reduces evapo-transpiration. Frequent thunderstorms in July and August maintain this grassland, a situation also found in higher precipitation zones to the north and east. Mixed-grass prairie is characterized by needle-and-thread, western wheatgrass, blue grama, Sandberg bluegrass, threadleaf sedge, needleleaf sedge, prairie junegrass, Indian ricegrass, prickly-pear cactus, globemallow, fringed sagebrush, sand dropseed, threeawn, little bluestem, threadleaf sedge, and

various species of milkvetch and locoweed. This area is predominantly used for livestock and wildlife grazing.

Shortgrass Prairie

The shortgrass prairie is characterized by buffalo grass and blue grama. Other associated species include hairy grama, western wheatgrass, side-oats grama, yucca, and prickly-pear cactus (Barker and Whitman 1994). This area lies in the 12- to 20-inch annual precipitation zone in the rain shadow of the Rocky Mountains. Soils are sandy loams, loams, and clay loams. Most of the area is used for livestock grazing and very little is managed by the BLM.

Desert Grassland

On sandier soils and dunes, where water is more available and the shifting dunes are restricted by shrub establishment, desert grasslands commonly occur as a variant of shortgrass prairie. Common grass species include thickspike wheatgrass, slender wheatgrass, bluebunch wheatgrass, Indian ricegrass, needle-and-thread, Sandberg bluegrass, threadleaf sedge, and sand dropseed. Other shrubs and forbs growing among the grasses are sand sagewort, phlox, Hooker sandwort, bud sagebrush, fringed sagebrush, Wyoming big sagebrush, rubber rabbitbrush, horsebrush, and prickly-pear cactus (Knight 1994).

Saltgrass meadows occur in shallow depressions or adjacent to playa lakes where groundwater is near the desert surface. These areas are characterized by inland saltgrass, alkaligrass, alkali sacaton, and, in wetter areas, alkali cordgrass (Knight 1994). Desert grasslands provide palatable forage and often provide islands of diversity within the desert shrublands.

Shrub Communities

Shrublands dominate the majority of lands administered by the BLM in the planning area. These areas are very diverse; therefore, several shrub community types are discussed in this section.

Greasewood

Greasewood-dominated shrublands occur on the fringes of playas, desert lakes, ponds, and desert streams. These areas have general characteristics of flat, alluvial fans in canyons and flood plains adjacent to intermittent and perennial streams in the 7- to 9-inch and 10- to 14-inch precipitation zones or in association with stabilized sand dunes. Greasewood is a halophyte that does well in very saline soils; however, it needs more soil moisture to survive than saltbush.

Where greasewood is the dominant shrub, subdominant shrubs include shadscale, Gardner saltbush, alkali sagebrush, and basin big sagebrush. The understory is limited to salt-tolerant herbaceous vegetation such as inland saltgrass, saltbrush (*Ampler gardneri*), tansy mustard (*Descarainia pinnata*), meadow barley (*Hordeum brachvanthentm*), basin wildrye (*Ehnms cinereus*), western wheatgrass, alkali sacaton, bottlebrush squirreltail, Sandberg bluegrass, biscuit root, pepperweed, and sea blight.

Large expanses of this vegetation type occur in the Great Divide Basin. Greasewood shrublands often occur on the terraces above wetter areas, where silver sagebrush or basin big sagebrush dominate (Knight 1994). Although greasewood is not considered palatable forage, pronghorn and sheep will eat the spiny twigs and leaves in the spring and early summer, and cattle and horses use this species in summer and fall as a source of salt. Also many species also use greasewood communities as cover.

Mountain Shrub

Bitterbrush Shrub Steppe

Bitterbrush-dominated plant communities exist on sand, sandy, and sandy loam soils in the 10- to 14-inch annual precipitation zones. Bitterbrush varies in height depending on soil depth, precipitation, and browsing. It may appear as a low spreading shrub about six inches tall, or as a tall shrub reaching six feet in height.

Bitterbrush is often a co-dominant with mountain or basin big sagebrush, and in the sand hills south of Rawlins it is intermixed with silver sagebrush, basin big sagebrush, and rabbitbrush in deep sand soils. At higher elevations and precipitation levels, bitterbrush occurs in mixtures with sagebrush, snowberry, serviceberry, mountain mahogany, and occasionally, chokecherry. Herbaceous plants associated with bitterbrush include grasses such as needle-and-thread, bluebunch wheatgrass, Indian ricegrass, sand dropseed, and thick spike wheatgrass, and include forbs such as lupine, penstemon, sego lily, wild onion, larkspur, and prickly-pear cactus.

Bitterbrush is probably the most important winter browse species for mule deer in the region. Elk and cattle use it as well in the fall and spring. It responds best to low-intensity (cooler-season) prescribed burns, brush beating, and chemical treatment directed at killing sagebrush. Resprouting response to fire is considered fair to moderate when fires occur in low-intensity. High-intensity fires (fires with extreme energy release components and residual heat) will kill bitterbrush.

Mesic Upland Shrub Steppe

Serviceberry or chokecherry, or a combination of both, dominates the mesic upland shrub steppe community, often in conjunction with snowberry, currant, and wood rose. Good examples of this plant community occur on the middle elevations of Battle Mountain near Savery. These shrubs may reach ten to 15 feet in height. They occur in dense stands or scattered patches, often adjacent to aspen or willow. Understory grasses include basin wildrye, green needlegrass, Columbia needlegrass, and Kentucky bluegrass, and forbs include bluebell, columbine, aster, violet, elkweed, chickweed, and stinging nettle.

This community provides hiding and thermal cover for deer, elk, and other wildlife species. The dominant shrubs provide excellent forage for browsing animals when their softer leaves and shoots stay within reach. These shrubs will reestablish following fire, often in less dense patches, making them more accessible to wildlife and livestock.

Xeric Upland Shrub Steppe

True mountain mahogany dominates the xeric upland shrub steppe plant community on dry rocky slopes or in very shallow, undeveloped soils in the 10- to 14-inch precipitation zone. It occurs as both the dominant shrub or as an understory of Utah juniper, occurs at higher elevations, and mixes with bitterbrush, snowberry, serviceberry, green rabbitbrush, broom snakeweed, and mountain big sagebrush. Common herbaceous plants include bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and mat-forming forbs such as phlox, buckwheat, false locoweed, Hooker sandwort, goldenweed, and milkvetch.

True mountain mahogany may reach five to seven feet in height depending on the amount of browsing and soil depth. Fire generally lessens the density of the shrub stands, allowing grasses and other herbaceous plants to increase while still providing wildlife browse. Mountain mahogany is an important wildlife fall and winter forage. A notable characteristic is the hedging growth pattern exhibited by mountain mahogany plants after they have been browsed by mule deer and elk.

Wyoming Big Sagebrush/Grassland

The Wyoming big sagebrush/grassland is the most common vegetative cover type in south-central Wyoming. It occurs in shallow-to-moderately deep soil at lower elevations, giving way to basin big sagebrush in deeper soils and to mountain big sagebrush above 6,500 feet in elevation and within the 9- to 16-inch annual precipitation zones (Knight 1994). Shrub height varies from as little as six inches on shallow sites to around 30 inches in deeper soils. Canopy cover is generally lower than observed in either basin or mountain big sagebrush—usually under 30%.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with Gardner saltbush and open grasslands. In shallow, rocky-to-gravelly soils, Wyoming big sagebrush may co-dominate with black sagebrush, green rabbitbrush, and sometimes winter fat. Grass and forb species vary depending on soil texture, aspect, and slope. Common grass and grass-like species include bluebunch and thickspike wheatgrass, Sandberg and mutton bluegrass, Indian ricegrass, needle-and-thread, threadleaf sedge, and bottlebrush squirrel tail. Common forbs include phlox, Hooker sandwort, onion, goldenweed, sego lily buckwheat, penstemon, Indian paintbrush, globemallow, and prickly-pear cactus.

Wyoming big sagebrush is the most frequently eaten sagebrush and is a staple for pronghorn antelope, mule deer, and Greater Sage-Grouse. It is also one of the dominant species found on pronghorn and mule deer crucial winter ranges. Fire is an important component of all sagebrush-dominated plant communities. Depending on the nature of the site, the fire return interval can be between 25 and 100 years (Knight 1994).

Basin Big Sagebrush Shrubland

Basin big sagebrush shrubland is found in moderately deep-to-deep soils of all soil textures, in zones of ten to 16 inches of annual precipitation (Beetle 1960). It occurs as pockets within Wyoming big sagebrush and Gardner saltbush communities, as the dominant plant type along valley bottoms and canyons, and along ephemeral washes. This subspecies of big sagebrush may reach 12 feet in height, with canopy cover reaching 70%.

Basin big sagebrush mixes with serviceberry, green and rubber rabbitbrush, snowberry, bitterbrush, silver sagebrush, and mountain mahogany, depending on the soil depth, annual precipitation, and elevation. Grasses occurring in these communities include basin wildrye, green needlegrass, Idaho fescue, thickspike wheatgrass, Kentucky and mutton bluegrass, and bottlebrush squirrel tail. Common forbs include bluebells, groundsel, onion, violet, buttercup, false dandelion, buckwheat, penstemon, Indian paintbrush, lupine, locoweed, and prickly-pear cactus.

Basin big sagebrush is not palatable forage. It usually shows little or no use, even in extreme winters when use levels of other plants are severe. It is important, however, as hiding cover for mule deer and elk and as habitat for other wildlife species. In some areas it also provides critical winter habitat for Greater Sage-Grouse when snow covers most other shrubs. Basin big sagebrush increases in density and cover as the dominant plant species, and to even a greater degree when associated with poor livestock management and/or interruptions in the fire cycle. To increase diversity in basin big sagebrush shrublands, prescribed fires and chemical and mechanical treatments are employed, resulting in increases of grasses and other understory plants. The natural fire recurrence interval in the sagebrush type is approximately 30 to 75 years.

Mountain Big Sagebrush/Grassland

Mountain big sagebrush is located in shallow or moderately deep soils at elevations above 6,500 feet, in 9- to 20-inch annual precipitation zones. It is the dominant plant community on the Brown's Hill-to-Miller Hill plateau south of Rawlins. This is one of the largest homogeneous communities of this sagebrush type in the United States. Mountain big sagebrush also occurs as smaller plant communities at the lower mountain elevations, intermixed with aspen and conifer woodlands. Shrub height will vary from eight to 60 inches, with canopy cover reaching 50% to 60%.

Mountain big sagebrush is usually the dominant shrub in foothill and mountain sage communities, with bitterbrush, serviceberry, snowberry, and mountain mahogany providing subdominant brush diversity. Grasses include Idaho fescue, king spike fescue, green and Colombia needle grass, Kentucky, mutton, and big bluegrass; elk sedge, and Ross' sedge. Common forbs found in these areas include Indian paintbrush, phlox, balsamroot, locoweed, lupine, larkspur, penstemon, and Oregon grape.

Mountain big sagebrush is palatable to wildlife, although browsing is limited during the winter when these habitats become unavailable because of snow. Following fire, mountain big sagebrush reestablishes as the dominant species more quickly than do other sagebrush types, often resuming dense canopy cover after approximately 40 years. The natural fire recurrence interval in this sagebrush type is approximately 25 to 75 years.

Silver Sagebrush/Grasslands

Silver sagebrush/grasslands have two subtypes with very different habitats. The most common is found in deep sandy soils and consists of silver sage as the dominant species. It is associated with basin big sage, green rabbitbrush, serviceberry, chokecherry, and wood rose. Herbaceous species include needle-and-thread, Indian ricegrass, prairie sandreed, sand dropseed, scurfpea, and prickly-pear cactus.

The second type of silver sagebrush is located in riparian habitat along streams above the wet sedge and willow riparian zone. This second riparian terrace is also habitat for basin wildrye, Kentucky bluegrass, streambank wheatgrass, redtop, Baltic rush, clover, checkermallow, aster, and, occasionally, cottonwood and willow.

Silver sagebrush is desirable forage for both livestock and wildlife, and it provides important habitat for big game and nongame species. In contrast to big sagebrush, silver sagebrush resprouts, so that it responds well (recovers faster) to prescribed fire as a management tool when it is dry enough to burn. Any disturbance in the silver sagebrush community may result in less desirable species increasing in prevalence due to the transition of soil types or low-moisture regime.

Low Sages—Alkali, Birdsfoot, Black, and Wyoming Three-Tip Sagebrush/Grassland

Alkali sagebrush is found growing in clay soils and, as its name implies, can withstand soils of higher alkalinity than can other sagebrush species (Beetle and Johnson 1982; Knight 1994). It reaches six to 12 inches in height and occurs in relatively pure communities because of the high clay content and high cation exchange capacity in the soils in areas below 7,500 feet in elevation. Understory grasses include bluebunch wheatgrass, western wheatgrass, mutton bluegrass, bottlebrush squirreltail, and Indian ricegrass. Forbs noted at this site include wild buckwheat, biscuit root, and wild onion. Browsing on this sage is light.

Birdsfoot sagebrush is found in alkaline soils, where pH ranges from 8.5 to 11, and below 7,500 feet. It is a mat species, reaching only three to six inches in height. At lower pH levels, birdsfoot sage mixes with Gardner saltbush, and it appears with a mixture of grasses and forbs on windswept ridges and hills. At higher pH levels, birdsfoot sagebrush occurs as a monoculture.

Black sagebrush occurs on gravelly-to-rocky soils that have a "shallow effective" rooting depth (less than 15 inches) and various textures from sandy loams to clay loams. As a result, plant heights may vary between four and 12 inches. On the plains north of the Ferris and Seminoe Mountains, it is the principal shrub present, but it will often intermix with Wyoming big sagebrush. Above 7,400 feet, it gives way to Wyoming three-tip sagebrush. It also has been observed as an understory shrub in true mountain mahogany stands. On sandy sites, it is commonly found with needle-and-thread, threadleaf sedge, Junegrass, sandwort, and buckwheat, whereas on loamy soils it will occur with wheatgrasses, bluegrasses, Indian ricegrass, phlox, onion, paintbrush, and penstemon. Black sagebrush sites rarely burn, probably because of the low production and shrub cover these sites support. In some locations, black sagebrush is considered an important browse species for mule deer.

Wyoming three-tip sagebrush occurs above 7,000 feet in the foothills and at the higher elevations of the mountain ranges. It normally grows between four inches and 15 inches tall in moderately deep, well-drained soils (Beetle and Johnson 1982). It is often found intermixed with mountain big sagebrush and black sagebrush. Understory grasses and forbs include Idaho fescue, king spike fescue, Colombian needlegrass, elk sedge, Ross' sedge, Indian paintbrush, mountain pea, larkspur, balsamroot, phlox, and buckwheat. Wyoming three-tip sagebrush-dominated areas are often used as forage for wildlife. This species does burn, but because of a lack of fuel continuity, large, resource-damaging fires are rare.

Saltbush

Salt desert shrubland is perhaps the most arid vegetation type in the intermountain West (Knight 1994). Gardner saltbush dominates the salt desert shrub community type and in some instances occurs as up to 90 percent of the vegetation cover. These areas are characterized by accumulations of salt in poorly developed soils. Soils of these areas usually have a pH of 7.8 to 9, which restricts the uptake of water by all but the most salt-tolerant plants (halophytes). Soil textures can be sandy loam, sandy clay loam, or loam and clay. Salts accumulate around these plants each year with leaf fall. Halophytes function essentially to redistribute salts from the soil depths to the surface, thereby concentrating salts around the perimeter of the plant. This enables the plant to eliminate competition for scarce water and nutrients from other, less salt-tolerant plants (Goodin and Mozafar 1972).

Gardner saltbush normally grows no higher than 12 inches. It may grow along the ground, forming a mat. Subdominant shrubs include birdfoot sage, bud sage, greasewood, broom snakeweed, shadscale, spiny horsebrush, and winterfat. Grasses associated with these sites are Indian ricegrass, bottlebrush squirreltail, Sandberg bluegrass, and western wheatgrass. Forbs found in these areas include wild onion, biscuit root, woody aster, globemallow, princess plume, and prickly-pear cactus.

Salt desert shrublands occur at elevations between 6,000 and 7,600 feet within the lowest precipitation areas in the planning area. These areas are typically flat or rolling hills. Excellent examples of this type exist in the Separation Flats area west of Rawlins. Gardner saltbush is a valuable forage species on winter and spring ranges. In the spring when green, it has higher protein concentrations than late-season alfalfa, and it is a preferred livestock forage.

Sand

The sand vegetation zone is mapped as a combination of active sand dune type and sand dune complex type. A band of sand dunes stretches across the northern portion of the planning area. In addition, dunes are found near the western boundary of the planning area and in the Sand Hills, which are southwest of Rawlins and near the Dad homestead.

Blowout grass is a common early colonizer species on sands. Species that survive in the frequently shifting sands include Indian ricegrass, needle-and-thread, alkali wildrye, and slimflower scurfpea. Alkali cordgrass commonly occurs in areas where water accumulates (Knight 1994). Dune areas typically have earlier successional plant species unless the continued growth of vegetation leads to increased soil organic matter, increased soil structure, and lower wind velocities across the dunes, thereby stabilizing them. Stabilized dunes may provide habitat for later successional species, such as thickspike wheatgrass, Sandberg bluegrass, sand dropseed, Hooker sandwort and bud sagebrush, fringed sagebrush, Wyoming big sagebrush, rubber rabbitbrush, horsebrush, spiny hopsage, and prickly-pear cactus (Knight 1994).

Some dunes may become vegetated for a while only to suffer a blowout from atypical wind speeds or directions. Once such a blowout starts to enlarge, the destabilized dune becomes active again. These dunes provide habitat for unique plant species, such as blowout penstemon, which is Wyoming's only endangered plant species. Some places in these dunes may have more water than other places. Ice that forms in interstices between the sand grains provides supplemental water when it melts in the spring. In addition, snowdrifts that become insulated by a blanket of overblown sand may serve as a source of water for more permanent dunal ponds, particularly if there is an impermeable layer beneath the sand. High water levels in Seminoe Reservoir that indirectly raise the ground water table may also support the dunal ponds. Such ponds are an important source of water for wildlife in the midst of the sandy dunes.

Wetland/Riparian Communities

The GAP data used three plant cover types to depict wetland/riparian communities: forest-dominated riparian, graminoid/forb-dominated wetlands, and shrub-dominated riparian areas. These types provide the best reflection of wetland/riparian communities in smaller drainages, where agriculture has not extensively modified the vegetation

Wetland/riparian vegetation communities in arid and semi-arid environments often are key sites for the local ecosystem. Most terrestrial animal and insect life depends on riparian or wetland areas as sources of water, forage, and cover. Wetland/riparian areas in good health maintain water quality and aquifers, control erosion, diminish the impact of floods, and act as a stabilizing force in western landscapes subject to frequent drought and dynamic precipitation cycles. Wetland/riparian vegetation also moderates stream water temperatures; adds structure to the river network; provides habitat for fish, birds, and wildlife; and provides organic material for insect production.

Wetland Areas

Wetland vegetation depends on the hydrologic network of the watershed, the duration of water availability, geologic conditions, soil types and depth, climate, and management history. Sedges, rushes, cattails, willows, and other wetland obligates dominate the environment. As water availability decreases, herbaceous vegetation shifts from sedges (wetland obligates) to grasses and wetland facultative plants (plants that usually occur in wetlands but are occasionally found in other habitats).

Wetlands in the planning area are represented by the following characteristics:

- Shoreline vegetation around open water bodies
- Riparian vegetation along streams
- Open meadows that accumulate moisture in the winter and spring
- Dunal ponds associated with the Great Basin Divide Basin.

Based on GAP data, there are 881,700 acres in the planning area that can be classified as wetlands. Many of these areas are seasonally dry and infrequently inundated with water. Vegetation in these areas varies according to the frequency, depth, and duration of inundation. From an ecosystem perspective, an area that is unique to the wetland areas in the planning area is the dunal ponds, which are seasonally supported by precipitation that is trapped in the Great Divide Basin sand deposits. The variety of shrubs, grasses, and forbs present depends on the degree and duration of wetness and exposure at each location.

In most cases salt accumulation is not excessive in the wetland areas. Where drainage is limited, alkaline conditions can occur, and these can affect the types of plants that can be sustained. Vegetated wetlands and flood plains dissipate stream energy, store water for later release, provide areas of infiltration for ground water, support the hyperphenic zone of the river, and provide rearing areas for fish and animal species.

Public lands within the planning area boundaries provide potential habitat for obligate and facultative wetland plants. Wetland vegetation can form nearly monotypic stands of vegetation (e.g., sedges or cattails) or diversified assemblages of plants. The determining factors appear to be availability of water, soils, and management actions on the surrounding lands. Meadows typically have a wider variety of plants, probably because of their more gradual transition from dry to wet conditions. Wetlands that are isolated by location and distance from other vegetation types typically are more likely to have a monotypic plant assemblage.

Desert Riparian

Many different types of desert riparian occur in the planning area, depending on the timing and duration of soil wetting, soil type and depth, and topography of the area. These types usually occur on alluvial material of sand, sandy loam, loam or an unconsolidated mixture of soil and cobble material. Soils are usually well-drained and are higher in organic matter content than the surrounding uplands. Streams are often ephemeral or intermittent; therefore, vegetation depends on spring runoff or spring and summer rain.

The wettest areas in the desert commonly support Baltic rush, Nebraska sedge, water sedge, and tufted hairgrass, with mountain iris, sandbar willow, and narrowleaf cottonwood occasionally occurring along the fringes. Seasonally wet areas in the desert and steppe communities commonly contain Kentucky bluegrass, tufted hairgrass, foxtail barley, redtop, northern reedgrass, slender wheatgrass, basin wildrye, field horsetail, wood rose, shrubby cinquefoil, silver sage, basin big sagebrush, greasewood, and a variety of willow species.

Desert ephemeral washes may lie on saltier soils and therefore support salt-tolerant species. Inland saltgrass and western wheatgrass dominate this herbaceous community, whereas greasewood and basin big sagebrush are the dominant shrubs.

Irrigated nonfederal lands along the major streams and rivers in the desert have limited the extent of native vegetation in some riparian areas. Where topography and soils restrict irrigation of nonfederal lands, native vegetation persists. These areas sustain riparian woodlands that support trees and shrubs such as plains cottonwood, narrowleaf cottonwood, Fremont cottonwood, Geyer willow, sandbar willow, and yellow willow. The trees and shrubs often give way to herbaceous communities where soils are shallow. Herbaceous plants and lower shrubs dominating these areas would be part of the understory in the riparian tree communities. Vegetation includes slender wheatgrass, thickspike wheatgrass, smooth brome, tufted hairgrass, meadow foxtail, timothy, mountain iris, horsetail, gooseberry, currant, buffalo berry, and basin big sagebrush. Such communities are located along the fringes of the riparian areas or in rocky areas.

Riparian areas are associated with the highest production of grasses and other very palatable herbaceous species in the desert as well as with the greatest plant diversity. Often open water is also present. These characteristics draw both livestock and wildlife and also provide critical habitat to many species that depend on water for survival. Desert riparian communities normally represent less than 1% of the total area in the desert. This places additional pressure on the management of riparian sites for ecological and hydrological sustainability. Management of BLM livestock allotments is often focused on limiting grazing on the desert riparian areas to preserve their valuable diversity and productivity.

Foothills and Mountain Riparian

Riparian areas in the foothills and mountains are generally moister for longer periods of time and support plants that need to be in wet or saturated soils throughout the growing season. The stream gradients are also steeper, and the streambed material much larger. Riparian areas in the foothills and mountains receive snowmelt and spring discharges that provide perennial flow and cooler water. The soils are usually coarser, with higher organic matter content and increased soil development compared with lower elevations. These areas range in elevation from 7,500 to 10,000 feet and may include alpine tundra characteristics in the upper reaches of the watersheds.

Willow is often the dominant species in these environments. Frequently observed are sandbar willow, Geyer willow, yellow willow, whiplash willow, Wolf willow, Booth willow, Bebb's willow, and plain leaf willow. Species prominent in the composition of the willow understory include beaked sedge, Nebraska sedge, water sedge, field sedge, Baltic rush, bull rush, spike rush, tufted hairgrass, Kentucky bluegrass, meadow foxtail, and reedgrass. These understory plants dominate in the open meadows and marshes. Other shrubs and trees that occur are water birch, shrubby cinquefoil, redosier dogwood, snowberry, skunkbrush sumac, narrow leaf cottonwood, aspen, Englemann spruce, and lodgepole pine (Knight 1994).

As in the desert riparian area, mountain riparian vegetation is more diverse and higher in productivity than the surrounding uplands, causing livestock and game to concentrate there. The forage also stays lush and more palatable into the late summer (when upland grasses have cured), adding to the attractiveness of these areas. Livestock management strategies often include controlled season and duration of use of these areas.

Table 3-98. Vegetation Communities

Vegetation Zone	Vegetation Communities	Total Acres BLM Surface Acres
	Casper Field Office	
Agriculture/Town		1,143,480
Barren		155,940
Woodlands	Aspen	31,310
	Limber and Whitebark Pine	86,720
	Juniper	217,080
Forests	Lodgepole Pine	65,300
	Ponderosa Pine	460,180
	Douglas Fir	12,720
	Spruce Fir	
Grasslands	Mixed Grass Prairie	3,120,990
	Shortgrass Prairie	
	Desert Grassland	
Shrub	Greasewood	76,410
	Mountain Shrub	179,720
	Sagebrush	2,352,740
	Low Sages	
	Saltbush	338,730
Sand		24,350
Wetland/Riparian	Forest-dominated riparian	141,290
	Graminoid/forb-dominated wetland/riparian	48,290
	Shrub-dominated riparian	70,890
Total Casper Field Office Acres (total includes additional, unclassified land)		**8,562,580**
	Kemmerer Field Office	
Agriculture/Town		276,170
Barren		123,680
Woodlands	Aspen	163,600
	Limber and Whitebark Pine	143,120
	Juniper	95,470
Forests	Lodgepole Pine	392,680
	Ponderosa Pine	
	Douglas Fir	88,140
	Spruce Fir	83,850
Grasslands	Mixed Grass Prairie	14,540
	Shortgrass Prairie	
	Desert Grassland	

Vegetation Zone	Vegetation Communities	Total Acres BLM Surface Acres
Shrub	Greasewood	14,440
	Mountain Shrub	26,450
	Sagebrush	2,096,400
	Low Sages	
	Saltbush	295,330
Sand		
Wetland/Riparian	Forest-dominated riparian	15,740
	Graminoid/forb-dominated wetland/riparian	1,560
	Shrub-dominated riparian	88,850
Total Kemmerer Field Office Acres (total includes additional, unclassified land)		**3,930,360**
Newcastle Field Office		
Agriculture/Town		438,940
Barren		59,880
Woodlands	Aspen	1,310
	Limber and Whitebark Pine	-
	Juniper	8,410
Forests	Lodgepole Pine	25,130
	Ponderosa Pine	906,040
	Douglas Fir	-
	Spruce Fir	-
Grasslands	Mixed Grass Prairie	2,906,690
	Shortgrass Prairie	-
	Desert Grassland	-
Shrub	Greasewood	146,790
	Mountain Shrub	1,590
	Sagebrush	328,180
	Low Sages	-
	Saltbush	98,880
Sand		-
Wetland/Riparian	Forest-dominated riparian	81,200
	Graminoid/forb-dominated wetland/riparian	48,110
	Shrub-dominated riparian	28,570
Total Newcastle Field Office Acres (total includes additional, unclassified land)		**5,083,230**
Pinedale Field Office		
Agriculture/Town		284,970
Barren		5,670
Woodlands	Aspen	55,540

Vegetation Zone	Vegetation Communities	Total Acres BLM Surface Acres
	Limber and Whitebark Pine	9,780
	Juniper	-
Forests	Lodgepole Pine	41,5330
	Ponderosa Pine	-
	Douglas Fir	360
	Spruce Fir	220
Grasslands	Mixed Grass Prairie	6,960
	Shortgrass Prairie	-
	Desert Grassland	-
Shrub	Greasewood	6,980
	Mountain Shrub	-
	Sagebrush	1,087,880
	Low Sages	-
	Saltbush	61,020
Sand		-
Wetland/Riparian	Forest-dominated riparian	20,330
	Graminoid/forb-dominated wetland/riparian	940
	Shrub-dominated riparian	34,220
Total Pinedale Field Office Acres (total includes additional, unclassified land)		**1,620,180**
	Rawlins Field Office	
Agriculture/Town		1,006,350
Barren		201,280
Woodlands	Aspen	220,730
	Limber and Whitebark Pine	169,730
	Juniper	79,570
Forests	Lodgepole Pine	697,180
	Ponderosa Pine	206,780
	Douglas Fir	820
	Spruce Fir	128,000
Grasslands	Mixed Grass Prairie	2,638,440
	Shortgrass Prairie	28,800
	Desert Grassland	-
Shrub	Greasewood	479,170
	Mountain Shrub	258,210
	Sagebrush	42,011,330
	Low Sages	-
	Saltbush	635,440

Vegetation Zone	Vegetation Communities	Total Acres BLM Surface Acres
Sand		63,400
Wetland/Riparian	Forest-dominated riparian	78,050
	Graminoid/forb-dominated wetland/riparian	1,970
	Shrub-dominated riparian	85,730
Total Rawlins Field Office Acres (total includes additional, unclassified land)		**11,245,620**
	Rock Springs Field Office	
Agriculture/Town		78,790
Barren		152,460
Woodlands	Aspen	25,490
	Limber and Whitebark Pine	7,840
	Juniper	317,820
Forests	Lodgepole Pine	15,720
	Ponderosa Pine	-
	Douglas Fir	-
	Spruce Fir	170
Grasslands	Mixed Grass Prairie	23,890
	Shortgrass Prairie	-
	Desert Grassland	-
Shrub	Greasewood	123,290
	Mountain Shrub	-
	Sagebrush	3,709,480
	Low Sages	-
	Saltbush	-
Sand		66,600
Wetland/Riparian	Forest-dominated riparian	30,450
	Graminoid/forb-dominated wetland/riparian	1,630
	Shrub-dominated riparian	103,890
Total Rock Springs Field Office Acres (total includes additional, unclassified land)		**5,357,320**
	Planning Area	
Agriculture/Town		3,228,700
Barren		698,910
Woodlands	Aspen	497,990
	Limber and Whitebark Pine	417,200
	Juniper	718,340
Forests	Lodgepole Pine	1,237,530
	Ponderosa Pine	1,573,000

Vegetation Zone	Vegetation Communities	Total Acres BLM Surface Acres
	Douglas Fir	102,050
	Spruce Fir	212,240
Grasslands	Mixed Grass Prairie	8,711,510
	Shortgrass Prairie	28,800
	Desert Grassland	-
Shrub	Greasewood	847,080
	Mountain Shrub	471910
	Sagebrush	13,786,020
	Low Sages	-
	Saltbush	2,092,810
Sand		154,340
Wetland/Riparian	Forest-dominated riparian	367,050
	Graminoid/forb-dominated wetland/riparian	102,500
	Shrub-dominated riparian	412,150
Total BLM Planning Area Acres (total includes additional, unclassified land)		**35,799,290**

Noxious and Invasive Weed Management

Noxious weeds are defined in Executive Order 13112 as those "species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Noxious weed species, when introduced to an area, are aggressive and often dominate natural communities. They are often able to establish in areas following disturbance. As listed in Table 3-99, the State of Wyoming has designated 25 weeds as noxious, 19 of which are known to be a problem within the planning area.

Table 3-99. Noxious Weeds Designated by the Wyoming Weed and Pest Control Act

Common Name	Scientific Name	Present in the Planning Area
Canada thistle	*Cirsium arvense*	X
Common burdock	*Arctium minus*	X
Common St. Johnswort	*Hypericum perforatum*	-
Common Tansy	*Tanacetum vulgare*	X
Dalmation toadflax	*Linaria dalmatica*	X
Diffuse knapweed	*Centaurea diffusa*	X
Dyer's woad	*Isatis tinctoria*	X
Field bindweed	*Convolvulus arvensis*	X
Hoary cress	*Cardaria draba and Cardaria pubescens*	X
Houndstongue	*Cynoglossum officinale*	X
Leafy spurge	*Euphorbia esula*	X

Common Name	Scientific Name	Present in the Planning Area
Musk thistle	*Carduus nutans*	X
Ox-eye daisy	*Chrysanthemum leucanthemum*	X
Perennial pepperweed	*Lepiduim latifolium*	X
Perennial sowthistle	*Sonchus arvensis*	X
Plumeless thistle	*Carduus acanthoides*	X
Purple loosestrife	*Lythrum salicaria*	-
Quackgrass	*Agropyron repens*	-
Russian knapweed	*Centaurea repens*	X
Russian Olive	*Elaeagnus angustifolia*	X
Saltcedar	*Tamarix spp.*	X
Scotch thistle	*Onopordum acanthium*	X
Skeletonleaf bursage	*Franseria discolor*	-
Spotted knapweed	*Centaurea maculosa*	X
Yellow toadflax	*Linaria vulgaris*	X

Source: Wyoming Weed and Pest Council 2010

Of the species listed in Table 3-99, perennial pepperweed, leafy spurge, knapweeds, and Dyer's woad are considered to have the highest management priority within the planning area. The Sublette County Weed and Pest Agency is concerned with known significant infestations of perennial pepperweed along Muddy Creek north of Big Piney and along the Green River south of Big Piney to LaBarge (Laster 2002b). In addition to the State of Wyoming Noxious Weed List, each county also has an additional list, referred to as the Weed and Pest Declared List.

Other weed species present within the planning area, although not officially designated noxious, can be disruptive to native plant communities. These include cheatgrass, halogeton, and Russian thistle. Of these, halogeton is the most problematic in the planning area. Weeds are present primarily in areas of disturbance, including along roads, in areas of oil and gas development, and in heavily grazed areas. GIS data for weed populations have not been completed for most of the planning area.

Seven sage-grouse Management Zones have been established based on populations within floristic provinces which are detailed in the Greater Sage-Grouse Conservation Strategy, 2006.

Research and development of cheatgrass control strategies are ongoing, but management of the fire return interval and the fuel profile created by cheatgrass are recognized as fundamental components of cheatgrass control efforts. There are over 20 million acres of sage-grouse habitat within Wyoming that is suitable for cheatgrass to take over. Private landowners hold the greatest amount of sage-grouse habitat that has the potential to be converted by cheatgrass (nearly 11 million acres). BLM-administered lands manage nearly seven million acres of sagebrush habitat that is suitable for cheatgrass to take over. Management Zone II has the greatest amount of sage-grouse habitat with the potential to be overtaken by cheatgrass (nearly 65%). Revegetation following fire is expensive compared with the costs of letting natural regeneration processes run their course, but the potential to reduce fire potential, increase forage quality, and increase habitat quality based on intensive revegetation efforts may justify these actions in some habitats. Within Management Zone I there are 1,417,700 acres of cheatgrass potential within the sage-grouse core and general habitats on BLM and National Forest System land. Within Management Zone II there are 6,367,000 acres of cheatgrass potential within the sage-grouse core and general habitats on BLM/Forest Service land (BLM 2013a).

Poisonous Plants

Poisonous plants are a normal component of the ecosystem. Most poisonous plant species will kill animals only if they are eaten in large amounts, such as only consuming those species (Stoddartet al. 1975). Several factors, such as time of year, lack of available water and climate conditions, influence poisoning occurrence and severity, in addition to the animals' seasonal susceptibility, the age and species of animal, and a mineral deficiency in the diet.

A shortage of salt in the diet may cause animals to eat plants they would not normally eat. Shortages of other minerals such as phosphorus induce abnormal appetites, causing animals to consume low-value vegetation, including poisonous plants. On a large scale, poisonous plants have a minimal effect on livestock operations. However, on a local scale, use of specific areas or pastures can be limited by poisonous plant presence.

The high occurrence of selenium in soils of south-central Wyoming results in specific plants absorbing selenium, which can be toxic when consumed by livestock. Selenium acts as a cumulative poison, and can cause chronic poisoning effects over a long period or quick death if consumed in quantity. Local names for this poisoning effect include "alkali disease" and "blind staggers." Large concentrations of woody aster and other selenium-accumulating plants occur in Poison Basin west of Baggs, Sage Creek Basin south of Rawlins, Alkali Basin north of Sinclair, and Hanna and Shirley Basins.

More than 20 species of poisonous plants are known to exist in the planning area. Table 3-100 lists some of the poisonous plant species, dangerous seasons, and grazing animals that may be harmed by these plants. Poisonous noxious species are not included in the table.

Table 3-100. Poisonous Plants in the Planning Area

Species	Dangerous Season(s)	Kind of Livestock Endangered
Arrowgrass	All	All
Chokecherry	All	All, especially sheep
Death camas	All, especially spring	All, especially sheep
Greasewood	Spring, summer, fall	All, but mostly sheep
Halogeton	All	All, but mostly sheep
Horsebrush	Spring	Sheep
Horsetail	Haying season	All, especially cattle and horses
Low larkspur	Early spring	Cattle
Tall larkspur	Early summer	Cattle
Loco	All, especially spring	All
Lupine	Spring, summer, fall	Sheep
Prince's plume	Spring and summer	All
Russian knapweed	All	Horses
Senecio	Spring and summer	All
Western waterhemlock	Spring	All

Species	Dangerous Season(s)	Kind of Livestock Endangered
Woody aster	Spring and summer	All

Source: Stoddart et al. 1975; Panter 2011.

3.16.2 Forest Service

General Planning Area Description

Vegetation resources within the planning area are diverse and in some areas unique. The precipitation, elevation, and temperature extremes, combined with soil and geology variability, create a variety of vegetation habitat types. Vegetation resources within the planning area include mixed-grass, sagebrush shrubland, and forest communities. Riparian areas and wetlands are ecologically among the most important resources on public land. Structurally diverse plant communities provide habitat for wildlife as well as forage for domestic animals. In addition, healthy riparian areas and wetlands stabilize the soil, act as sponges releasing water throughout the year, and improve water quality for adjacent streams. Resource uses may affect the natural function and condition of riparian areas and wetlands.

Noxious and invasive weeds are identified as a major threat to native ecosystems. They contribute to the loss of rangeland productivity, increased soil erosion, reduced native species diversity and loss of wildlife habitat and, in some instances, are hazardous to human and animal health and welfare (Federal Noxious Weed Act, Public Law 93-629). Waterways, roads, and animals are the principal vectors for expansion of noxious and invasive weed species. Noxious weed mapping and management are part of regular rangeland assessments.

According to NFMA regulations (CFR 219.26), grassland and forest planning must provide for diverse plant and animal communities consistent with the overall multiple-use objectives of the planning area. The Clean Water Act and the Safe Drinking Water Act are major pieces of federal legislation intended to protect aquatic resources. The ESA provides for the conservation of threatened and endangered species. Additional direction for conservation of other species at risk is provided in FSM 2670.

Ecological Provinces

Baileys' (1995) description of North American ecoregions places the planning area in four different vegetation provinces. These include the Intermountain Semi-Desert Province (342), Great Plains Dry Steppe Province (331), Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest Province (M331) and Black Hills Coniferous Forest Province (M334). The following subsections provide an overview of each of these vegetation provinces.

Intermountain Semi-Desert Province

The Intermountain Semi-Desert Province is contained within the intermountain basins of Wyoming and northern Colorado. The chief vegetation type, sagebrush steppe, is made up of sagebrush, saltbush, and a mixture of grasses and forbs. Willows, rushes, and sedges dominate the wetter valley bottoms, while greasewood and inland saltgrass dominate drier streams and ephemeral washes (Bailey 1995; Knight 1994). The higher elevations may contain pockets of aspen in the wetter areas and juniper/limber pine stands in the drier areas.

This area is sometimes considered a cold desert, as the summers are hot and the winters can be extremely cold. The growing season is short, and the annual precipitation varies between five and 14 inches. Annual snowfall averages between 20 and 60 inches (Martner 1986). Winter snow accumulation and runoff provide available moisture for spring plant growth. Snow distribution patterns caused by wind, topography, and existing vegetation function to develop pockets of highly productive sites within the drier, less productive surrounding areas.

This area lies predominantly at elevations below 8,000 feet. Forest and alpine areas dissect this vegetation province; these areas provide winter habitat for many wildlife species. Livestock and wildlife grazing are the primary uses of the area.

Great Plains Dry Steppe Province

Mixed and shortgrass prairies east of the central Rocky Mountains dominate the Great Plains Dry Steppe Province. Typical grasses in these areas include buffalo grass, grama grasses, wheatgrasses, and needle grasses. Deeper soils in wetter areas may grow taller grasses, such as Indian grass and little bluestem. Scattered shrub colonies may dot the landscape with big sagebrush, sand sagebrush, and rabbitbrush. Wet riparian areas provide habitat for cottonwood, sumac, willow, and alder (Bailey 1995; Knight 1994).

This area lies in the rain shadow of the Rocky Mountains. Winters are cold and dry, and summers are warm, with frequent thunderstorms (Martner 1986; Bailey 1995). Cheyenne has a moderate growing season of 138 days, but Laramie, 40 miles west, has a much shorter growing season of only 93 days. The annual precipitation of the area is between ten inches in the far west and 16 inches east of Cheyenne. The average annual snowfall is between 60 and 80 inches (Martner 1986).

Within the planning area, the Great Plains Dry Steppe Province dominates the ecology of the Laramie Basin and the prairie east of the Laramie Range to Nebraska. The Laramie Basin varies in elevation between 7,000 feet and 7,500 feet, whereas the elevation of the far southeast portion of the planning area ranges between 5,500 feet and 7,000 feet. Most of this area is privately owned and is used for grazing of livestock, irrigated cropland, or dryland farming.

Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province

The Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province is a transition from grass- and shrub-dominated areas to shrub- and tree-dominated areas. Brome and fescue grasses, mountain mahogany, sagebrush, aspen, and juniper dominate the 8,000 to 9,000 feet elevations. The middle elevations of pine and spruce forest lie between 8,500 feet and 12,000 feet. Alpine tundra occurs only in the planning area above 10,000 feet and is dominated by short grasses and cushion-type forbs, as well as by krummholz patches of spruce and fir. Riparian vegetation also varies according to elevation; however, willows and water-tolerant grasses, sedges, and rushes often dominate from the foothills to the alpine (Bailey 1995; Knight 1994).

The climate of these areas is quite variable and dynamic as a result of factors such as elevation, aspect, slope, and topographical change. Eastern and southern slopes are generally drier and warmer than are western and northern slopes. As the elevation rises, the mean temperature drops and the growing season gets shorter. Annual precipitation generally increases from 14 inches in the foothills to over 60 inches in the alpine area. Winter mountain snowpack may reach over 200 inches per year and provides a reservoir for lower elevation water users (Martner 1986; Knight 1994).

Mountain ranges dominated by the Southern Rocky Mountain Steppe—Open Woodland—Coniferous Forest Province are well distributed throughout the planning area. They include the Snowy Range, the Sierra Madre, the Laramie Range, the Shirley Mountains, the Freeze Out Mountains, the Seminoe Mountains, and the Ferris Mountains. These areas provide summer forage for wildlife and livestock as well as important habitat for many nongame mammals, birds, and fish. Higher elevation provides areas of increased diversity and productivity within large areas of lower precipitation and often harsher environments.

Black Hills Coniferous Forest Province

The Black Hills coniferous forest province is an evergreen forest dominated by ponderosa pine and lodgepole pine. Ponderosa pine is found in abundance along the lower part of the montane zones. Lodgepole pine is found in the Rockies but in smaller numbers than the ponderosa pine. Typical deciduous trees include aspen, ash, birch, bur oak, elm and hackberry. Sagebrush is the common shrub. The Black Hills have an altitude between 5,000 to 6,600 feet on average with the highest point being 7,242 feet. The annual precipitation and temperature range from 15 to 26 inches and 37F (3C) to 48F (9C), respectively. The wildlife that use this habitat varies from the large ungulates (e.g. elk, mule deer, etc.) to small rodents (e.g. red squirrels, black-tailed prairie dog, etc…) (Bailey 1995).

General Vegetation Zones and Communities

The general vegetation zones illustrated in Map 3-21 represent combinations of plant community classes taken directly from the GAP satellite imagery analysis. The classes combined for each zone, the zone's total area, the dominant vegetation, and a description of the area where the vegetation occurs are also provided in Table 3-101.

Distinct plant communities within the planning area are influenced by characteristics such as soil depth, texture, and salt content; climate variables, particularly temperature, total and seasonal distribution of precipitation, and wind; and topographic features, most importantly elevation, aspect, and slope. Plant communities respond to other environmental influences such as wildlife foraging, rodent burrowing, and ant hills.

Plants themselves also influence soil chemistry and soil resistance to wind and water erosion. The following plant community overviews explain the diverse and complex nature of vegetation communities in the planning area.

Table 3-101. Vegetation Acreages by National Forest

Vegetation Zone	Vegetation Communities	Total Acres Forest Service Surface Acres
Medicine Bowl National Forest		
Agriculture/Town		5,220
Barren		16,550
Woodlands	Aspen	116,660
	Limber and Whitebark Pine	41,000
	Juniper	640
Forests	Lodgepole Pine	647,720
	Ponderosa Pine	250,840
	Douglas Fir	820
	Spruce Fir	116,050
Grasslands	Mixed Grass Prairie	95,830
	Shortgrass Prairie	0
	Desert Grassland	0
Shrub	Greasewood	0
	Mountain Shrub	7,880

Vegetation Zone	Vegetation Communities	Total Acres Forest Service Surface Acres
	Sagebrush	84,420
	Low Sages	0
	Saltbush	0
Water		510
Wetland/Riparian	Forest-dominated riparian	2,500
	Graminoid/forb-dominated wetland/riparian	0
	Shrub-dominated riparian	5,620
Total		**1,392,260**
	Bridger-Teton National Forest	
Agriculture/Town		6,590
Barren		247,150
Woodlands	Aspen	189,280
	Limber and Whitebark Pine	792,640
	Juniper	0
Forests	Lodgepole Pine	1,173,940
	Ponderosa Pine	0
	Douglas Fir	170,270
	Spruce Fir	553,560
Grasslands	Mixed Grass Prairie	12,710
	Shortgrass Prairie	0
	Desert Grassland	0
Shrub	Greasewood	0
	Mountain Shrub	440
	Sagebrush	229,810
	Low Sages	0
	Saltbush	0
Water		16,100
Wetland/Riparian	Forest-dominated riparian	11,130
	Graminoid/forb-dominated wetland/riparian	200
	Shrub-dominated riparian	60,740
Total Acres		**3,457,970**
	Thunder Basin National Grasslands	
Agriculture/Town		108,530
Barren		9,700
Woodlands	Aspen	0
	Limber and Whitebark Pine	0

Vegetation Zone	Vegetation Communities	Total Acres Forest Service Surface Acres
	Juniper	0
Forests	Lodgepole Pine	0
	Ponderosa Pine	74,670
	Douglas Fir	0
	Spruce Fir	0
Grasslands	Mixed Grass Prairie	1,140,400
	Shortgrass Prairie	0
	Desert Grassland	0
Shrub other	Greasewood	36,260
	Mountain Shrub	0
	Sagebrush	346,890
	Low Sages	0
	Saltbush	43,810
Sand		0
Wetland/Riparian	Forest-dominated riparian	27,350
	Graminoid/forb-dominated wetland/riparian	35,420
	Shrub-dominated riparian	6,260
Total Acres		**1,829,290**
Total Forest Service Planning Area Acres		**6,679,520**

Agriculture/Town

This highly modified vegetation zone is mapped within the planning area. It includes areas that are settled, farmed with or without irrigation, or mined. It also includes areas mapped by GAP as forest-dominated riparian that in reality are primarily hayfields with only linear cottonwood stands remaining. Within the three National Forests there are 120,340 acres within the planning area.

Barren

The barren vegetation zone occurs in diverse locations, all of which are inhospitable to vegetation. These locations range from exposed areas on mountaintops, to rocky outcrops and granite rock piles, to basin soils (e.g. sand dunes, badlands, etc.) that do not support plants for various reasons. This zone also includes areas mapped as open water that are primarily large deep reservoirs not supporting plant life. Within the three National Forests, there are 273,410 acres within the planning area.

Woodland Communities

Aspen

Quaking aspen communities in the planning area occupy the transitional zones between the sagebrush-dominated communities and the coniferous forests. Aspen are also present along streams, in draws, or on the leeward areas of hills and ridges where snow collects. Aspen colonies typically reproduce asexually, producing clones in which separate trees are connected by root suckers. Therefore, several acres of aspen may be interconnected through their roots (Barns 1966). The soils of these areas are usually well-developed deep loam and sandy loam soils with good drainage and high organic matter.

Acting as snow traps, aspen stands are able to support higher productivity and more diverse herbaceous plants than are the adjacent coniferous or sagebrush communities. Aspen stands also provide protective cover essential to mountain watersheds. Understory plants commonly include mountain brome, lupine, columbine, Indian paintbrush, elk sedge, Columbia needlegrass, Kentucky bluegrass, wildrye, licorice-root, elkweed, bedstraw, yarrow, bluebells, yampah, fairy bells, arnica, snowberry, serviceberry, Oregon grape, wood rose, Scouler's willow, and common juniper.

Aspen respond well to fire, and fires typically stimulate repressed colonies to increase root sucker regeneration. This may diversify the age structure of the stand and increase herbaceous production. The occurrence of spring and fall fires has produced the best results.

Wildlife use aspen in the fall, winter, and spring for both cover and forage. The open cover of aspen stands provides mule deer fawning areas and elk calving areas. High forb and grass production as well as shade draw wildlife and cattle into these areas during summer grazing seasons. Birds use these areas for important nesting sites, and other nongame species also rely on this habitat. Lower elevation aspen stands at edges of sagebrush are important areas of wildlife biodiversity for many small birds, raptors, and owls. A diversity of age classes and stand densities is important in maintaining diverse wildlife communities supported by aspen.

River bottom cottonwood forests occur along the North Platte River bottom and are dominated by plains cottonwood and narrowleaf cottonwood. The vegetation type is very similar to riparian woodlands; however, these areas are drier and usually have a natural understory dominated by upland grasses and forbs in areas where agriculture is absent. Within the three National Forests, there are 305,930 acres of aspen within the planning area.

Limber and Whitebark Pine Woodland Communities

Although limited in size, this vegetation type is important for wildlife because of the nutritious, fleshy seeds. This is one of the most threatened forest/woodland types in the West due to the lack of fire and encroachment by other conifer species (primarily subalpine fire) and disease outbreaks; primarily white pine blister rust. Limber and whitebark pine occurs in the Absaroka, Teton, and Wind River ranges. Grouse whortleberry, heartleaf arnica (*Arnica cordifolia*), Ross' sedge, and Wheeler's bluegrass (*Poa wheeleri*) are common dominant understory components; common juniper and russet buffaloberry (*Shepherdia canadensis*) are occasional dominants.

Limber and whitebark pine ecosystems have a mixed-severity fire regime of widely ranging fire intensities and frequencies. Mixed-severity fires create complex landscapes of dead whitebark pine stands intermingled with live stands of different ages. The fire regime of whitebark pine is Fire Regime III. The BpS is the Rocky Mountain Subalpine—Montane Limber-Bristlecone Pine Woodland (LANDFIRE 2007). Within the three National Forests there are 833,640 acres of limber and whitebark pine woodland communities within the planning area

Forest Communities

Within the planning area, lower-elevation forest communities are found on northern and eastern slopes, whereas higher-elevation communities are more extensive and are found on all slopes. The forest communities contain several vegetation types, including lodgepole pine, subalpine fir, Douglas fir, and Engelmann spruce. Dominant conifer species are an indication of elevation, slope aspect, soil characteristics, and climate.

Fire Regimes are a conditional class referring to the level of departure from the natural historic fire frequency and severity in an area, the associated change in vegetation, and the composition and structure of fuels. It also refers to the ecological risk of losing key ecosystem components. The vegetation in the planning area can be categorized into fire regime groups II, III, IV, and V. Fire regime group II includes shrub communities that experience a fire return interval of 0 to 35 years at a stand replacement severity. Fire regime group III consists of the shrubland and mixed conifer communities that have a fire return interval of 35 to 100+ years, and experience mixed severity fires. Fire regime group IV occurs in the lodgepole stands in which the fire return interval is also 35 to 100+ years but which has a stand replacement severity. Fire regime group V occurs in spruce-fir stands that experience a fire return interval of greater than 200 years at a stand replacement severity.

Biophysical Settings are vegetation layers that use historical disturbance regimes and current biophysical environments to depict how the landscape may have been before Euro-American settlement (LANDFIRE 2011).

Lodgepole Pine

The most common tree in the mountains of northern Colorado, Wyoming, and much of the Northern Rockies is lodgepole pine. These forests occur in the middle elevations of the area mountain ranges, between 8,000 and 10,000 feet (Knight 1994). Lodgepole pine is one of the most important commercial species in this area. The average lifespan of Rocky Mountain lodgepole pine is 150 to 200 years. This species often occurs in dense, pure stands with little understory. As the stand ages, shade-tolerant conifer species (e.g., spruce and fir) become established in the understory.

Lodgepole is dependent on fire for regeneration. Cones often retain seeds until fire or cutting causes opening and dispersal of seeds. Lodgepole are often the first trees to become established after fires (BLM 1989a). Historically, fires would be stand-replacing events. If fire does not occur, the stand may become dominated by shade-tolerant conifer species such as subalpine fir and Engelmann spruce.

The lodgepole pine forest canopy does not allow for a very diverse understory plant community. Plants that occur here are pine reedgrass, Wheeler bluegrass, heartleaf arnica, bedstraw, wortleberry, common juniper, wood rose, wax currant, and russet buffalo berry. Lodgepole pine will grow in mixed stands of aspen, Englemann spruce, subalpine fir, Douglas fir, and ponderosa pine (Knight 1994). Lodgepole pine forests are present in many mountain areas of the planning area and are managed for wildlife habitat, watershed maintenance, and timber production. Within the three National Forests there are 1,821,660 acres of lodgepole pine within the planning area

Ponderosa Pine

Ponderosa pine occurs at lower elevations on the eastern slopes of mountains, where summer precipitation levels may be higher and the growing season is longer and warmer. Ponderosa pine forests are often open woodlands and support a mixed-grass or shortgrass understory. Some notable stands of ponderosa pine in the planning area are on the eastern slopes of the Laramie Range, Shirley Mountains, and Seminoe Mountains. Within the three National Forests there are 325,500 acres of ponderosa pine within the planning area

Douglas Fir

Douglas fir is an important commercial species in this area and generally occurs with other conifers, primarily lodgepole pine, Engelmann spruce, and subalpine fir. The GAP data greatly underestimates the Douglas fir, with most of the acres included in other forest types. Douglas fir is the most likely to be found dominating on its own in stands with an understory of bunchgrasses in drier areas or shrubs, grasses, and forbs in more mesic zones.

Understory species include whitestem gooseberry (*Ribes inerme* var. *klamathense*), common juniper, mountain snowberry, spike fescue (*Leucopoa kingii*), bluegrasses (*Poa* spp.), heartleaf arnica, northern bedstraw, oxford ragwort (*Senecio streptanthifolius*), starry Solomon's-seal, Oregon-grape, prickly rose, sheep fescue (*Festuca ovina*), weedy milkvetch (*Astragalus miser*), silvery lupine (*Lupinus argenteus*), Pacific anemone (*Anemone multifida*), arrowleaf balsamroot (*Balsamorhiza sagittata*), rock clematis (*Clematis columbiana* var. *tenuiloba*), fernleaf biscuitroot (*Lomatium dissectum*), and mountain ninebark.

Mature Rocky Mountain Douglas fir is generally more fire resistant than spruces, true firs, and lodgepole pine. In northwestern Wyoming, cool, dry Rocky Mountain Douglas fir likely burned every 50 to 100 years. Recent research shows that Fire Regime III is appropriate for this type. The BpS is either the Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland or the Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland, dependent on precipitation (LANDFIRE 2007).Within the three National Forests there are 171,090 acres of Douglas fir within the planning area

Spruce-Fir

Subalpine fir and Englemann spruce are co-dominant species within this type. The whitebark and limber pine association, Douglas fir, blue spruce, and lodgepole pine are also associated with these communities (BLM 1989a). Mixed conifer forests are often dense, with a large amount of accumulated litter and little understory growth (BLM 1989a).

Engelmann spruce is a valuable commercial species in this area; the other main component in this type, the subalpine fire, is of lesser commercial value. Spruce-fir stands generally do not produce enough forage for livestock but do provide browse and cover for large and small wildlife species. The subalpine fir component is the most susceptible of any of the conifer species in the area to insects and disease.

The spruce and subalpine fir habitat types generally experience high-intensity stand-replacing fires at intervals of 100 years or more. The spruce-fir stands are Fire Regime IV. The BpS for this forest type is either Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland or the Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland, dependent on precipitation (LANDFIRE 2007).Within the three National Forests there are 669,610 acres of spruce fir within the planning area

Other Conifer Woodland Communities

Juniper

Juniper woodlands in the Colorado River watershed area often have Utah juniper as the single tree species and can have pinyon pine (*Pinus edulis*) mixed in with it. These sites occur on rocky, fractured bedrock areas at elevations between 5,700 and 7,500 feet with annual precipitation between ten and 15 inches. In other areas, on foot-slopes adjacent to conifer forests, Rocky Mountain juniper occurs in association with limber pine. These sites may occur in association with basin and mountain big sagebrush steppe in shallow, poorly developed soils at elevations between 7,500 and 8,500 feet. Annual precipitation in these areas is between 16 and 20 inches. Both types of juniper woodlands have understory vegetation that may include bluebunch wheatgrass, needle-and-thread, slender wheatgrass, Idaho fescue, Wyoming big sagebrush, mountain big sagebrush, snowberry, mountain mahogany, bitterbrush, and common juniper.

Juniper-dominated communities often become decadent because the dominant species pumps most of the soil water into the atmosphere, resulting in a monoculture of juniper. At this point, prescribed fire in these areas does not result in an effective burn, because the fine fuels on the ground do not carry the fire into the trees. However, when these communities do eventually burn, they may sustain dangerous high-intensity wildfire during high winds in the hot season. After juniper woodlands burn, production of herbaceous vegetation responds very well.

The juniper communities provide valuable yearlong cover and forage for elk and mule deer as well as many nongame species. Six species of juniper dependent passerine birds are known to use these juniper communities for perching, foraging, migration nesting, escape or thermal cover, or other various stages of their life cycles (Fitton 1989). Within the three National Forests there are 640 acres of juniper within the planning area

Grassland

Three grassland types occur in the planning area: mixed-grass prairie, shortgrass prairie, and desert grassland. These grasslands are characterized below.

Mixed-Grass Prairie

Because of the altitude and prevalence of sandy soils, the Laramie Basin is an isolated pocket of mixed-grass prairie. Summers in this area are cool, which reduces evapotranspiration. Frequent thunderstorms in July and August maintain this grassland, a situation also found in higher precipitation zones to the north and east. Mixed-grass prairie is characterized by needle-and-thread, western wheatgrass, blue grama, Sandberg bluegrass, threadleaf sedge, needleleaf sedge, prairie junegrass, Indian ricegrass, prickly-pear cactus, globemallow, fringed sagebrush, sand dropseed, threeawn, little bluestem, threadleaf sedge, and various species of milkvetch and locoweed. This area is predominantly used for livestock and wildlife grazing. Within the three National Forests there are 1,248,940 acres of mixed-grass prairie within the planning area.

Shortgrass Prairie

The shortgrass prairie is characterized by buffalo grass and blue grama. Other associated species include hairy grama, western wheatgrass, side-oats grama, yucca, and prickly-pear cactus (Barker and Whitman 1994). This area lies in the 12- to 20-inch annual precipitation zone in the rain shadow of the Rocky Mountains. Soils are sandy loams, loams, and clay loams. Within the three National Forests there are no acres of shortgrass prairie within the planning area but do occur on BLM lands within the planning area.

Desert Grassland

On sandier soils and dunes, where water is more available and the shifting dunes are restricted by shrub establishment, desert grasslands commonly occur as a variant of shortgrass prairie. Common grass species include thickspike wheatgrass, slender wheatgrass, bluebunch wheatgrass, Indian ricegrass, needle-and-thread, Sandberg bluegrass, threadleaf sedge, and sand dropseed. Other shrubs and forbs growing among the grasses are sand sagewort, phlox, Hooker sandwort, bud sagebrush, fringed sagebrush, Wyoming big sagebrush, rubber rabbitbrush, horsebrush, and prickly-pear cactus (Knight 1994).

Saltgrass meadows occur in shallow depressions or adjacent to playa lakes where groundwater is near the desert surface. These areas are characterized by inland saltgrass, alkaligrass, alkali sacaton, and, in wetter areas, alkali cordgrass (Knight 1994). Desert grasslands provide palatable forage and often provide islands of diversity within the desert shrublands. Within the three National Forests there are no acres of desert grassland within the planning area but do occur on BLM lands within the planning area.

Shrub Communities

Greasewood

Greasewood-dominated shrublands occur on the fringes of playas, desert lakes, ponds, and desert streams. These areas have general characteristics of flat, alluvial fans in canyons and flood plains adjacent to intermittent and perennial streams in the seven to nine inch and ten to 14 inch precipitation zones or in association with stabilized sand dunes. Greasewood is a halophyte that does well in very saline soils; however, it needs more soil moisture to survive than saltbush.

Where greasewood is the dominant shrub, subdominant shrubs include shadscale, Gardner saltbush, alkali sagebrush, and basin big sagebrush. The understory is limited to salt-tolerant herbaceous vegetation such as inland saltgrass, saltbrush (*Ampler gardneri*), tansy mustard (*Descarainia pinnata*), meadow barley

(*Hordeum brachvanthentm*), basin wildrye (*Ehnms cinereus*), western wheatgrass, alkali sacaton, bottlebrush squirreltail, Sandberg bluegrass, biscuit root, pepperweed, and sea blight.

Large expanses of this vegetation type occur in the Great Divide Basin. Greasewood shrublands often occur on the terraces above wetter areas, where silver sagebrush or basin big sagebrush dominate (Knight 1994). Although greasewood is not considered palatable forage, pronghorn and sheep will eat the spiny twigs and leaves in the spring and early summer, and cattle and horses use this species in summer and fall as a source of salt. Also many species also use greasewood communities as cover. Within the three National Forests there are 36,260 acres of greasewood within the planning area.

Mountain Shrub
Overall within the three National Forests there are 8,330 acres of mountain shrub within the planning area.

Bitterbrush Shrub Steppe
Bitterbrush-dominated plant communities exist on sand, sandy, and sandy loam soils in the 10- to 14-inch annual precipitation zones. Bitterbrush varies in height depending on soil depth, precipitation, and browsing. It may appear as a low spreading shrub about six inches tall, or as a tall shrub reaching six feet in height.

Bitterbrush is often a co-dominant with mountain or basin big sagebrush, and in the sand hills south of Rawlins it is intermixed with silver sagebrush, basin big sagebrush, and rabbitbrush in deep sand soils. At higher elevations and precipitation levels, bitterbrush occurs in mixtures with sagebrush, snowberry, serviceberry, mountain mahogany, and, occasionally, chokecherry. Herbaceous plants associated with bitterbrush include grasses such as needle-and-thread, bluebunch wheatgrass, Indian ricegrass, sand dropseed, and thick spike wheatgrass, and include forbs such as lupine, penstemon, sego lily, wild onion, larkspur, and prickly-pear cactus.

Bitterbrush is probably the most important winter browse species for mule deer in the region. Elk and cattle use it as well in the fall and spring. It responds best to low-intensity (cooler-season) prescribed burns, brush beating, and chemical treatment directed at killing sagebrush. Resprouting response to fire is considered fair to moderate when fires occur in low-intensity. High-intensity fires (fires with extreme energy release components and residual heat) will kill bitterbrush.

Mesic Upland Shrub Steppe
Serviceberry or chokecherry, or a combination of both, dominates the mesic upland shrub steppe community, often in conjunction with snowberry, currant, and wood rose. Good examples of this plant community occur on the middle elevations of Battle Mountain near Savery. These shrubs may reach ten to 15 feet in height. They occur in dense stands or scattered patches, often adjacent to aspen or willow. Understory grasses include basin wildrye, green needlegrass, Columbia needlegrass, and Kentucky bluegrass, and forbs include bluebell, columbine, aster, violet, elkweed, chickweed, and stinging nettle.

This community provides hiding and thermal cover for deer, elk, and other wildlife species. The dominant shrubs provide excellent forage for browsing animals when their softer leaves and shoots stay within reach. These shrubs will reestablish following fire, often in less dense patches, making them more accessible to wildlife and livestock.

Xeric Upland Shrub Steppe
True mountain mahogany dominates the xeric upland shrub steppe plant community on dry rocky slopes or in very shallow, undeveloped soils in the 10- to 14-inch precipitation zone. It occurs as both the dominant shrub or as an understory of Utah juniper, occurs at higher elevations, and mixes with bitterbrush, snowberry, serviceberry, green rabbitbrush, broom snakeweed, and mountain big sagebrush. Common

herbaceous plants include bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and mat-forming forbs such as phlox, buckwheat, false locoweed, Hooker sandwort, goldenweed, and milkvetch.

True mountain mahogany may reach five to seven feet in height depending on the amount of browsing and soil depth. Fire generally lessens the density of the shrub stands, allowing grasses and other herbaceous plants to increase while still providing wildlife browse. Mountain mahogany is an important wildlife fall and winter forage. A notable characteristic is the hedging growth pattern exhibited by mountain mahogany plants after they have been browsed by mule deer and elk.

Sagebrush

Within the three National Forests, there are 661,120 acres of sagebrush habitat within the planning area.

Wyoming Big Sagebrush/Grassland

The Wyoming big sagebrush/grassland is the most common vegetative cover type in south-central Wyoming. It occurs in shallow-to-moderately deep soil at lower elevations, giving way to basin big sagebrush in deeper soils and to mountain big sagebrush above 6,500 feet in elevation and within the 9- to 16-inch annual precipitation zones (Knight 1994). Shrub height varies from as little as six inches on shallow sites to around 30 inches in deeper soils. Canopy cover is generally lower than observed in either basin or mountain big sagebrush—usually under 30%.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with Gardner saltbush and open grasslands. In shallow, rocky-to-gravelly soils, Wyoming big sagebrush may co-dominate with black sagebrush, green rabbitbrush, and sometimes winter fat. Grass and forb species vary depending on soil texture, aspect, and slope. Common grass and grass-like species include bluebunch and thickspike wheatgrass, Sandberg and mutton bluegrass, Indian ricegrass, needle-and-thread, threadleaf sedge, and bottlebrush squirrel tail. Common forbs include phlox, Hooker sandwort, onion, goldenweed, sego lily buckwheat, penstemon, Indian paintbrush, globemallow, and prickly-pear cactus.

Wyoming big sagebrush is the most frequently eaten sagebrush and is a staple for pronghorn antelope, mule deer, and Greater Sage-Grouse. It is also one of the dominant species found on pronghorn and mule deer crucial winter ranges. Fire is an important component of all sagebrush-dominated plant communities. Depending on the nature of the site, the fire return interval can be between 25 and 100 years (Knight 1994).

Basin Big Sagebrush Shrubland

Basin big sagebrush shrubland is found in moderately deep-to-deep soils of all soil textures, in zones of ten to 16 inches of annual precipitation (Beetle 1960). It occurs as pockets within Wyoming big sagebrush and Gardner saltbush communities, as the dominant plant type along valley bottoms and canyons, and along ephemeral washes. This subspecies of big sagebrush may reach 12 feet in height, with canopy cover reaching 70%.

Basin big sagebrush mixes with serviceberry, green and rubber rabbitbrush, snowberry, bitterbrush, silver sagebrush, and mountain mahogany, depending on the soil depth, annual precipitation, and elevation. Grasses occurring in these communities include basin wildrye, green needlegrass, Idaho fescue, thickspike wheatgrass, Kentucky and mutton bluegrass, and bottlebrush squirrel tail. Common forbs include bluebells, groundsel, onion, violet, buttercup, false dandelion, buckwheat, penstemon, Indian paintbrush, lupine, locoweed, and prickly-pear cactus.

Basin big sagebrush is not palatable forage. It usually shows little or no use, even in extreme winters when use levels of other plants are severe. It is important, however, as hiding cover for mule deer and elk and as habitat for other wildlife species. In some areas it also provides critical winter habitat for Greater Sage-Grouse when snow covers most other shrubs. Basin big sagebrush increases in density and cover as the dominant plant species, and to even a greater degree when associated with poor livestock management and/or interruptions in the fire cycle. To increase diversity in basin big sagebrush shrublands, prescribed fires and chemical and mechanical treatments are employed, resulting in increases of grasses and other understory plants. The natural fire recurrence interval in the sagebrush type is approximately 30 to 75 years.

Mountain Big Sagebrush/Grassland
Mountain big sagebrush is located in shallow or moderately deep soils at elevations above 6,500 feet, in 12- to 20-inch annual precipitation zones. It is the dominant plant community on the Brown's Hill-to-Miller Hill plateau south of Rawlins. This is one of the largest homogeneous communities of this sagebrush type in the United States. Mountain big sagebrush also occurs as smaller plant communities at the lower mountain elevations, intermixed with aspen and conifer woodlands. Shrub height will vary from ten to 30 inches, with canopy cover reaching 50% to 60%.

Mountain big sagebrush is usually the dominant shrub in foothill and mountain sage communities, with bitterbrush, serviceberry, snowberry, and mountain mahogany providing subdominant brush diversity. Grasses include Idaho fescue; king spike fescue; green and Colombia needle grass; Kentucky, mutton, and big bluegrass; elk sedge; and Ross' sedge. Common forbs found in these areas include Indian paintbrush, phlox, balsamroot, locoweed, lupine, larkspur, penstemon, and Oregon grape.

Mountain big sagebrush is palatable to wildlife, although browsing is limited during the winter when these habitats become unavailable because of snow. Following fire, mountain big sagebrush reestablishes as the dominant species more quickly than do other sagebrush types, often resuming dense canopy cover after approximately 40 years. The natural fire recurrence interval in this sagebrush type is approximately 25 to 75 years.

Silver Sagebrush/Grasslands
Silver sagebrush/grasslands have two subtypes with very different habitats. The most common is found in deep sandy soils and consists of silver sage as the dominant species. It is associated with basin big sage, green rabbitbrush, serviceberry, chokecherry, and wood rose. Herbaceous species include needle-and-thread, Indian ricegrass, prairie sandreed, sand dropseed, scurfpea, and prickly-pear cactus.

The second type of silver sagebrush is located in riparian habitat along streams above the wet sedge and willow riparian zone. This second riparian terrace is also habitat for basin wildrye, Kentucky bluegrass, streambank wheatgrass, redtop, Baltic rush, clover, checkermallow, aster, and, occasionally, cottonwood and willow.

Silver sagebrush is desirable forage for both livestock and wildlife, and it provides important habitat for big game and nongame species. Silver sagebrush responds well to prescribed fire as a management tool when it is dry enough to burn. Any disturbance in the silver sagebrush community may result in less desirable species increasing in prevalence due to the transition of soil types or low-moisture regime.

Low Sages—Alkali, Birdsfoot, Black, and Wyoming Three-Tip Sagebrush/Grassland
Alkali sagebrush is found growing in clay soils and, as its name implies, can withstand soils of higher alkalinity than can other sagebrush (Beetle and Johnson 1982; Knight 1994). It occurs in relatively pure communities because of the high clay content and high cation exchange capacity in the soils in areas below 7,500 feet in elevation. Understory grasses include bluebunch wheatgrass, western wheatgrass, mutton bluegrass, bottlebrush squirreltail, and Indian ricegrass. Forbs noted at this site include wild buckwheat, biscuit root, and wild onion. Browsing on this sage is light.

Birdsfoot sagebrush is found in alkaline soils, where pH ranges from 8.5 to 11, and below 7,500 feet. At lower pH levels, birdsfoot sage mixes with Gardner saltbush, and it appears with a mixture of grasses and forbs on windswept ridges and hills. At higher pH levels, birdsfoot sagebrush occurs as a monoculture.

Black sagebrush occurs on gravelly-to-rocky soils that have a "shallow effective" rooting depth (less than 15 inches) and various textures from sandy loams to clay loams. On the plains north of the Ferris and Seminoe Mountains, it is the principal shrub present, but it will often intermix with Wyoming big sagebrush. Above 7,400 feet, it gives way to Wyoming three-tip sagebrush. It also has been observed as an understory shrub in true mountain mahogany stands. On sandy sites, it is commonly found with needle-and-thread, threadleaf sedge, Junegrass, sandwort, and buckwheat, whereas on loamy soils it will occur with wheatgrasses, bluegrasses, Indian ricegrass, phlox, onion, paintbrush, and penstemon. Black sagebrush sites rarely burn, probably because of the low production and shrub cover these sites support. In some locations, black sagebrush is considered an important browse species for mule deer.

Wyoming three-tip sagebrush occurs above 7,000 feet in the foothills and at the higher elevations of the mountain ranges. It normally grows between four inches and 15 inches tall in moderately deep, well-drained soils (Beetle and Johnson 1982). It is often found intermixed with mountain big sagebrush and black sagebrush. Understory grasses and forbs include Idaho fescue, king spike fescue, Colombian needlegrass, elk sedge, Ross' sedge, Indian paintbrush, mountain pea, larkspur, balsamroot, phlox, and buckwheat. Wyoming three-tip sagebrush-dominated areas are often used as forage for wildlife. This species does burn, but because of a lack of fuel continuity, large, resource-damaging fires are rare.

Saltbush

Salt desert shrubland is perhaps the most arid vegetation type in the intermountain West (Knight 1994). Gardner saltbush dominates the salt desert shrub community type and in some instances occurs as up to 90% of the vegetation cover. These areas are characterized by accumulations of salt in poorly developed soils. Soils of these areas usually have a pH of 7.8 to 9, which restricts the uptake of water by all but the most salt-tolerant plants (halophytes). Soil textures can be sandy loam, sandy clay loam, or loam and clay. Salts accumulate around these plants each year with leaf fall. Halophytes function essentially to redistribute salts from the soil depths to the surface, thereby concentrating salts around the perimeter of the plant. This enables the plant to eliminate competition for scarce water and nutrients from other, less salt-tolerant plants (Goodin and Mozafar 1972).

Gardner saltbush normally grows no higher than 12 inches. It may grow along the ground, forming a mat. Subdominant shrubs include birdfoot sage, bud sage, spiny hopsage, greasewood, broom snakeweed, shadscale, spiny horsebrush, and winterfat. Grasses associated with these sites are Indian ricegrass, bottlebrush squirreltail, Sandberg bluegrass, and western wheatgrass. Forbs found in these areas include wild onion, biscuit root, woody aster, globemallow, princess plume, and prickly-pear cactus.

Salt desert shrublands occur at elevations between 6,000 and 7,600 feet within the lowest precipitation areas in the planning area. These areas are typically flat or rolling hills. Excellent examples of this type exist in the Separation Flats area west of Rawlins. Gardner saltbush is a valuable forage species on winter and spring ranges. In the spring when green, it has higher protein concentrations than late-season alfalfa, and it is a preferred livestock forage. Within the three National Forests there are 43,810 acres of saltbush within the planning area.

Wetland/Riparian Communities

The GAP data used three plant cover types to depict wetland/riparian communities: forest-dominated riparian, graminoid/forb-dominated wetlands, and shrub-dominated riparian areas. These types provide the best reflection of wetland/riparian communities in smaller drainages, where agriculture has not extensively modified the vegetation

Wetland/riparian vegetation communities in arid and semi-arid environments often are key sites for the local ecosystem. Most terrestrial animal and insect life depends on riparian or wetland areas as sources of water, forage, and cover. Wetland/riparian areas in good health maintain water quality and aquifers, control erosion, diminish the impact of floods, and act as a stabilizing force in western landscapes subject to frequent drought and dynamic precipitation cycles. Wetland/riparian vegetation also moderates stream water temperatures; adds structure to the river network; provides habitat for fish, birds, and wildlife; and provides organic material for insect production. Within the three National Forests there are 149,220 acres of wetland/riparian within the planning area.

Wetland Areas

Wetland vegetation depends on the hydrologic network of the watershed, the duration of water availability, geologic conditions, soil types and depth, climate, and management history. Sedges, rushes, cattails, willows, and other wetland obligates dominate the environment. As water availability decreases, herbaceous vegetation shifts from sedges (wetland obligates) to grasses and wetland facultative plants (plants that usually occur in wetlands but are occasionally found in other habitats).

Wetlands are a valuable natural resource, and impacts to these areas should be avoided wherever possible. Wetlands in the planning area are represented by the following characteristics:

- Shoreline vegetation around open water bodies.
- Riparian vegetation along streams.
- Open meadows that accumulate moisture in the winter and spring.
- Dunal ponds associated with the Great Basin Divide Basin.

Based on GAP data, there are 881,700 acres on the National Forest System lands within the planning area that can be classified as wetlands. Many of these areas are seasonally dry and infrequently inundated with water. Vegetation in these areas varies according to the frequency, depth, and duration of inundation. From an ecosystem perspective, an area that is unique to the wetland areas in the planning area is the dunal ponds, which are seasonally supported by precipitation that is trapped in the Great Divide Basin sand deposits. The variety of shrubs, grasses, and forbs present depends on the degree and duration of wetness and exposure at each location.

In most cases salt accumulation is not excessive in the wetland areas. Where drainage is limited, alkaline conditions can occur, and these can affect the types of plants that can be sustained. Vegetated wetlands and flood plains dissipate stream energy, store water for later release, provide areas of infiltration for ground water, support the hyperphenic zone of the river, and provide rearing areas for fish and animal species.

Public lands within the planning area boundaries provide potential habitat for obligate and facultative wetland plants. Wetland vegetation can form nearly monotypic stands of vegetation (e.g., sedges or cattails) or diversified assemblages of plants. The determining factors appear to be availability of water, soils, and management actions on the surrounding lands. Meadows typically have a wider variety of plants, probably because of their more gradual transition from dry to wet conditions. Wetlands that are isolated by location and distance from other vegetation types typically are more likely to have a monotypic plant assemblage.

Desert Riparian

Many different types of desert riparian occur in the planning area, depending on the timing and duration of soil wetting, soil type and depth, and topography of the area. These types usually occur on alluvial material of sand, sandy loam, loam or an unconsolidated mixture of soil and cobble material. Soils are usually well-drained and are higher in organic matter content than the surrounding uplands. Streams are often ephemeral or intermittent; therefore, vegetation depends on spring runoff or spring and summer rain.

The wettest areas in the desert commonly support Baltic rush, Nebraska sedge, water sedge, and tufted hairgrass, with mountain iris, sandbar willow, and narrowleaf cottonwood occasionally occurring along the fringes. Seasonally wet areas in the desert and steppe communities commonly contain Kentucky bluegrass, tufted hairgrass, foxtail barley, redtop, northern reedgrass, slender wheatgrass, basin wildrye, field horsetail, wood rose, shrubby cinquefoil, silver sage, basin big sagebrush, greasewood, and a variety of willow species.

Desert ephemeral washes may lie on saltier soils and therefore support salt-tolerant species. Inland saltgrass and western wheatgrass dominate this herbaceous community, whereas greasewood and basin big sagebrush are the dominant shrubs.

Irrigated nonfederal lands along the major streams and rivers in the desert have limited the extent of native vegetation in some riparian areas. Where topography and soils restrict irrigation of nonfederal lands, native vegetation persists. These areas sustain riparian woodlands that support trees and shrubs such as plains cottonwood, narrowleaf cottonwood, Fremont cottonwood, Geyer willow, sandbar willow, and yellow willow. The trees and shrubs often give way to herbaceous communities where soils are shallow. Herbaceous plants and lower shrubs dominating these areas would be part of the understory in the riparian tree communities. Vegetation includes slender wheatgrass, thickspike wheatgrass, smooth brome, tufted hairgrass, meadow foxtail, timothy, mountain iris, horsetail, gooseberry, currant, buffalo berry, and basin big sagebrush. Such communities are located along the fringes of the riparian areas or in rocky areas.

Riparian areas are associated with the highest production of grasses and other very palatable herbaceous species in the desert as well as with the greatest plant diversity. Often open water is also present. These characteristics draw both livestock and wildlife and also provide critical habitat to many species that depend on water for survival. Desert riparian communities normally represent less than 1% of the total area in the desert. This places additional pressure on the management of riparian sites for ecological and hydrological sustainability. Management of livestock allotments is often focused on limiting grazing on the desert riparian areas to preserve their valuable diversity and productivity.

Foothills and Mountain Riparian

Riparian areas in the foothills and mountains are generally moister for longer periods of time and support plants that need to be in wet or saturated soils throughout the growing season. The stream gradients are also steeper, and the streambed material much larger. Riparian areas in the foothills and mountains receive snowmelt and spring discharges that provide perennial flow and cooler water. The soils are usually coarser, with higher organic matter content and increased soil development compared with lower elevations. These areas range in elevation from 7,500 to 10,000 feet and may include alpine tundra characteristics in the upper reaches of the watersheds.

Willow is often the dominant species in these environments. Frequently observed are sandbar willow, Geyer willow, yellow willow, whiplash willow, Wolf willow, Booth willow, Bebb's willow, and plain leaf willow. Species prominent in the composition of the willow understory include beaked sedge, Nebraska sedge, water sedge, field sedge, Baltic rush, bull rush, spike rush, tufted hairgrass, Kentucky bluegrass, meadow foxtail, and reedgrass. These understory plants dominate in the open meadows and marshes. Other shrubs and trees that occur are water birch, shrubby cinquefoil, redosier dogwood, snowberry, skunkbrush sumac, narrow leaf cottonwood, aspen, Englemann spruce, and lodgepole pine (Knight 1994).

As in the desert riparian area, mountain riparian vegetation is more diverse and higher in productivity than the surrounding uplands, causing livestock and game to concentrate there. The forage also stays lush and more palatable into the late summer (when upland grasses have cured), adding to the attractiveness of these areas. Livestock management strategies often include controlled season and duration of use of these areas.

Noxious and Invasive Weed Management

Noxious weeds are defined in Executive Order 13112 as those "species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Noxious weed species, when introduced to an area, are aggressive and often dominate natural communities. They are often able to establish in areas following disturbance. As listed in Table 3-102, the State of Wyoming has designated 25 weeds as noxious, 19 of which are known to be a problem within the planning area.

Table 3-102. Noxious Weeds within the Planning Area

Common Name	Scientific Name	Present in the Planning Area
Canada thistle	*Cirsium arvense*	X
Common burdock	*Arctium minus*	X
Dalmation toadflax	*Linaria dalmatica*	X
Dyer's woad	*Isatis tinctoria*	X
Field bindweed	*Convolvulus arvensis*	X
Hoary cress	*Cardaria draba and Cardaria pubescens*	X
Houndstongue	*Cynoglossum officinale*	X
Leafy spurge	*Euphorbia esula*	X
Musk thistle	*Carduus nutans*	X
Ox-eye daisy	*Chrysanthemum leucanthemum*	X
Perennial pepperweed	*Lepiduim latifolium*	X
Perennial sowthistle	*Sonchus arvensis*	X
Plumeless thistle	*Carduus acanthoides*	X
Russian knapweed	*Centaurea repens*	X
Russian Olive	*Elaeagnus angustifolia*	X
Saltcedar	*Tamarix spp.*	X
Scotch thistle	*Onopordum acanthium*	X
Spotted knapweed	*Centaurea maculosa*	X
Yellow toadflax	*Linaria vulgaris*	X

Source: Wyoming Weed and Pest Council 2010

Poisonous Plants

Poisonous plants are a normal component of the ecosystem. Most poisonous plant species will kill animals only if they are eaten in large amounts, such as only consuming those species (Stoddart et al. 1975). Several factors, such as time of year and climate conditions, influence poisoning occurrence and severity, in addition to the animals' seasonal susceptibility, the age and species of animal, and a mineral deficiency in the diet.

A shortage of salt in the diet may cause animals to eat plants they would not normally eat. Shortages of other minerals such as phosphorus induce abnormal appetites, causing animals to consume low-value vegetation, including poisonous plants. On a large scale, poisonous plants have a minimal effect on livestock operations. However, on a local scale, use of specific areas or pastures can be limited by poisonous plant presence.

The high occurrence of selenium in soils of south-central Wyoming results in specific plants absorbing selenium, which can be toxic when consumed by livestock. Selenium acts as a cumulative poison, and can cause chronic poisoning effects over a long period or quick death if consumed in quantity. Local names for this poisoning effect include "alkali disease" and "blind staggers." Large concentrations of woody aster and other selenium-accumulating plants occur in Poison Basin west of Baggs, Sage Creek Basin south of Rawlins, Alkali Basin north of Sinclair, and Hanna and Shirley Basins.

More than 20 species of poisonous plants are known to exist in the planning area. Table 3-103 lists some of the poisonous species, dangerous seasons, and grazing animals endangered. Poisonous noxious species are not included in the table.

Table 3-103. Poisonous Plant Species on National Forest System Land

Species	Dangerous Season(s)	Kind of Livestock Endangered
Arrowgrass	All	All
Chokecherry	All	All, especially sheep
Death camas	All, especially spring	All, especially sheep
Greasewood	Spring, summer, fall	All, but mostly sheep
Halogeton	All	All, but mostly sheep
Horsebrush	Spring	Sheep
Horsetail	Haying season	All, especially cattle and horses
Low larkspur	Early spring	Cattle
Tall larkspur	Early summer	Cattle
Loco	All, especially spring	All
Lupine	Spring, summer, fall	Sheep
Prince's plume	Spring and summer	All
Russian knapweed		
Senecio	Spring and summer	All
Western waterhemlock	Spring	All
Woody aster	Spring and summer	All

Stoddart, Smith, and Box 1975; Poisonous Plants of Livestock in the Western States, USDA, 1980.

Bridger-Teton National Forest

The most common sagebrush vegetation type, comprising 88% of all sagebrush communities on the Forest, is mountain big sagebrush (*A. tridentata ssp. tridentata*). Forest-wide 60% of the mountain big sagebrush type has a sagebrush canopy greater than 25% (Forest Service 2007a); a mountain big sagebrush canopy less than 40% is desirable for optimum herbaceous understory (Winward 2004). Bitterbrush, a preferred browse species associated with the mountain big sagebrush community is predominantly mature and often decadent. The most common understory species in the mountain big sagebrush type is Idaho fescue, a plant highly palatable for all ungulates. Listed in no particular order are the other most common grass/grasslike species: Letterman's needlegrass, bluegrass species other than Kentucky, Columbia needlegrass, slender wheatgrass and elk sedge. Most common forbs (again in no particular order) are lupine, sulphur buckwheat, rose pussytoes, groundsels, arrowleaf balsamroot, geranium and Indian paintbrush. In some locations the diversity of species is relatively low. Ground cover averages in mountain big sagebrush are variable across the Forest; overall approximately 1/3 of the vegetation type has more than 20% bare soil (Forest Service 1997). Mountain big sagebrush on the BTNF is documented as generally increasing in cover and extent since the early 1900s (Gruell 1980a).

The predominance of mountain big sagebrush canopy > 25% and the decadence of bitterbrush in the mountain big sagebrush type is primarily attributable to an altered fire return interval. The fire regime in the big sagebrush ecosystem has been altered over the last 100 years, directly by fire suppression and indirectly by livestock and wildlife grazing which removes fine fuels (BTNF PFC 1997, Wyoming Interagency Vegetation Committee 2002, A. Norman personal communication 2008).

Core and general sage-grouse habitat has been mapped on the BTNF by the State of Wyoming (WY EO 2011-5). There are 3,060 acres of mountain big sagebrush on the BTNF that were mapped as core habitat for the Greater Sage-Grouse. Of these acres, 700 acres have a sagebrush/ bitterbrush canopy cover of ten to 24 percent, and 2,360 acres are mapped as having a canopy cover of 25% to 100%.

Additional occupied sage-grouse habitats (not within those core and general areas mapped and designated by the State) have also been identified and mapped by the Upper Snake River Basin Local Working Group and BTNF personnel based on observation data. There are 70,890 acres mapped as occupied sage-grouse habitat within the mountain big sagebrush vegetation types. Of these acres 27,830 acres have a sagebrush/ bitterbrush canopy cover of 10% to 24%, and 43,070 acres are mapped as having a canopy cover of 25% to 100%.

The silver sagebrush vegetation type is slightly more than 8% of all sagebrush communities on the BTNF. Like mountain big sagebrush, silver sagebrush tends to have a canopy greater than 25% across the Forest (Forest Service 2007a) compared to an ideal range of canopy cover of 10% to 30% (Mueggler and Stewart 1980; USDA 1997). The most common understory species in the silver sagebrush vegetation type are highly palatable grasses. Common grasses/grasslike species include elk sedge, needlegrasses (Columbia and Thurber's), slender wheatgrass and mountain brome. Forbs that are common tend to provide little forage value. The most common forb species are: yarrow, herbaceous cinquefoil(s), groundsel(s), aster(s), leafy bract aster, one flowered helianthella, strawberry, fleabane(s) and geranium. Ground cover is high, as it should be, on the mesic sites occupied by silver sagebrush.

Ground cover averages in mountain big sagebrush are variable across the Forest; average ground cover for this vegetation type ranges from 80% to 98% (Forest Service 1997). It is not expected that the extent of silver sagebrush communities has changed much since pre-settlement conditions due to its mesic site preference.

Core and general sage-grouse habitat has been mapped on the BTNF by the State of Wyoming (WY EO 2011-5). There are two acres of silver sagebrush on the BTNF that were mapped as core habitat for the Greater Sage-Grouse. These acres have a canopy cover of 10% to 24%.

Additional occupied sage-grouse habitats (not within those core and general areas mapped and designated by the State) have also been identified and mapped by the Upper Snake River Basin Local Working Group and BTNF personnel based on observation data. There are 4,600 acres mapped as occupied sage-grouse habitat within the silver sagebrush vegetation types. Of these acres 710 acres have a canopy cover of 10% to 24%, and 3,880 acres are mapped as having a canopy cover of 25% to 100%.

Current Management Practices

Prescribed fire, chemical, biological, and mechanical methods, and/or livestock grazing could be used to achieve vegetation goals. Vegetation treatments will be designed to reduce erosion, protect Special Status Plant Species, enhance vegetation community and watershed health, increase forage production, and enhance wildlife habitats. Treatments will be designed to consider the natural role of fire in ecosystem management and to restore the natural range of variability in vegetation community types. Treated areas will generally be rested from livestock grazing for a minimum of two full growing seasons after treatment or until at least 60% ground cover is achieved. Analysis could indicate a need for a longer rest period.

Medicine Bow National Forest

The Brush Creek-Hayden and Laramie Ranger Districts are situated on the Sierra Madre and Snowy mountain ranges and are therefore dominated by dense forest vegetation. Spruce-fir forests occupy higher elevations, while aspen and lodgepole pine dominate the next lower elevation zone. Upland shrublands occupy the lowest elevation edges of the Forest and only make up a small percentage of total district acres. Primary upland shrubland habitat types are big sagebrush/bunchgrass and big sagebrush-bitterbrush/bunchgrass, but also include some plant communities dominated by three-tip sagebrush, alkali sagebrush, black sagebrush, serviceberry, mountain snowberry, true mountain-mahogany, chokecherry and Gambel oak.

The majority of rangelands on the districts (including shrublands, riparian areas and aspen forest) are in satisfactory condition with a stable or upward trend. Some small, localized area are still recovering from historical heavy grazing use. Forested lands have long been considered to be in satisfactory condition, but the recent severe drought of 1999-2005 and the large scale forest insect and disease outbreak that followed, have significantly altered the nature and health of forest stands. A majority of mature lodgepole pine trees and many stands of mature limber pine, Engelmann spruce, subalpine fir, aspen and Douglas-fir have been killed. Natural regeneration of the forest has already begun in many areas and is expected to continue.

Greater Sage-Grouse habitat, as delineated on the two districts, includes about 10,670 acres of forest (aspen and coniferous), 230 acres of riparian habitat, 350 acres of tall, dense mixed shrub habitat (Gambel oak, serviceberry, chokecherry), and 7,700 acres of sagebrush and sagebrush/mixed mountain shrub habitat. The 56% of delineated habitat that is forested is not likely to be used much, if at all, by Greater Sage-Grouse. In addition, some of the shrubland and riparian sites are small parcels surrounded by forest and do not appear to be preferred habitat for sage-grouse.

Shrubland management on the districts has undergone a transition over time from large scale removal or thinning of shrubs (conducted from the late 1950's through the early 1980's), to management for a variety of age classes, with the majority in mid to late seral stages. Many acres of big sagebrush were sprayed with 2,4-D to remove or thin sagebrush stands that had become very dense as a result of historical overgrazing. Within the designated sage-grouse habitat, about 35% of the shrublands were sprayed with 2,4-D between 1962 and 1981. In the past 100 years wildfire has only affected a relatively small percentage of the two districts; however, that situation could change with the high tree mortality the units are now undergoing.

Sagebrush stands within sage-grouse habitat vary in species composition and other characteristics among sites. On shallower soil sites shorter species such as black sagebrush, three-tip sagebrush dominate. On the more moist sites, bitterbrush is co-dominant with big sagebrush. Canopy cover of sampled sites within designated sage-grouse habitat areas varies from 8% to 22%. One game-proof study exclosure within the core area on Six Mile Allotment has big sagebrush canopy of 40% to 42%. This site is located within big game winter range. Bare ground measurements on these sites range from 1% to 18%. The herbaceous layer on most sites is dominated by native bunchgrasses and native perennial forbs.

The Douglas Ranger District is characterized by granite rock outcrops and large areas of Ponderosa Pine with intermingled meadows on the east side of the District and Limber and Lodgepole Pine with intermingled high plains on the west side of the District.

The approximately 8,000 acres of National Forest System land that lie within either core or general sage-grouse habitat as designated by the Governor of Wyoming, are within five of the geographic areas located on the Douglas District.

Current Management Practices

Vegetation is managed for healthy, diverse native plant communities. In forested areas timber harvest has long been used to create a variety of age classes. Before the insect and disease epidemic, a majority of forest stands were in late seral stages. Now the forest is transitioning to largely early seral state as a result of the major insect and disease outbreak. Timber harvest will continue for some time, with emphasis on creation of fuel breaks, salvage of dead material and thinning of young stands. Where natural regeneration is not adequate, tree planting is being planned and implemented.

Shrublands are managed for 10% to 20% early seral, 60% to 80% mid seral, and 10% to 20% late seral stages. Prescribed burning is the primary tool used to create early seral stands. Burns are planned and managed to achieve a fine-scale mosaic. Within the sage-grouse habitat, approximately 460 acres have been burned by prescription between 1988 and 1995. Recovery of big sagebrush canopy to pre-treatment levels varies widely depending on the method of treatment, site conditions, other shrubs present and levels of livestock and wildlife grazing and browsing.

Riparian areas, because of their high ecological value, are managed under an extensive set of standards, guidelines and best management practices. They are managed for upper mid seral ecological status.

Vegetation is currently managed for a mix of seral stages. In general, the forested areas are in late seral stages, with the grass and riparian areas offering diversity in seral stage. Livestock grazing is balanced with the needs of wildlife. Active areas of timber thinning have taken place and will continue to take place. There are a number of prescribed burns planned for timbered areas. No active vegetation management is taking place that would adversely affect sage-grouse habitat.

Noxious Weeds and Other Invasive Plants

Overview

Noxious weeds and other invasive plants have long been present on the Medicine Bow National Forest but today they present a growing threat to native plant communities. One reason is the ever increasing number of visitors from many locations and the improved access to many parts of the Forest via roads and trails. Many visitors inadvertently introduce weed seeds where they recreate, work or travel. Another reason is the change in vegetation brought about by the severe drought of 1999-2005 and the ensuing forest-wide insect and disease outbreak. Dying forests create new opportunities for invasive plants as sunlight reaches the forest floor, disturbance from wildfires, where timber removal for fuels reduction and salvage of wood create disturbed sites. Climate change is likely to bring about further stresses to native plant communities that create open niches for invasive plants.

There are presently 13 species of state-listed noxious weeds documented on the Medicine Bow National Forest. In addition to the state-listed noxious weeds, numerous other invasive non-native species occur. The most harmful and aggressive of these is cheatgrass (*Bromus tectorum*). One of the most notable effects of the drought mentioned above was the establishment and spread of dense cheatgrass stands in locations where it had not been seen before or where only scattered plants had previously been observed.

Most cheatgrass infestations are on steep southward-facing (south, southeast and southwest) in big sagebrush shrublands. They occupy relatively small areas relative to total shrubland acres on the district, but cheatgrass readily colonizes burned areas and other disturbed sites. Patches of cheatgrass infestation are currently documented in sage-grouse core areas on three allotments, and general habitat on six allotments on the Brush Creek/Hayden and Laramie Districts. One additional allotment is adjacent to a large cheatgrass infestation on an old wildfire site on BLM land.

Cheatgrass is present on the Douglas Ranger District, with most infestations being found in areas of previous wildfires. No known infestations occur in either the core or general sage-grouse habitat.

Current Management Practices

Noxious weeds are treated annually using a variety of methods and a number of prevention measures are in place; however, weed control funding levels and manpower are not adequate to treat or inventory all weed populations. New weed populations become established every year. Overall, weed control efforts do not keep pace with growth of existing populations of many species or establishment of new populations. In particular, populations of yellow toadflax (*Linaria vulgris*), Dalmatian toadflax (*Linaria dalmatica*), and oxeye daisy (*Leucanthemum vulgare*) have increased markedly in the past decade.

Treatment of cheatgrass has only occurred on a trial basis in a few locations. Most of the infestations on the two districts are very difficult to treat by ground application of herbicide because they are on such steep, rocky slopes. The best herbicide for controlling cheatgrass must be applied at a very low rate and very evenly to kill the cheatgrass while avoiding negative effects to non-target species. This is only feasible via aerial application. The MBNF cannot aerially apply any pesticide without first completing an EIS. That effort is underway.

Management Issues and Concerns

Invasive species, and particularly cheatgrass, degrade sage-grouse habitat. On sagebrush sites where cheatgrass is the dominant herbaceous species, habitat quality is very poor. Cheatgrass can rapidly alter site conditions by changing soil structure and organic matter content, crowding out most native grasses and forbs, and changing the natural fire return interval from 30 or more years to every three to four years. When big sagebrush plant communities burn frequently, big sagebrush is eventually eliminated since it is killed by fire and unable to resprout from the root crown. Where cheatgrass is present within or near sagebrush habitats, the ability of land managers to use prescribed fire as a shrubland management tool is compromised. This reduces our ability to manage for a variety of age classes while retaining a healthy complement of native plant species.

Where invasive species displace native vegetation, livestock and wildlife must shift their foraging to locations where native plant communities persist, thus concentrating grazing/browsing impacts on fewer acres and impacting plant health.

Thunder Basin National Grassland

Wyoming has the fewest number of large grassland areas (only two) with low agricultural cultivation. However, these areas are the largest in the range. The larger of the two areas is approximately 11,500 square miles, adjacent to another area of approximately 8,400 square miles. The TBNG falls within these two areas.

Vegetation Composition and Structure

The TBNG is comprised of grasslands, shrublands and forested areas. Vegetation composition is described in terms of seral stage and structure. These classifications are based on the major species found in the vegetation type. The composition of a plant community changes over time due to the interactions of many factors, such as grazing, fire, and weather. Differences in seral stage may imply a difference in primary productivity. Primary productivity is an expression of the ecological efficiency of a site to convert sunlight to plant material. Because primary productivity is difficult to predict and model, vegetation composition is used as a key indicator. Structure, with regard to vegetation species composition, is closely related to vegetation seral states.

The grassland is in a broad transition area between the plains of the central United States and range physiographic provinces to the west. It occupies a north-south transition area between the southern and middle Rocky Mountains. Because of its location, the TBNG contains plants characteristic of a variety of regions, such as hawthorn, big bluestem, little bluestem, creeping juniper, buffalo grass, blue grama and prickly pear cactus. The area also has extensive areas of sagebrush communities, greasewood and Western wheatgrass. Foothill and lower-elevation mountain species also occur, such as ponderosa pine, Rocky Mountain juniper, Oregon grape and boxelder.

Sagebrush communities have a mean canopy cover of big sagebrush that can range as high as 55%. Western wheatgrass, blue grama, threadleaf sedge, prairie junegrass and needle-and-thread are some of the main understory species. Prairie sandreed is a component of the understory on more sandy sites.

Vegetation communities dominated by other shrub species include upland areas and drainages dominated by silver sagebrush, spiny saltbush, sand sagebrush, fringed sagewort, greasewood, rabbitbrush, willow, or other shrubs. Wooded draws and upland thickets dominated by snowberry, buffaloberry, chokecherry, American plum, or other shrubs.

Grassland vegetation includes Western wheatgrass, needle-and-thread, blue grama, buffalo grass, prairie junegrass, green needle grass and prickly pear cactus.

Ponderosa pine stands also exist on the TBNG. No field studies or inventories have been completed on these stands. Species consist of Ponderosa Pine and juniper species with a mixed herbaceous understory.

Vegetative structure is a characteristic used to analyze habitat quality for wildlife species. It is decided as the height and density of vegetation including residual stubble left following ungulate grazing within a management unit (pasture). A mosaic of acreage in various degrees of vegetation structure (high, moderate, low) is needed to provide a variety of habitat needs for all grassland wildlife species.

Variation in vegetation structure objectives across the grassland is designed to provide the mix of plant communities for associated wildlife. High structure in the sagebrush communities can have tall and dense sagebrush, or lesser canopy cover of sagebrush with a diverse, dense herbaceous understory. Residual cover is important, and its value increases during drought years when current year herbaceous cover is reduced. Vegetation communities providing high structure are usually in late to late intermediate seral stages on highly productive soils with a desired species composition.

Since a large portion of the grassland is primarily a shrubland, multiple structural components exist on the landscape with the presence of predominantly Wyoming big sagebrush and various mixed grass prairie plant species. Wyoming big sagebrush is abundant within the analysis area, and is a key structural component, especially in areas where sage-grouse nesting sites are located. Based on District surveys, nesting occurs within these sagebrush habitat types, and the height and density of grasses and forbs, as well as residual matter in the understory of sagebrush stands, are important factors influencing structure.

At the opposite end of the spectrum is low structure. Low structure grassland is primarily what its name implies; a grassland. Typically, very few shrubs are present on areas classified in low structure, with dominant species being blue grama, western wheatgrass, and scarlet globemallow. Prairie dog colonization and/or heavy livestock utilization can create low structure grassland from a mixed grass prairie. Therefore, low structure is usually associated with early to early intermediate seral stages.

Rare Plant Communities

Rare plant communities known or suspected to occur on the Grassland occupy sites within Big Sagebrush/Wheatgrass vegetation type or within riparian areas. The following lists are comprised of the communties that are known to occur, suspected to occur and not suspected to occur.

Known to occur:

- Eastern Cottonwood/Western snowberry
- Birdfoot Sagebrush/Western Wheatgrass Dwarf-shrubland
- Gardners Saltbush/Western Wheatgrass Shrub Herbaceous Vegetation
- Prairie Cordgrass/Western Wheatgrass
- Silver Sagebrush/Western Wheatgrass Shrub Herbaceous Vegetation
- Black Greasewood/Alkali Sacaton Sparse Vegetation
- Western Wheatgrass/Green Needlegrass Herbaceous Vegetation
- Rocky Mtn. Juniper/Big Sagebrush Woodland
- Three-square Bulrush Herbaceous Vegetation and Prairie Cordgrass/Three-square Bulrush Herbaceous Vegetation
- Western Wheatgrass Herbaceous Vegetation

Suspected to occur:

- Western Wheatgrass – Spikerush Herbaceous Vegetation
- Silver Sagebrush/Needle-and-thread Shrub Herbaceous Vegetation
- Silver Sagebrush/Prairie Sandreed Shrub Herbaceous Vegetation
- Prairie Sandreed/Needle-and-thread Herbaceous Vegetation
- Greasewood/Bluebunch Wheatgrass Shrubland
- Eastern Cottonwood/Western Wheatgrass Woodland
- Ponderosa Pine/Sun Sedge Woodland
- Ponderosa Pine/Western Wheatgrass Woodland
- Ponderosa Pine/Little Bluestem Woodland
- Little Bluestem/Sideoats Grama, Blue Grama/Thread-leaf Sedge Herb Vegetation

Species of Special Concern

There are several species of special concern that exist for the Grassland. These species will be covered in the Threatened, Endangered and Sensitive species section of this report.

Current Management Practices

Monitoring Protocols/Data Collected (for vegetative structure)

Rangeland analysis efforts have been conducted across the entire Grassland over the last eight years (Spring Creek unit in 2004, Thunder Basin area in 2005-2006, and Inyan Kara area in 2007). Cover-Frequency transects were read on most allotments, with resultant photopoints and Robel pole readings taken at established transect intervals to measure vegetation height. Visual inspections of nearly all pastures were made to verify and extrapolate transect results. Parker 3-Step permanent transects were re-read in many locations as well. Table 3-104 shows the percent of desired condition of vegetation structure for TBNG.

Table 3-104. Percent of Rangeland Vegetation Structure (as of 2008) for the Thunder Basin National Grassland

Vegetation Structure	High	Moderate	Low
Grassland Plan Desired Condition (percent)	29-39%	38-48%	18-28%
Existing Condition as of 2008			
Acres	152,160	288,730	95,220
Percent	28%	54%	18%

Monitoring Protocols/Data Collected (for current vegetative species composition and seral stage)
Rangeland analysis efforts have been conducted across the entire Grassland over the last eight years (Spring Creek unit in 2004, Thunder Basin area in 2005-2006, and Inyan Kara area in 2007). Parker 3-Step permanent condition and trend transects were re-read in many locations. Cover-Frequency transects were installed on most allotments, with readings recorded for all perennial grasses, forbs, and shrubs, as well as tree species. Visual inspections of nearly all pastures were made to verify and extrapolate transect results.

Results were evaluated using the following Ecological Classification Types developed by rangeland research scientist Dr. Daniel Uresk of the Forestry Sciences Laboratory at Rapid City, South Dakota:

- Wyoming big sagebrush – western wheatgrass – blue grama
- Greasewood – western wheatgrass
- Needle-and-thread – western wheatgrass – blue grama
- Plains cottonwood (annual species, including annual bromes, were not used in computations; however, greater presence of those species usually decreases the numbers of perennial plants, thereby generally lowering the vegetation composition stage.)

Generally, big sagebrush is dominant in the late seral stage, western wheatgrass in Late Intermediate, and blue grama in Early Intermediate. Early stages are often associated with pioneer plant communities that follow behind disturbance processes, and generally display higher percentages of annual forbs, annual grasses, and base soil. Table 3-105 shows the percentage of desired condition of seral stages on the TBNG.

Table 3-105. Percent of Rangeland Vegetation Seral Stages (as of 2008) for the Thunder Basin National Grassland

	Seral Stages			
	Late	Late Intermediate	Early Intermediate	Early
Grassland Plan Desired Condition (percent)	12 – 22%	28 – 38%	28 – 38%	14 – 24%
Existing Condition as of 2008				
Acres	63,270	206,270	153,920	108,880
Percent	12%	39%	29%	20%

The most recent structure and composition data (2006-2009) was broken out by priority sage-grouse habitat and by general sage-grouse habitat. The results are in Table 3-106.

Table 3-106. Percent Structure and Composition by Sage-grouse Habitat Type for the Thunder Basin National Grassland

	Seral Stages			
	Late	Late Intermediate	Early Intermediate	Early
Priority Habitat	7%	56%	19%	18%
General Habitat	20%	32%	28%	20%
	Structure			
	High	Medium	Low	
Priority Habitat	20%	65%	16%	-
General Habitat	30%	47%	21%	-

Invasive Species

The Thunder Basin National Grassland had an estimated inventory of noxious weed species and infestation levels completed at that time. About 160 acres of noxious weeds were treated on the Grassland between 1994 and 1996; species and acres treated are listed in the table below. The Grassland also contains over 10,000 acres of crested wheatgrass. Table 3-107 shows the acres treated for noxious weeds on the Grassland from 1994 to 1996.

Table 3-107. Noxious Weeds and Acres Treated on Thunder Basin National Grassland (1994-1996).

Species	Acres Treated
Leafy spurge	70
Spotted knapweed	5
Canada thistle	80
Musk thistle	4

Cheatgrass

Overview

Cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*) are the two most aggressive non-native invasive species found on the TBNG. These species are prolific seed producers and can out-compete native species for valuable resources such as water and nutrients. These grasses germinate in the fall and early spring and are adapted to thrive in low moisture conditions. They are native to Mediterranean climates, and evolved in cold, semi-arid environments. Throughout the west, the number and size of infestations have increased in size and density over the last 20 years.

Bunting et al., (1987), Miller and Eddleman, (2000) and Schlatterer (1972) suggest that Wyoming big sagebrush communities are one of the most susceptible to cheatgrass invasion. Wyoming big sagebrush communities also tend to be most susceptible to fire compared to the other big sagebrush subspecies (Tisdale 1994). Historic fire seasons in sagebrush communities on the Grassland usually occur between July and September, with the most extreme fire conditions being in August (Bunting et al. 1994). Historic fire regimes are variable in big sagebrush/bunchgrass ecosystems, with fire return intervals as long as 70 years. With cheatgrass expansion, plant communities have changed in large areas. This composition change has an effect on fire return frequency. Whisenant (1990) suggested that cheatgrass introduction to the big sagebrush ecosystem has increased fire frequency about 12 to 22 times.

Cheatgrass on the Grassland is usually matured and cured by early to mid-June, while most native herbaceous species cure in late July and early August. In areas where cheatgrass has replaced native species, earlier and more frequent fire can occur, causing further damage to native plant species. With an increased fire frequency, conversion to annual grasslands is likely and an increase in other invasive species such as Russian-thistle, and tumble mustard can replace native plants in previously sagebrush dominated ecosystems.

Current Management

From 1999 to 2008, an especially severe drought heavily impacted these already rather dry habitats, affording a greater opportunity for weeds to invade. One of the most notable effects of the drought was the establishment and spread of dense cheatgrass stands in locations where it had not been seen before or where only scattered plants had previously been observed.

Ranchers in the grasslands (members of the Thunder Basin Grassland Prairie Ecosystem Association) who hold grazing permits have sprayed 26,730 acres of cheatgrass since 2006 – much of it within established allotments – to encourage native plant competitiveness and thereby improve sage-grouse habitat.

They have been forced to confine their efforts to the private lands – even in the allotments – because the Forest Service does not yet have approval to aerial apply target herbicides to control cheatgrass. The agency is in the process of completing an EIS to be able to do so, and the effort is scheduled for completion in 2013, which will allow the Thunder Basin to significantly increase its efforts to improve sage-grouse habitat where this invasive species is replacing native vegetation.

Funding for noxious weed treatment, as well as assigned target acres, was again greatly reduced in 2011, this time largely as a result of vegetation funding being diverted for Regional priority funding for the bark beetle efforts. As a result, only 110 acres of noxious weeds were treated on the Grassland – only a third of the average amount over the past several years. Primary species treated were the same as in the past: leafy spurge, diffuse knapweed, saltcedar, cheatgrass, and Canada thistle. The district is focusing much of its efforts on inventorying for the presence of saltcedar (tamarisk) because it is still possible to eradicate this species from the Grassland. Saltcedar is not classified as a noxious weed by the state of Wyoming (although it is by most western states). However, this non-native invasive tree species is a serious threat to riparian ecosystems. All five counties, all three Grazing Associations, and the Thunder Basin Prairie Ecosystem Association are cooperating parties with the Forest Service in controlling noxious weed and invasive plant infestations. Table 3-108 shows the acres treated for noxious weeds on the Grassland from 2008 to 2011.

Table 3-108. Noxious Weed Treatment (acres)

2008	2009	2010	2011
300	530	180	110

Management Issues and Concerns

Most evidence points to the fact that cheatgrass populations on the Thunder Basin will increase in dry years and decrease in wet years, especially when residual stands of the native vegetation, although reduced, are interspersed throughout. It is imperative that the Medicine Bow/Routt National Forests and Thunder Basin National Grasslands complete their EIS efforts for Invasive Plant Control as soon as possible in order to work cooperatively with the intermingled private landowners to improve existing sage-grouse habitat by controlling cheatgrass in native vegetation stands. The Thunder Basin Grassland Prairie Ecosystem

Association continues to monitor their recent efforts to determine how rapidly sage-grouse begin using the sprayed areas.

3.17 VISUAL RESOURCES

3.17.1 Bureau of Land Management

General Planning Area Description

Visual resources within the planning area are influenced by a wide variety of topographical, geological, hydrological, vegetative, and other characteristics within the region. Landforms range from relatively flat land, to low mountains, low rolling or flat-topped hills, and isolated hills; to higher elevations containing mountain shrub vegetation and alpine forest atop the highest areas. Elevation and precipitation vary widely within the planning area and help determine the dominant vegetation. With the widely diverse vegetation patterns that result from varying topographic, soils, and precipitation characteristics come changes in color, form, line, and texture. Much of the planning area contains natural settings with limited development, open spaces with panoramic vistas, and scenic views. In the non-mountainous, lower elevations of the area, summer views are characterized by scrubby low-growing gray-green vegetation, distant mountains, and an intense blue sky. In contrast, winter views are monochromatic gray, with clear skies and an apparently lifeless gray-to-brown foreground backed by distant snow-capped mountain peaks. Different combinations of plant communities create subtle changes in mosaics of textures and colors. More extensive views that encompass several viewsheds are available from high points. The horizon is a significant aspect of all distant views.

The VRM system provides a way to identify and evaluate scenic values to determine the appropriate levels of management. It also provides a way to analyze potential impacts to visual resources and apply visual design techniques to ensure that surface-disturbing activities harmonize with their surroundings. The BLM VRM system consists of two stages: (1) Visual Resource Inventory (VRI) and the designation of VRM Classes during the resource management planning process; and (2) implementation of RMP decisions and analysis through the Visual Resource Contrast Rating (VCR). The inventory stage identifies the visual resources of an area and assigns them to inventory classes. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points (BLM 1986b). The results of the VRI and visual sensitivity are considered throughout the RMP process, and the areas' visual resources are assigned to management classes with established objectives. VRM involves applying methods for evaluating landscapes and determining appropriate techniques and strategies for maintaining visual quality and reducing adverse impacts. A summary of the BLM VRM program follows:

- Lands have different visual values that warrant different management.
- The VRM inventory is used to systematically identify and evaluate visual resources based on scenic quality, visual sensitivity, and distance zones. The evaluation produces a numerical index value.
- Inventoried visual resource values are considered during the RMP process along with allocated resources in order to establish VRM management classes. These classes have established objectives that dictate how the visual resources would be managed under the various alternatives.
- Visual values are considered along with all other resource values during the RMP process when determining VRM objectives. Management decisions reflect the multi-disciplinary analysis.
- VRM objectives established through the RMP process provide the tools for the design and construction of all surface-disturbing activities.

Proposed projects are analyzed using the Contrast Rating Process to determine if management objectives would be met and to identify mitigation measures to minimize visual impacts. The BLM Contrast Rating procedure is used to determine visual contrast that may result from the construction and operation of the project based on photo simulations depicting project features. In addition to using photo simulations, field staff visit the proposed location of the project and choose key observation points from where the project will most likely be viewed. Using the contrast rating form, the KOPs are analyzed for visual impacts and level of contrast with the existing scenery. At each key observation point, existing landforms, vegetation, and structures are described using the basic components of form, line, color, and texture. Project features are evaluated using simulations, and described using the same basic elements of form, line, color, and texture. The level of perceived contrast between the proposed project and the existing landscape is classified using the following definitions:

- None: The element contrast is not visible or perceived.
- Weak: The element contrast can be seen but does not attract attention.
- Moderate: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- Strong: The element contrast demands attention, would not be overlooked, and is dominant in the landscape.

This method assumes that the extent to which the project results in adverse effects to visual resources is a function of the visual contrast between the project and the existing landscape character. Impact determinations are based on the identified level of contrast, and are not a measure of the overall attractiveness of the project (BLM 1986b). The Management Alternatives in Table 2-1 of this plan will not change the VRM classifications outlined in table 3-103.

The level of contrast is assessed for all project components used during construction, operation and maintenance, and decommissioning of a proposed project. The level of visual contrast expected to result from construction or decommissioning related activities is estimated based on knowledge of anticipated activities and equipment that could be present.

VRM in the planning area focuses on values and resources in broad areas with vast vistas of native landscapes and unique areas of spectacular quality. Such visual resource values are defined through the implementation of the BLM's VRM methodology, beginning with a classification system comprising three phases: 1) inventory (as outlined in BLM Handbook 8410-1, *Visual Resource Inventory and Evaluation*); 2) establishment of management classes through land use plans; and 3) analysis of management actions to ensure compliance (as outlined in BLM Handbook 8431-1, *Visual Contrast* Rating). These classifications are based on scenic quality, visual sensitivity levels, and viewer distance zones. Visual Resource Inventory (VRI) is considered, along with BLM's allocated resources, in the assignment of VRM Classes I through IV, which prescribe VRM objectives. VRM Class boundaries vary in each alternative to reflect potential management actions in consideration of the visual values defined in the inventory and other resource decisions. Each VRM class has a management objective, as described below:

- Class I. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activities. The level of change to the characteristic landscape should be very low and should not attract attention. Examples of Class I areas would be WSAs and some ACECs.
- Class II. The objective of this class is to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Examples would be some ACECs and SRMAs that are more focused on recreation in a more natural setting.

- Class III. The objective of this class is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate. Management activities may attract the attention of the casual observer but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. An example of this is can be the foreground/middle ground of NHT where integrity of setting is lacking.
- Class IV. The objective of this class is to provide for management activities that require major modifications to the existing character of the landscape. The level of change to the landscape can be high. The management activities may dominate the view and may be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, disturbance minimization, and repetition of the basic visual elements of form, line, color, and texture (BLM 1986b).
- Areas that have no VRM designations. These are areas that may or may not have been inventoried but no designation was given.

Current VRM classes for portions of the planning area were established, the acreages in each VRM class are identified in Table 3-109, and the spatial distributions of these acreages are shown on Map 3-22—Visual Resource Management Classifications. VRM classes I through IV range from completely natural landscapes to landscapes containing extensive human modification, respectively. Boundaries and corresponding acreages are subject to change as more inventories and evaluations are conducted. Heavily impacted areas are normally populated with highly visible large-scale facilities or exhibit obvious surface disturbances. High-profile visual intrusions involve concentrated development, such as buildings, industrial facilities, infrastructure associated with oil and gas fields, quarries, and ROWs involving surface disturbance activities. Low-profile visual intrusions include range improvements, fences, and two-track routes, and are found throughout the planning area. Individually, these intrusions provide minimal disturbance to visual resources; however, the cumulative impact of these intrusions, over time, can disrupt the overall character of the landscape and adversely impact visitor experience. According to the established VRM classes, BLM-administered surface lands include 319,050 acres of Class I land, 4,370,960 acres of Class II land, 17,965,230 acres of Class III land, and 11,080,120 acres of Class IV land.

Table 3-109. Planning Area Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Planning Area		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	319,050
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	4,370,960
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	17,965,230
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	11,080,120
Total		**33,735,360**

The condition of visual resources in the planning area varies greatly depending on location, the amount of activity, and the overall character of the landscape. Some areas have been impacted by large-scale development, grazing management, and recreational activities, while other portions have remained relatively undeveloped. There is an increasing demand for renewable and non-renewable energy development in sensitive visual resource areas. Increased development on surrounding private lands that compromises visual resources has made protecting intact resources more important. Utilities are also having an increasing visual impact in the planning area and even buried ROW (e.g. fiber-optic lines and pipelines) leave visual effects prior to reclamation from linear changes in the visual patterns.

Casper Field Office

The condition of visual resources in the field office varies greatly depending on location, the amount of activity, and the overall character of the landscape. Heavily impacted areas normally are populated with highly visible large-scale facilities or exhibit obvious surface disturbance. High-profile visual intrusions involve concentrated development, such as buildings, industrial facilities, infrastructures associated with oil and gas fields, quarries, and ROWs involving surface disturbance. Surface-disturbing activities associated with these areas are readily noticed due to the amount of contrast with the representative landscapes. Portions of the NHTs and other historic trails lie within designated ROW corridors. Low-profile visual intrusions, which include range improvements, fences, and two-track roads, are located throughout the field office. Individually, these intrusions provide minimal disturbance to visual resources. Table 3-110 displays the VRM classes and acres for the Casper Field Office.

Table 3-110. Casper Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Casper Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	0
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	1,385,260
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	2,173,320
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	5,005,520
Total		**8,564,100**

Kemmerer Field Office

The condition of visual resources in the field office varies greatly depending on location, the amount of activity, and the overall character of the landscape. Some areas have been impacted by large-scale development, grazing management, and recreational activities, while other portions have remained relatively undeveloped. Results of this evaluation identified that large, undeveloped portions of the field office were generally identified as having a scenic quality rating of A or B for the sensitive viewing areas including recreational roads/facilities, NHTs, and cultural sites. Table 3-111 displays the VRM classes and acres for the Kemmerer Field Office.

Table 3-111. Kemmerer Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Kemmerer Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	32,810
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	392,720
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	347,210
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	654,730
Total		**1,427,470**

Newcastle Field Office

Table 3-112 displays the VRM classes and acres for the Newcastle Field Office.

Table 3-112. Newcastle Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Newcastle Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	0
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	30,120
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	5,054,090
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	170
Total		**5,084,380**

Pinedale Field Office

Within the field office, the diversity of topography and landforms exhibited by these two distinctly different topographic zones creates an extraordinary variety of visual contrasts and scenic beauty. The field office contains a major river system and watershed, the Upper Green River, and borders the slopes of several major mountain ranges: Gros Ventre Range to the north, Wind River Range to the east, and Wyoming Range to the west. The New Fork River is a major tributary of the Green River and flows south along the foothills of the Wind River Range.

Numerous areas within the field office exhibiting high degrees of scenic quality are easily accessible to tourists and other recreationists. Some examples of high-quality scenic views and viewsheds within the area are as follows:

- The Green River and valley is highly scenic. River floaters can enjoy a variety of scenic landforms, vegetation, and wildlife.
- In the vicinity of the town of Pinedale, adjacent to the Wind River Front, is an area that includes very scenic foothill country adjoining the BTNF. It includes the lands adjacent to Fremont, Soda, Willow, and New Fork lakes.
- Scab Creek, an area of extraordinary scenic views, contains some of the best scenery of BLM-administered lands in Wyoming. This area is typified by steep, rugged rock outcrops, aspen, lodgepole pine, and Douglas fir stands interspersed with grassy meadows, small lakes, and streams.
- The Mesa, an extensive, flat-topped highland south of Pinedale, provides excellent views of all the mountain ranges in the area.
- The stretch of road along Highway 352 in the vicinity of the town of Cora encompasses the majority of the land between the town of Pinedale and the Warren Bridge Campground. The upper New Fork flows adjacent to this highway and provides excellent views of the Wind River and Gros Ventre Ranges to the northeast.
- A section of the LaBarge Creek Road passes between Lake Mountain and Miller Mountain, providing one of the most scenic drives through the Wyoming Range. The area consists of steep canyons, scenic rock outcrops along narrow canyon bottoms, and clear streams lined with aspens and willows. The landscape view leading to the mountain foothills is high, rolling plains interspersed with colorful mesas and buttes.

Blue Rim and Ross Butte provide a high desert landscape that is bounded on the north and west by the New Fork and Green rivers. Dramatic views of a colorful and massive badland escarpment are most evident to river floaters and to travelers along Highway 351 and Highway 189. Table 3-113 displays the VRM classes and acres for the Pinedale Field Office.

Table 3-113. Pinedale Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Pinedale Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	21,290
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	239,520
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	419,410
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	242,660
Total		**922,880**

Rawlins Field Office

Much of the field office contains natural settings with limited development, open spaces with panoramic vistas, and scenic views. In the non-mountainous, lower elevations of the area, summer views are characterized by scrubby low-growing gray-green vegetation, distant mountains, and an intense blue sky. In contrast, winter views are monochromatic gray, with clear skies and an apparently lifeless gray-to-brown foreground backed by distant snow-capped mountain peaks. Different combinations of plant communities create subtle changes in mosaics of textures and colors. More extensive views that encompass several viewsheds are available from high points. The horizon is a significant aspect of all distant views.

Several areas within the field office that exhibit high scenic quality are easily accessible for tourists and other recreationists. The highest quality scenic views in the field office are the WSAs, particularly the Ferris Mountains and Adobe Town WSAs because of their unique geological formations. Both of these areas are quite rugged and untrammeled by humans (Clair 2002b). A number of areas within the field office are ranked as Visual Resource Inventory Class II which indicates that these areas are the most valued viewsheds in the Rawlins Field Office. Many of these scenic areas are easily accessible for tourists and other recreationists including the following: 1) all WSAs, 2) Pedro Mountains, 3) Seminoe Mountains/Seminoe Reservoir, 4) Shirley Mountains, and 5) most areas adjacent to National Forest boundaries. Table 3-114 displays the VRM classes and acres for the Rawlins Field Office.

Table 3-114. Rawlins Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Rawlins Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	67,640
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	1,116,680
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	9,245,330
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	849,670
Total		**11,279,320**

Rock Springs Field Office

The field office lies mostly within the Wyoming Basin physiographic province: however, the Wind River Mountains are within the central Rocky Mountain province. The Wyoming Basin is located in the west-central portion of the state. It is bounded on the north by the Wind River Range and on the south by the Uinta Mountain Range. The province extends east into the Red Desert and west to the foothills of the Wyoming Range. The field office includes a portion of the Red Desert.

The landscape found in the Wyoming Basin Province is characterized primarily by highly erodible soils and multi-colored, horizontally layered sedimentary bedrock. These conditions have generated the formation of the colorful badlands landscape common throughout most of the province. Between these badland areas, the land form is primarily low rolling or flat-topped hills. Dramatic elevation changes and steeper slopes become more dominant near the Wyoming and Wind River Mountain ranges.

The general lack of precipitation and localized occurrence of surface water resources provide for three major vegetative communities. Riparian zones are commonly found along all the perennial streams and rivers, as well as along several of the areas having intermittent surface water. The remainder of the vegetation is sparse and tends to be located on the well-drained soils of side slopes and hillsides in the province. Alkaline conditions occur in localized areas where evaporation rates exceed the volume of infiltrating surface water. Surface water in the Wyoming Basin Province is primarily restricted to the Green River and its tributaries. Other major surface water resources include Fontenelle, Flaming Gorge, and Big Sandy Reservoirs.

Cultural modifications within this physiographic province are primarily a function of activities associated with petroleum production. Oil and gas facilities, pipelines, roads, power distribution lines, etc., are all very common in the producing areas (western half) of the province. Ranching and other rural or small community developments, as well as cities and towns, compose the remainder of the cultural modifications of the province. Areas with important scenic and visual values include the Greater Sand Dunes ACEC, recreation sites, Wilderness Study Areas, South Pass Historic Area and the scenic vistas along Highway 28, White Mountain Petroglyphs, rivers, the Wind River Mountains, Red Creek, Currant Creek, Little Mountain, Pine Mountain, Steamboat Mountain, major reservoirs, historic trails, Continental Divide snowmobile and hiking trails.

The present VRM classes encompassing the area include Class II, III, and IV. Rock and cliff formations around Steamboat provide diversity in form, structure, texture, and hue. Aspen groves and conifer stands contrast and enhance the visual aspect. Depth is provided by Steamboat Mountain numerous deep canyons and the talus slopes of Steamboat Rim. Diversity is provided through a variety of vegetation communities, springs, seeps, meadows, and both intermittent and ephemeral streams. Table 3-115 shows the VRM classes and acreage within the field office.

Table 3-115. Rock Springs Field Office Visual Resource Management Acreages

VRM Management Class	Class Objective	Acreage
Rock Springs Field Office		
Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape must be very low and must not alter or attract attention.	230,100
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape must be low.	873,290
Class III	To partially retain the character of the landscape. The level of change to the characteristic landscape must be moderate.	1,068,690
Class IV	To provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.	3,184,360
Total		**5,356,440**

3.17.2 Forest Service

General Planning Area Description

Visual resources within the planning area are influenced by a wide variety of topographic, geologic, hydrological, vegetative, and other characteristics of the region. Landforms range from relatively flat land to low mountains, low rolling or flat-topped hills, and isolated hills to higher elevations containing mountain shrub vegetation and alpine forest atop the highest areas. Elevation and precipitation vary widely within the planning area and determine the dominant vegetation. The widely diverse vegetation patterns that result from varying topographic soils and precipitation characteristics create changes in color, form, line, and contrast.

On the MBNF and TBNG, the Forest Service utilizes the Scenery Management System (SMS) to provide an overall framework for the orderly inventory, analysis, and management of scenery (Forest Service 1995) (Map 3-23). The SMS applies to all National Forests and National Grasslands administered by the Forest Service and to all Forest Service activities including, but not limited to, timber harvesting; road building; stream, range and wildlife improvements; special use developments; utility line construction; recreation developments; and fire/fuels management.

Four Scenic Integrity Objectives (SIOs) provide forest plan objectives to achieve the desired scenic condition and landscape character of the Forest. The SIOs are described below:

- **Very High SIO** refers to landscapes where the valued landscape character is intact, with only minute deviations, if any.
- **High SIO** provides the landscape character to appear intact. Deviations may be present but must repeat the form, line, color, texture and pattern common to the landscape character, so completely and at such scale, that they are not evident.
- **Moderate SIO** allows the valued landscape character to appear slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- **Low SIO** provides the valued landscape character to appear moderately altered. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed.

SIOs are considered forest plan guidelines. Guidelines are advisable courses of action that should be followed to achieve forest goals, but are optional. Deviation from guidelines must be analyzed during project level analysis and documented in a project decision but do not require a forest/grassland plan amendment. A grace period of one year is provided to meet the Scenic Integrity Objectives of High and Moderate and three years to meet Low SIO after the completion of a project.

On the BTNF, scenery is managed through Visual Quality Objectives (VQO) (Map 3-23). VQOs are defined as desired levels of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. The VQOs that apply to the project area are Retention, Partial Retention, and Modification. The following defines the VQOs of Retention, Partial Retention, Modification, and Maximum Modification. Guidelines for meeting VQOs are described in Forest Service Handbook 462, National Forest Landscape Management, Volume 2 (Forest Service 1974).

Retention: Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape, and should not be evident to casual forest visitors.

Partial Retention: Activities may repeat form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but remain visually subordinate to the visual strength of the characteristic landscape.

Modification: Activities of vegetative and landform alteration must borrow from naturally established line, form, color, and texture so that their visual characteristics are those of natural occurrences within the surrounding area when viewed as middle ground or background. Activities may visually dominate the original characteristic landscape.

Maximum Modification: Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type.

Distance Zones:

- Foreground is the landscape found within 0 to 0.5 mile from the viewer.
- Middle ground is the landscape located 0.5 mile to four miles from the viewer.
- Background is the landscape located four miles + from the viewer.

Bridger-Teton National Forest

The BTNF is a large part of the Greater Yellowstone region, containing some of the most pristine and scenic landscapes. People come from around the world to see the scenery and wildlife of the Greater Yellowstone area. The contribution of the BTNF's scenery resources to this area's desirability as a world-wide destination cannot be over-estimated.

The landscape character for the project area is surrounded by high, steep, rugged mountain peaks and precipitous ridges sometimes associated with gentle sloping sagebrush grassy mountains, leading to broad lush valleys. Several sections represent the montane and alpine zones of the central Rocky Mountains and the Greater Yellowstone Ecosystem. Scenic views include outstanding cliffs, crags, rock outcrops, talus slopes, and avalanche chutes that are rich in variety of form, line, color, and texture. Project elevations range from 6,200 feet to 11,682 feet. Vegetation patterns of coniferous forest, deciduous aspen forest, and grass/brush communities all add dramatic visual contrast to the mountainous setting. While small meandering streams in the broad valleys serve as dominant visual features.

Vegetation patterns in the project area are primarily contiguous with a strong interplay of texture and color created by the mosaic of conifer timber, aspen, sagebrush, and grass. Grassy openings and open grown stands of trees create the dominant visual patterns on east facing slopes and along the mountain ridgelines. The primary tree and brush species are spruce/subalpine fir mix, lodgepole pine, Douglas-fir, and aspen, and mountain big sagebrush.

Desired landscape character is maintained or enhanced using the Visual Management System. Activities to further increase visual quality, which is already at or near desired conditions, include increasing the variety, integrity, and stability of the valued attributes defined in the Visual Management System.

Managing for scenic quality benefits the local and regional economy; it creates tourism because of the natural human response to beautiful scenery. The most important draw is the renewal that humans receive from being in a natural setting. The Greater Yellowstone area is a major recreation destination, attracting visitors from Wyoming, Idaho, and Montana residents to travelers from across the United States and parts of the world. It is important to manage the scenic resources to ensure a quality sightseeing experience for the public. Scenery is an integral component of all forest settings and contributes to the quality of the users' experience. Providing a natural appearing landscape for these visitors is important. In the National Visitor Use Monitoring Project, scenery was identified as the number one reason that visitors come to the BTNF. Table 3-116 shows the VQOs for the BTNF established in the forest plan.

Table 3-116. Visual Quality Objectives for the Bridger-Teton National Forest

Visual Quality Objectives	Acres
Preservation	847,810
Retention	264,300
Partial Retention	426,600

Visual Quality Objectives	Acres
Modification	181,750
Maximum Modification	3,590
Total	**1,724,050**

Management of multiple resources has altered the natural landscape character into the existing condition of the landscape. The most obvious effects on scenic resources are from vegetation and landform alterations. Multiple resource management actions that have altered scenic resources include, but are not limited to, timber management, oil and gas extraction, roads and trails, campgrounds and picnic grounds, fire management (suppression and prescribed burning), and livestock grazing.

Medicine Bow National Forest

The MBNF includes four units in three distinct mountain ranges. The Medicine Bow portion of the Central Rockies includes the northern extension of the Colorado Front Range, which divides to include the Laramie Range on the east (the southern extension is known as Sherman Mountains) and the Medicine Bow Mountains on the west. The Sierra Madre Mountains, which are the northern part of the Parks Range, occupy the westernmost portion of the Forest. The Continental Divide bisects the Sierra Madre Range. The major river drainages flow from the Continental Divide: the Green River Basin flows west into the Colorado River system, and the western Dakota sub-Basin and Platte River Basin flow east. All of the MBNF is mountainous with elevations range from 5,050 feet above sea level in the Laramie Range to 12,013 feet above sea level at Medicine Bow Peak in the Snowy Range of the Medicine Bow Mountains. Approximately 80% of the MBNF is forested. Lodgepole pine forests are the predominant vegetation type on the Forest. Other vegetation types include spruce-fir, aspen, and Ponderosa pine.

Timber harvest and livestock grazing activities have been part of the landscape character on the Forest before the turn of the century and other activities such as developed and dispersed recreation, road and trail development, water improvements and utility line development also are included in the visual landscape of MBNF.

There are numerous federal laws requiring all federal land management agencies to consider scenery and aesthetic resources in project planning. The revised 2003 MBNF Plan provides guidance for all resources management activities on National Forest System lands. The forest plan includes standards and guidelines for the scenic resources in the forest-wide direction and management area prescriptions. Table 3-117 gives the acres of each SIO within MBNF.

Table 3-117. Scenic Integrity Objective for the Medicine Bow National Forest

Scenic Integrity Objective	Acres
Low	218,030
Moderate	371,200
High	388,720
Very High	106,920
Total	**1,084,870**

Providing scenic quality and a range of recreation opportunities, which responds to the needs of National Forest customers and local communities, is one of the several regional goals as stated in the forest-wide direction. The desired condition of scenic resources for the MBNF is to provide scenic quality and maintain the overall landscape character. There would be some changes made through timber harvest and other vegetation treatments such as prescribed fire. Additional changes from natural events such as insects, disease, and fires would be evident on the landscape.

Thunder Basin National Grassland

The TBNG is located in northeast Wyoming and includes public land intermingled with other ownerships dispersed among plateaus and rolling foothills. Primary vegetation on the grassland includes grass and sagebrush communities. The TBNG landscape is rather unique as it is characterized primarily by remote and undeveloped lands, along with some developed lands employing multiple uses. Coal, gas, and oil developments and associated roads, utility corridors, and livestock grazing improvements are evident throughout the grassland landscape.

There are numerous federal laws requiring all federal land management agencies to consider scenery and aesthetic resources in project planning. The Revised 2001 TBNG Plan provides guidance for all resources management activities on National Forest System lands. The grassland plan includes standards and guidelines for the scenic resources in the grassland-wide direction and management area prescriptions.

Providing scenic quality and a range of recreation opportunities, which responds to the needs of National Forest and National Grassland visitors and local communities, is one of the several regional goals as stated in the grassland-wide direction.

The Revised TBNG Plan utilizes the SMS which provides an overall framework for the orderly inventory, analysis, and management of scenery. It applies to all activities including, but not limited to, timber harvesting, road building, stream, range and wildlife improvements, special use developments, utility line construction, recreation developments, and fuels management. Table 3-118 gives the acreages managed for the various SIOs within TBNG.

Table 3-118. Scenic Integrity Objectives for the Thunder Basin National Grassland

Scenic Integrity Objective	Acres
Low	1,597,350
Moderate	183,000
High	38,750
Total	**1,819,100**

Providing scenic quality and a range of recreation opportunities, which responds to the needs of national grassland customers and local communities, is one of the several regional goals as stated in the grassland-wide direction. The desired condition of scenic resources for the TBNG is to provide scenic quality and maintain the overall landscape character. There would be some changes made through vegetation treatments such as prescribed fire. Additional changes from natural fire events would also be evident on the landscape.

3.18 WATERSHED AND WATER QUALITY

3.18.1 Bureau of Land Management

General Planning Area Description

Water resources include surface and subsurface sources. This section focuses on watershed characteristics, the presence of surface and ground water sources within the planning area, and the overall quality of those water sources. Hydrological conditions affect riparian, wildlife, and fishery resources, and cause economic consequences to manmade structures and the water supply. Major watershed boundaries and surface water features are shown on Map 3-24—Watersheds and Surface Water Features.

Water bodies in Wyoming are classified for water quality regulation according to beneficial uses by the Wyoming DEQ (WDEQ 2001a). Class 1 waters are defined as "outstanding waters" and are those surface waters in which no further water quality degradation by point source discharges, other than from dams, will be allowed. Non-point sources of pollution in Class 1 waters are controlled by the implementation of appropriate best management practices. Class 1, 2, and 3 waters are those with specific water quality standards that must be maintained.

Casper Field Office

The Casper Field Office lies within the Missouri River watershed. The major tributary watersheds of the Missouri River include the North Platte River, the Cheyenne River, the Powder River, the Big Horn River, and the Niobrara River.

The North Platte River flows into the Casper Field Office through Pathfinder Reservoir on the southern border of Natrona County and exits to the east at the Nebraska state line. The North Platte watershed encompasses the largest land area (66%) within the field office and includes the following areas of interest for resource management: Bates Hole, Rattlesnake Hills, Laramie Range, Rawhide Buttes and Goshen Hole.

The Cheyenne River watershed comprises the headwaters of the Cheyenne River and tributaries located in northeast Natrona County and northern Converse County. About 16% of the field office lies within this watershed.

The Powder River watershed is located primarily in the northern half of Natrona County. It encompasses about 13% of the field office.

The Bighorn River watershed within the field office primarily includes the area drained by Badwater and Poison Creeks (tributaries to the Wind River, which is tributary to the Bighorn River). Located on the western edge of Natrona County, this drainage area comprises about 4% of the field office.

The Niobrara River watershed includes only a few square miles of drainage in northeastern Goshen County, amounting to less than 1% of the total field office.

Water is used primarily for agricultural, commercial, municipal, and industrial purposes within the field office. Water-based recreation and use by fish and wildlife also are prevalent. Agricultural uses consist primarily of livestock watering and irrigation for forage production for the livestock industry. Recent court decisions have established water allocations within the North Platte River watershed that define the allowable use of water within the North Platte River drainage in the field office (WSEO 2001).

Surface Water

Both surface water and groundwater are used as water sources within the Casper Field Office. Surface water sources typically adequately meet existing uses on public lands, but natural climatic fluctuations, such as drought, can make marginally adequate sources unreliable. Relatively few perennial or intermittent stream segments exist on public lands compared to private and state lands. Most of the drainages on public lands are ephemeral. The North Platte and Powder River watersheds, includes Class 1 and Class 2 reaches. All watersheds that lie within the Casper Field Office are Class 2 and 3 waters. The Cheyenne, Wind, and Niobrara River watersheds each include some Class 2 stream segments. The USGS (2005a) maintains streamflow statistics for streams within the field office, as well as for streams nationwide. The stream classes and water quality standards are defined (WDEQ 2002), and a list of classified segments maintained by Wyoming DEQ is available (WDEQ 2001a). Discharges associated with CBNG production have been authorized in the North Platte River, Cheyenne River, and Powder River watersheds. Table 3-119 summarizes water use as of the year 2000 for Converse, Goshen, Natrona, and Platte counties.

Table 3-119. Water Use Summary for the Year 2000 for Counties Encompassing the Casper Field Office

Water Use	Groundwater (Million gallons/day)	Surface Water (Million gallons/day)
Public Supply (municipal)	15.4	3.9
Domestic	1.4	0.0
Commercial (thermoelectric)	0.0	204.7
Industrial (includes mining)	56.8	5.1
Irrigation (withdrawal)	143.9	869.7

Source: USGS 2004b

Surface Water Quality

The development and use of resources requiring surface disturbance, such as mineral development, livestock grazing, forestry, OHV use, and recreation, impact surface water quality in the field office, primarily by increasing sediment loads. Streambank degradation and erosion, as well as upland sheet, rill, and gully erosion within the watersheds, are the predominant sources of sediment found in streams. Historic construction activities, unsurfaced roads, and some development activities have contributed to streambank degradation and erosion in the field office.

Groundwater

Groundwater resources within the field office occur in geologic formations (ranging from the Precambrian to the Holocene in age) exposed at points; most are known to yield some water to wells and springs. The major regional aquifers of the field office are the High Plains aquifer and the Northern Great Plains aquifer. The High Plains aquifer is mostly alluvial, relatively shallow and thick, permeable, and generally productive for wells. The Northern Great Plains aquifer occurs primarily within the Powder River Basin in the field office and comprises a variety of formations, some of which are carbonate rocks that provide high-yielding aquifers and some confined formations that provide artesian wells. Discharges to small streams or springs at outcrops occur in some areas (USGS 1996). Groundwater recharge occurs primarily from direct infiltration of precipitation into the shallower aquifers from infiltration into the rock outcrop areas of the deeper aquifers and leakage between aquifers. As of February 2006, more than 21,000 active water wells were permitted through the Wyoming State Engineer's Office within the four counties of the field office (WSEO 2006).

Groundwater Quality

In the four counties of the field office, areas that are highly vulnerable to groundwater contamination are located along the alluvial floodplains of the major rivers. The vulnerable areas contain high water tables, sandy soils, and high hydraulic conductivity rates that create suitable conditions for contaminant leaching from the surface into the groundwater. Approximately 1% of Converse County is considered to contain groundwater highly vulnerable to contamination. Approximately 2% of Natrona County, 8% of Platte County, and 13% of Goshen County contain areas with high groundwater vulnerability (Wyoming Geographic Information Science Center 1998).

Kemmerer Field Office

The Kemmerer Field Office encompasses portions of three regional watersheds including the Green River, the Bear River, and the Snake River watershed. The majority of the field office is sagebrush steppe and receives between less than six and ten inches of water per year (based on the years between 1941 and 1990) and at higher elevations the area receives between ten and 60 inches per year.

On private and state lands, the primary uses of water are domestic and agricultural. On federally managed public lands, the primary uses of water are livestock production and as drilling fluids for hydrocarbon production wells.

Surface Water

Perennial and intermittent streams, lakes, and reservoirs within the field office support fish through at least a portion of the year. They are listed below in association with the regional watersheds in which they occur.

The Green River, a tributary to the Colorado River, drains the eastern 3,680 square miles (60%) of the field office. As part of the Colorado River System, land use management within the Green River watershed is subject to the Colorado River Salinity Control Act. Prominent streams in this watershed include Horse Creek, Cottonwood Creek, Beaver Creek, Birch Creek, LaBarge Creek, Delaney Canyon, Fontenelle Creek, Slate Creek, Eighteenmile Canyon, Shute Creek, Upper Henrys Fork, Upper Blacks Fork, Smiths Fork, Cottonwood Creek, Middle Blacks Fork, Dry Muddy Creek, Upper Hams Fork, Lower Hams Fork, Lower Blacks Fork, Sevenmile Gulch, Big Dry Creek, Muddy Creek, Little Muddy Creek, and Albert Creek. Fontenelle Reservoir, a large surface water resource, also occurs in the Green River Basin on the northern edge of the field office.

The Bear River flows north from the Uinta Mountains then winds in and out of the Wyoming-Utah border, eventually flowing into Idaho, north of Cokeville. The Bear River drains 1,490 square miles (24%) of the southwestern portion of the field office north to Bear Lake and eventually to the Great Salt Lake. Tributaries include Twin Creek and Smiths Fork. Although not directly affected by the Colorado River Salinity Control Act, any actions taken to minimize salt production, erosion, and sedimentation provide sufficient benefits to land health to justify similar land use management decisions to those taken within the Colorado River drainage. Prominent streams in the Bear River watershed that could be directly affected by BLM management include, but are not limited to, Stillwater Fork, Sulphur Creek, Pleasant Valley Creek, Yellow Creek, Saleratus Creek, Bear River-Big Creek, Bridger Creek, Twin Creek and its tributaries, Bear River, Smiths Fork, and Thomas Fork, Raymond Creek, Huff Creek, Muddy Creek, Salt River, and Mill Creek. The larger streams in the area, including the Smiths Fork and the main channel of the Bear River would experience more indirect than direct impacts as the result of the BLM actions.

The Snake River drains 957 square miles (16%) of the northern portion of the Kemmerer Field Office. Although not directly affected by the Colorado River Salinity Control Act, any actions taken to minimize salt production, erosion, and sedimentation provide sufficient benefits to land health to justify similar land use management decisions to those taken within the Colorado River drainage. Prominent streams in the Snake River watershed include Fall Creek, Hoback River, Greys River, Indian Creek, and Salt River.

Surface-disturbing actions within the Kemmerer Field Office are designed to protect and enhance water resources and include avoiding highly erodible soils, implementing zero runoff programs on large-scale disturbances, and reclamation of surface disturbance. Actions to assure that potable water supplies are protected include complying with Wyoming state surface and ground water regulations, and assuring that oil and gas wells are cased and cemented below freshwater zones to prevent the contamination of aquifers. Other actions to enhance and protect water resources during oil and gas development include plugging exploration holes and reducing sedimentation during road building and other surface-disturbing activities within floodplains and near streams, in riparian areas and wetlands, and in other areas that serve to recharge aquifers.

Surface Water Quality

Surface water quality and quantity are variable within the Kemmerer Field Office, but typically are adequate to meet existing uses on public lands. Natural climatic fluctuations, such as drought, can make marginally adequate sources unreliable.

Within the Green River watershed in the field office, Bitter Creek, and portions of Smiths Fork and Hams Fork watercourses are identified as impaired for aquatic habitat from unknown sources (Wyoming DEQ 2006). In the Bear River watershed, reaches of the Bear River are identified by Wyoming DEQ as impaired. Sediment that damages aquatic life is the cause of the impaired designation in a reach of the Bear River in the field office (Wyoming DEQ 2006). Portions of the Salt River in Star Valley are listed as impaired mainly due to fecal coliform levels that affects contact recreation (Wyoming DEQ 2006). Portions of the Bear River, and east and west forks of Smiths Fork were removed from the impairment list since 2004 as new assessments showed reduced threats and aquatic life uses being supported. The most recent 303d list and 305b report are available on the Internet with an updated list of impaired waters in the state on the Wyoming DEQ, Watershed Management Division website (http://deq.state.wy.us/wqd/watershed/index.asp). In other than severe cases, there is not a direct established link between water quality and sage-grouse populations; and monitoring and improvement efforts are ongoing.

A determination of categories of functioning condition for streams in the field office is summarized in Table 3-120. The information is shown as a percentage of the stream miles in each of the three regional watersheds with BLM–administered land in the field office. The monitoring of these areas is an ongoing process; therefore, the classification in Table 3-120 may not fully represent current conditions.

Table 3-120. Functioning Condition Ratings of Streams on Public Land in the Kemmerer Field Office

Basin	Proper Functioning Condition	Downward Trend	No Apparent Trend	Upward Trend	Nonfunctional	Not Rated
Green River	30%	3%	43%	19%	6%	0%
Bear River	31%	13%	36%	12%	6%	1%
Snake River	89%	11%	0%	0%	0%	0%

Source: BLM 2006c.
Note: Detail may not add up to 100% due to rounding.

Groundwater

Groundwater resources occur in the two major geologic features: the Overthrust Belt and the Green River Structural basin. These structural basins were formed by the deformation of some of the rock formations and are not the same as watersheds. The Green River Structural basin encompasses a portion of the western side of Wyoming, with the Rock Springs Uplift forming the eastern boundary. The folded geology of the Overthrust Belt complicates groundwater sources and recharge, and directs groundwater flow to the west. The contact between the Overthrust Belt and the Green River Structural basin acts as a groundwater barrier between the two structural basins. Within the Overthrust Belt, groundwater sources are localized and variable.

Groundwater Quality

Groundwater quality varies throughout the field office, influenced by the regional geologic structures. Groundwater in the Green River Structural basin is primarily recharged from direct infiltration of surface water and from the recharge area in the mountains to the east. Groundwater quality is highly variable but tends to deteriorate with depth and distance from recharge areas, primarily due to increasing salinity (USGS 2005b).

Areas with high to medium-high vulnerability to affect groundwater quality are found in the alluvial floodplains of the major rivers, including the Salt, Bear, and Green rivers, as well as the floodplains of Smiths Fork, Blacks Fork, Henrys Fork, Bitter Creek, and Sandy Creek. In general, groundwater is vulnerable in these areas due to high water tables, sandy soils, and high hydraulic conductivity rates, resulting in the rapid transport of contaminants through the soil and rock without much buffering or filtration (Wyoming Geographic Information Science Center 2003).

Newcastle Field Office

The Newcastle Field Office is drained primarily by four river basins: the Cheyenne River (51%), the Belle Fourche River (32%), the Little Missouri River (9%), and the Niobrara River (6%). A very small portion of the area (2%) drains into the Platte and Powder Rivers. Peak runoff occurs generally at two times during the year. Early runoff (March through April) is in response to snow melt with the major peak occurring in May and June in response to rainfall events. Most of the streams in the field office are ephemeral in nature and flow only in response to snowmelt and rainfall events.

Surface Water

Surface water quality of the area is generally suitable for livestock and limited irrigation of salt tolerant crops.

Groundwater

Since perennial supplies of surface water are scarce in the area, the primary source of water for domestic, agricultural (livestock), and industrial use is groundwater produced from wells. Water is available from several aquifers ranging from recent alluvial deposits to the Mississippian-aged Madison Limestone. Aquifers in the Newcastle Field Office are Alluvium, Arikaree, White River, Fort Union/Lance, Fox Hills, Newcastle Sandstone, Lower Cretaceous/Upper Jurassic, and Minnelusa/Pahasapa (Madison).

Alluvium aquifers are locally important throughout the field office for livestock and irrigation use. Logically it is more important in the larger river valleys such as the Belle Fourche, Cheyenne, and Little Missouri. In the larger valleys, quantities are suitable for irrigation; however, quality may limit usefulness. In parts of Niobrara County, the Arikaree Formation yields large quantities (up to 1,000 gallons per minute or more) of water suitable for practically any use. However, use of the Arikaree in parts of Wyoming and Nebraska has often exceeded the estimated 0.33 inches of annual recharge from surface infiltration resulting in groundwater “mining.” Because of this, additional uses of the water may be limited in the future.

Where it is present in Niobrara County, the White River Formation has some of the best, consistently good-quality water in the area. Quantity is the only factor which limits its use to primarily domestic and livestock. Recharge is by exposed outcrops and surface infiltration.

The Fort Union and Lance formations are the primary source of domestic and stock wells. Total dissolved solids (TDS) range from less than 1,000 milligrams per liter (mg/l) to over 3,000 mg/l. The water is characterized as a calcium sulfate/sodium sulfate type. In most wells the TDS concentrations exceed the recommended level for a drinking water supply; however, it is often used as such.

The Fox Hills Formation, with artesian pressure, is a commonly used aquifer for stock wells and a few domestic wells.

The Newcastle Sandstone is a locally significant aquifer where fairly large quantities of good quality water are produced. This aquifer supplies a few stock and domestic wells near the area of the outcrop along the flank of the Black Hills.

The Lower Cretaceous and Upper Jurassic Aquifers include the Cloverly, Fall River, Inyan Kara, Lakota, Morrison, and Sundance formations. These formations are locally important sources of stock water where they are shallow enough to be economically developed (for example, near outcrops). Except for the Hulett Sandstone member of the Sundance Formation, the yields are generally low but quite adequate for stock. The yield from the Hulett Sandstone, because of its coarse texture and relative thickness, may be the exception.

The Minnelusa is generally too deep for economic development. However, where it is shallower near Hulett (700 feet) it is the source for a large flowing well. A few deep wells have been drilled to the Minnelusa and Pahasapa (or Madison) and produce large quantities of good quality water. Large supplies of water could be used from these aquifers.

Recharge to most of the aquifers underlying the area is through the outcrop areas. Except where the aquifers are exposed to the surface, recharge from surface infiltration is insignificant.

Pinedale Field Office

The Pinedale Field Office lies almost entirely within the Green River drainage. It contains portions of four separate watersheds located within the Upper Colorado hydrologic region (Region 14) and is adjacent to the Pacific Northwest hydrologic region (Region 17). The majority of the field office lies within the upper Green River and New Fork River watersheds and very small portions of the field office lie within the Big Sandy and Slate watersheds, all within the Green River drainage.

Surface water in the Pinedale Field Office is greatly influenced by topography and geology. The field office is characterized by a high plateau, dissected by the Green River and its tributaries, bounded to the north and east by the Wind River Range and to the west by the Wyoming Range and Absaroka Ridge. Glacial deposition features have created numerous lakes on the slopes of the Wind River Range; however, most of these lakes lie just outside the field office boundary (Woolley 1930).

Surface Water

The Green River arises on the western slope of the north end of the Wind River Range before turning south and entering the Pinedale Field Office. The Green River runs through an alluvial valley the entire length of the Pinedale Field Office to the southern boundary at Fontenelle Reservoir. The major tributary to the Green River is the New Fork River, whose tributaries arise from the glacial lakes on the western face of the Wind River Range. The New Fork River follows its own alluvial valley through a rolling plateau area, crossing south of the Mesa and joining the Green River in the vicinity of Big Piney. The land downstream of the New Fork River and east of the Green River consists of an arid, slightly rolling plateau known as the Little Colorado Desert (Woolley 1930). The Green River, from the northern boundary of the field office to the confluence with the New Fork River, is designated as Class 1 waters by the State of Wyoming. Class 1 waters are defined as "outstanding waters" (WDEQ 2001a) and are those surface waters in which no further water quality degradation by point source discharges, other than from dams, will be allowed. Tributaries that drain the area west of the Green River include North Piney Creek, Middle Piney Creek, South Piney Creek, Cottonwood Creek, LaBarge Creek, and Fontenelle Creek, all of which arise from the east face of the Wyoming Range and flow through bluffs and buttes formed from a highly dissected plateau.

Surface water is stored in several large and small reservoirs. Fontenelle Reservoir is the largest (345,000 acre-feet of storage). Other reservoirs include McNinch Number 1 Reservoir (1,100 acre-feet), McNinch Number 2 Reservoir (200 acre-feet), and Sixty-seven Reservoir (5,000 acre-feet).

Water in the Pinedale Field Office is used for agricultural, municipal, industrial (primarily oil and gas production), and recreation purposes. Table 3-121 shows the current water use in the field office.

Table 3-121. Water Use in the Pinedale Field Office

Water Use	Annual Surface Water Use (acre-feet)	Annual Ground-water Use (acre-feet)	Total Annual Water Use (acre-feet)	Percentage
Municipal	924	610	1,534	0.7
Domestic (rural)	Unknown	Unknown	1,936[a]	0.9
Irrigation	213,292	Minimal	213,292	98
Industrial	Minimal	788	788[a]	0.4
Total			**217,550**	**100**

[a] Water use was assumed to be half of that given for the basin as a whole.
Source: States West Water Resources Corporation 2001.

Municipal and domestic water use account for less than 2% of the total water use in the field office. Only four municipal supply systems are located in the field office. Pinedale and LaBarge rely on surface water, whereas Marbleton and Big Piney rely on groundwater wells for their water supply. Domestic supply wells located in rural areas beyond the reach of the municipal supply systems most likely use the same amount of water (or more) as the major towns. Irrigation (primarily for hay fields) is the greatest water use in the basin, with roughly 186,000 irrigated acres accounting for 98% of all water use, mostly from surface water diversions (States West 2001). Major industrial users of surface water in the Green River Basin include soda ash production, power generation, and chemical manufacturing; however, no major surface water industrial users are located in the Pinedale Field Office (States West 2001).

> *Oil and gas companies often secure water rights to use the water for onsite purposes, such as producing drilling mud and dust abatement. The actual water use at the wells during the drilling process is typically short term and, often, the terms of the water rights are limited" (States West 2001).*

Although oil and gas industries use some surface water for domestic supplies or fire protection,

> *...their major water supplies come from groundwater wells or groundwater sources that are by-products of their operations. The permitted capacity of the industrial wells is typically much larger than the actual use, which is relatively small and temporary in nature. The fact that there is water right for an industrial well cannot be considered a reliable indication of water use. The actual well may no longer be in use, or if it is being used, the duration of the actual pumpage is probably limited" (States West 2001).*

Surface Water Quality

The State of Wyoming has primacy with regard to water quality. Adhering to WDEQ standards is required by law. Surface water quality problems are detailed in Wyoming's 303(d) List of Waters Requiring Total Maximum Daily Loads (TMDL), required under the Clean Water Act. The 2006 303(d) list is incorporated into three lists: (1) 2006 303(d) Waters with Water Quality Impairments, (2) TMDL 2006 303(d) Waters with National Pollutant Discharge Elimination System Discharge Permits containing Waste load Allocations, and (3) 2006 303(d) Waters with Water Quality Threats. No water bodies in the Pinedale Field Office are on the first and third lists (WDEQ 2006). Two water bodies within the field office (North Piney Creek below Big Piney wastewater treatment facility and Reardon Draw [lower three miles from confluence with Green River]) were delisted from Wyoming's 2004 303(d) list (WDEQ 2006). Portions of the Green River below the LaBarge Wastewater Treatment Facility, as well as Pine Creek below the Pinedale Wastewater Treatment Facility, are included in the second 303(d) list, with permits expiring on November 30, 2006, and September 30, 2006, respectively (WDEQ 2006). The TMDLs for these segments are for ammonia, chlorine, and fecal coliform (WDEQ 2006). The list of impaired streams (303d) and report of water quality (305b) is updated every two years. The most recent version of the lists can be found on the Wyoming DEQ, Watershed Management Division website (http://deq.state.wy.us/wqd/watershed/index.asp).

Overall, surface water quality generally is good in the Pinedale Field Office. Total dissolved solids for the waters of the Green River drainage above Fontenelle Reservoir, including the New Fork River drainage, are on average less than 500 milligrams per liter (mg/L), have an acceptable pH range of 6.5 to 9.0, and have temperatures ranging from 0°C in the winter to 25°C in the summer (States West 2001; Hargett 2003; Garton 1998; Hargett 2005). Phosphorus levels at four of the monitored streams in the field office are below 0.1 mg/L; these levels do not suggest a nutrient problem (Hargett 2003, Garton 1998, Hargett 2005). However, total phosphorus concentrations can reach levels that could cause nuisance algae and aquatic plant blooms in later summer or early fall (States West 2001, Hargett 2005). Point source pollution is managed by the WDEQ.

Currently, an interbasin diversion of water exists from LaBarge Creek to Muddy Creek. The water is used for irrigation, but the disruption to the natural drainage tends to cause high sediment yield. This diversion is a major source of sediment for Muddy Creek, although it is probably not a large source of sediment for the drainage as a whole.

As part of the Upper Colorado River system, the Pinedale Field Office is subject to the Colorado River Salinity Control Act. No specific projects in the field office are designed to reduce salinity at a given point. However, downstream salinity and sedimentation is minimized by actions such as vegetation management and access route planning.

Surface Water Rights

Surface water is allocated through water rights as established by the Wyoming constitution under the doctrine of prior appropriation, or "first in time, first in right." However, water rights are considered property rights that are appurtenant to the land and can be transferred in use or location only after review by the State Engineer's Office or the Board of Control.

No BLM water rights reserved to the federal government exist within the Pinedale Field Office. All BLM water rights are established through the Wyoming State Engineers' Office (Doncaster 2002). Under Wyoming law, water rights may be established for instream flows. These rights are filed and granted on unappropriated water, either natural flow or as releases from reservoirs, to maintain and improve fisheries. Nine instream flow rights have been filed for by the State of Wyoming within or immediately adjacent to the field office. In addition to instream flow rights, the WGFD has established recommended minimum maintenance flows on many streams in the area to support game fish populations in the late-season, low-flow months.

The status of the functioning condition of riparian vegetation along the public land segments of major waterways was documented using the proper functioning conditions (PFC) method. The condition of the flood plain and stability of stream banks still need to be documented. Based on surveys conducted between 1993 and 2002 using the PFC method, the condition of streams within the Pinedale Field Office watersheds is generally good throughout the higher elevations. These reaches have more streamside vegetation and coarser, more stable substrate. The high-elevation streams are mostly perennial with high-frequency and low-magnitude flow events.

The condition of intermittent and ephemeral streams at lower elevations within Pinedale Field Office watersheds is generally poorer. This is generally a result of streambank vegetation conditions, the flashiness of the runoff (i.e., lower-frequency, high-magnitude floods), and the presence of finer-grained substrate more vulnerable to erosion.

Groundwater

Eight major aquifer systems are identified in the Pinedale Field Office. Most of the bedrock surface exposures in the area are Cretaceous and Tertiary age rocks, which include several aquifer systems, including the Frontier aquifer (western part of the basin), Mesa Verde aquifer system, and Tertiary aquifer system (States West 2001). The Tertiary aquifer system is composed of numerous water-bearing formations, including the Wasatch and Fort Union Formations (States West 2001). Most of the groundwater used in the field office derives from the Tertiary aquifer system or the Quaternary sands and gravels associated with the major river courses (States West 2001). In the central portion of the field office, water wells are generally less than 300 feet deep, with groundwater levels ranging from ten feet below the surface in drainages to 100 feet on interstream divides (BLM 1999a). In the southeastern portion of the field office, south of the New Fork River, estimated steady-state groundwater levels (i.e., with no pumping) show that groundwater levels slope gently from the northeast to the southwest (BLM 2006d).

The main uses of groundwater in the Pinedale Field Office are for municipal and industrial purposes. Industrial use of groundwater is primarily for oil and gas drilling in the field office. Based on historic TDS concentrations and WDEQ groundwater suitability standards, groundwater within the field office tends to be suitable for livestock water (<5,000 ppm) and is often within the range for agricultural water (<2,000 ppm). Water of less than 500 ppm TDS is considered potentially suitable for domestic water.

Groundwater Quality

Groundwater quality varies throughout the Pinedale Field Office based on location, well depth, and geologic unit. Groundwater at the northern, western, and eastern periphery of the field office is nearer to high recharge areas in the surrounding mountain ranges and generally has a TDS concentration less than 500 mg/L, which is considered suitable for domestic use. However, groundwater elsewhere in the field office can exceed TDS concentrations of 3,000 mg/L, which is still suitable for livestock use. Levels of TDS exceed the standards for drinking water in more than half of the sampled groundwater wells (States West 2001). The water quality at other wells is considered poor and would require treatment to be suitable for domestic use (States West 2001). In the central portion of the field office, groundwater discharging into streams is considered to be of good quality, comparable with that in supply wells (BLM 1999a). Groundwater produced in natural gas wells in the southeastern portion of the field office, in the Jonah field area, varied in quality, but TDS averaged between 2,000 and 5,000 mg/L (BLM 2006). In these aquifers, untreated produced water is not suitable for domestic use and is only marginally suitable for agriculture, but is suitable for livestock use (http://waterplan.state.wy.us/plan/green/2010/finalrept/gw_toc.html).

Groundwater quality in shallow alluvial aquifers generally is reduced by calcium bicarbonate (BLM 1999a). In the Wasatch Formation, ions are sodium bicarbonate in shallow zones and sodium sulfate in deeper sandstones (BLM 1999a). In the southeastern portion of the field office (Jonah field area) chloride concentrations in produced waters exceeded state groundwater standards for domestic, agricultural, and livestock use in three of the wells tested (BLM 2006d). Iron concentrations also exceeded the standards for domestic and agricultural use in many of the sampled wells. Other groundwater quality problems throughout the field office are caused by iron, manganese, fluoride, and nitrate (Lowham et al. 1985).

Disposal of water is an issue that has recently developed in the field office. Large amounts of water can be generated from conventional or CBNG wells, and this water can be saline and/or sodic. Salts that are mobilized in the Green River portion of the field office, which constitutes the majority of the land surface, eventually flow into the Colorado River. Salinity levels in the Colorado River are a regional, national, and international issue. Injection of produced waters into geologic formations is a potential avenue of disposal. Disposal of water needs to be in compliance with WDEQ regulations.

Rawlins Field Office

The Rawlins Field Office is topographically dominated by the Medicine Bow Mountains and the Sierra Madre in the south-central part of the field office; the highest point is Medicine Bow Peak at 12,013 feet. The areas outside the mountain ranges include several commonly occurring landforms and vegetation types such as sagebrush steppe, shortgrass prairie, active and vegetated sand dunes, playas, ridges formed by sedimentary rock outcrops, entrenched intermittent and ephemeral stream systems, river valleys with willow- and cottonwood-dominated floodplains, and land surface dissected by erosion, ranging from branching stream erosion patterns to intensely eroded badlands (Bartos et al. 2006). The North Platte River is the largest stream system in the field office and is regulated by three dams (Seminoe, Kortes, and Pathfinder), forming Pathfinder and Seminoe Reservoirs and forming the Miracle Mile, a Blue Ribbon trout fishery categorized as a Class 1 water between Kortes Dam and Pathfinder Reservoir. The Colorado River Basin includes the Muddy Creek and Savory Creek drainages that flow into the Little Snake River near Baggs and the Colorado border.

The watersheds in the field office drain into the Colorado River, Platte River, and Great Divide basins. Streamflows are dominated by spring snow melt runoff and rain storms in May and June for intermittent to perennial systems and summer rainstorms for ephemeral systems. Precipitation ranges from almost 44 inches in the Sierra Madre mountain range to less than six inches per year in portions of the Great Divide Basin (Bartos et al. 2006).

The climate of the Rawlins Field Office outside of the mountains is semi-arid to arid, with most locations having rainfall of six to 15 inches except for the shortgrass prairie near Cheyenne, which has 16 to 20 inches of rain (Curtis and Grimes 2004). Surface water resources include lakes, rivers, reservoirs, streams, creeks, water wells, and springs, and are important for a variety of reasons including economic, ecological, recreational, and human health. These water resources are important for the wildlife habitat they provide and as water sources for livestock, wildlife, and people in this arid and semi-arid environment.

The geological history of the field office includes vast inland seas that formed into the Rocky Mountain intermountain basins. Sediments deposited in these inland seas formed structural basins made up of the coals, sandstones, shales, and other geologic material found in the field office. The uplifts and mountain ranges have deformed these basins, creating dips and faults while exposing layers to erosion. These formations contain fresh and saltwater aquifers within these sediments as well as energy-rich mineral resources such as coal, uranium, oil, and natural gas. The geology of basins and ranges forms a topography important for surface water resources in the field office (USGS 2004b).

The Continental Divide splits around the Great Divide Basin, forming the western portion of the Rawlins Field Office. The Great Divide Basin has no known external drainage and contains ephemeral stream systems except for portions of Filmore and Separation Creeks that are perennial near the headwaters. There are a number of large playas and regions with many small playas in the Great Divide Basin and in other basins in the field office. Playas are low, flat, undrained areas, typically with clay bottoms, that pool water on the surface and accumulate salts.

The diverse climate, geology, and topography in the Rawlins Field Office form the surface and ground water resources. Portions of the headwaters of the Platte and Colorado Rivers are found in the field office; these rivers supply water to millions of people in the Western and Midwestern United States. Water in the intermountain west is less abundant than in most of the United States and is an important source of water for other regions; therefore, proper and cautious management of water resources is essential.

Surface Water

The Rawlins Field Office is topographically divided by the Continental Divide, so that streams in the southwestern portion of the field office are drained by Muddy Creek and the Little Snake River, into the Colorado River system, and eventually into the Gulf of California. Within the field office, the North Platte, Medicine Bow, and Laramie Rivers drain watersheds east of the Continental Divide. These rivers flow into the Mississippi River system via the Platte River and ultimately into the Gulf of Mexico. Streams to the north and west of Rawlins lie in the Great Divide Basin, which is a large, internally drained basin with no outflow. The rivers that convey the most water within the field office are the Encampment River, Medicine Bow River, Laramie River, North Platte River, and Little Snake River. All the rivers have peak flows in May or June in response to snowmelt and display peaks in the maximum values in the late summer in response to thunderstorms.

Generally, the upper North Platte and Medicine Bow Rivers above Seminoe Reservoir are Class 2ab or Class 1 waters, depending on the location. Individual tributaries can be Class 2ab to Class 2c or 3b depending on background conditions. Very small portions of the Laramie or South Platte River watersheds are managed by the BLM, and water quality classifications can vary greatly. The Lower North Platte (Seminoe and below) includes Class 1 waters at the Miracle Mile (a Blue Ribbon tailwater trout fishery) and the rest is predominantly Class 2ab. A large portion of the Great Divide Basin is managed by BLM, and water quality is typically Class 3b, with some portions 4c, such as Red Creek.

The main watersheds in the Colorado River Basin included in the field office are the Savery and Muddy Creek watersheds. Both of these systems drain into the Little Snake River very near the Wyoming-Colorado border. Savery Creek is predominantly 2ab with Class 3 waters in the headwaters. Muddy Creek is primarily Class 2c (Table 3-122).

Table 3-122. Classification of Selected Streams in the Rawlins Field Office

Surface Water*	Classification
Colorado River Basin	
Little Snake River	2AB
Savery Creek	2AB
Little Savery Creek	2AB
North and East Fork Savery Creek	2AB
Muddy Creek (Mouth to Sec. 29, T.17N, R.89W)	2C
Muddy Creek (Remainder)	2AB

Surface Water*	Classification
Wild Cow Creek	2C
Cow Creek	2C
Dry Cow Creek	3B
Deep Gulch Creek	3B
Barrel Springs Draw	3B
Great Divide Basin	
Separation Creek	4C
Fillmore Creek	3B
Red Creek	3B
North Platte River Basin	
Little Laramie River	2B
Encampment River (Forest Service boundary to Colorado state line)	1
North Platte River (Pathfinder Reservoir to Kortes Dam)	1
North Platte River (Kortes Dam to Sage Creek)	2AB
Sage Creek	2AB
Little Sage Creek	2C
Sugar Creek	3B
North Platte River (Sage Creek to Colorado state line)	1
Encampment River (Forest Service boundary to Colorado state line)	1
South Platte River Basin	
Crow Creek (Above Avenue C in Cheyenne)	2AB

Source: WDEQ 2001a.

Most watersheds in the Rawlins Field Office are shrub-dominated rangelands below 8,500 feet. Watersheds in the desert and range areas of the field office are in a water balance deficit, meaning the annual potential evapotranspiration exceeds the annual precipitation. Therefore, there is limited runoff from watersheds in these desert areas, and most streams originating in these areas are ephemeral. Areas above 8,500 to 9,000 feet are in a water balance surplus, meaning that annual precipitation exceeds annual potential evapotranspiration. Most of the stream flows in these areas are perennial, and most of the large rivers originate in these high elevation areas, which are mostly located in National Forests.

Watersheds originating in the mountains receive flow from melting snow and summer rainstorms. Discharge in these streams typically peaks in May or June. There is an additional peak in the daily records of most systems in August or September before discharge tapers off to a base flow. Streams originating in the desert areas respond to snowmelt as well; however, the peak flow from these streams occurs in April and May, and desert streams may go dry by early June. Following spring runoff, these streams flow only as a response to rainfall events. Perennial and intermittent streams that flow into sandy substrates may disappear or become intermittent along certain reaches.

The many dams and diversions along streams and rivers dampen the peak flows and enable higher flows through the late summer when irrigation water is needed. Dams and diversions have altered the normal seasonal flow patterns of many streams and rivers in the field office and resulted in changes to the natural hydrograph. Dams have also altered the movement of sediment down rivers and most discharge cold, clean water during the hot months. This has enabled a prime trout fishery in the Miracle Mile below Seminoe Reservoir.

The Great Divide Basin lies in the northwestern portion of the field office. This is a large, closed basin that splits the Continental Divide. None of the precipitation falling within the basin leaves through surface flow. This is a unique geological and hydrologic feature, because the Continental Divide does not split anywhere else in the United States.

Surface Water Quality

Water quality within the field office is influenced by the type of rock and soils with which the water has been in contact, vegetation, groundwater interaction, and pollutants discharged into water bodies from point and non-point sources.

Table 3-123 shows water quality at USGS sites located around the field office. Human-induced impacts, such as changes in thermal and turbidity conditions in water bodies and impacts from increased salinity, heavy metals, and nutrients from irrigation or other discharges, affect natural water quality in this region. Water quality impacts within the field office may be associated with agricultural runoff, road maintenance, riparian vegetation removal, channel modification, stream bank destabilization, atmospheric deposition, resource extraction, oil and gas activities, urban runoff, and grazing activities. Heavy metal, nutrient, sediment, and salinity impacts can be associated with mining, oil and gas extraction, agricultural runoff, and other surface disturbing activities. Water quality typically varies as a function of flow conditions.

As water quality decreases, the ability of aquatic benthos, food base, and fisheries to maintain themselves is diminished. Stressors associated with increasing temperatures, lower dissolved-oxygen levels, changing pH, and smothering from sediments negatively impact the aquatic ecosystem and diminish the ability of a stream system to sustain natural conditions.

The primary surface water quality concerns in the field office are salinity in the Little Snake River basin and turbidity in the North Platte River Basin. The Little Snake River is part of the Upper Colorado River Basin and is therefore covered by the Colorado River Basin Salinity Control Act. Many of the watersheds discharging water within the field office are on highly erodible soils, notably Muddy Creek flowing into the Little Snake River and Sage Creek flowing into the North Platte River. Elevated dissolved salt loading has been documented in Muddy Creek, and elevated suspended sedimentation loading has been documented in both Muddy and Sage Creeks. Reaches on both these streams have been or are listed as threatened on the State 303(d) list for sediment and/or habitat degradation.

All water discharged must be approved by the State of Wyoming under its National Pollutant Discharge Elimination System (WYPDES) Program. The WYPDES Program requires that water quality not be degraded below numerical requirements for beneficial uses specified for the water bodies receiving the discharges or located below the discharges. Seminoe Reservoir and the North Platte River are water quality classification 2ab, which is the highest numerical standard and is protected for game fish and drinking water. Portions of the North Platte River (the Miracle Mile and the headwaters) are considered Class 1 waters, meaning that water quality cannot be degraded by point source discharges.

Water quality analysis from sampling taken at the USGS stream flow gauging stations is shown in Table 3-123. Average, high, and low values as well as periods of record are listed for selected parameters.

Table 3-123. Summary Data from United States Geological Survey Surface Water Quality Stations in the Rawlins Field Office

Stream Name and Location	Encampment River at Mouth near Encampment, Wyoming	North Platte River above Seminoe Reservoir near Sinclair, Wyoming	Medicine Bow River above Seminoe Reservoir near Hanna, Wyoming	Laramie River near Fort Laramie, Wyoming	Little Snake River near Slater, Colorado
USGS Site Number	**6625000**	**6630000**	**6635000**	**6670500**	**9253000**
Sample period	1965–1989	1960–2005	1965–1993	1965–2005	1957–2004
Drainage area (mi^2)	265	4,061	1,942	3,933	285
Number of samples[1]	233	480	222	297	211
Temperature (°C)	6.5(196)	8.9(262)	9.2(203)	11.1(243)	8.0(325)
pH	7.8(167)	7.9(471)	8.0(128)	8.1(214)	8.0(22)
Conductance, µmhos/cm (mean)	270(169)	408(480)	1,244(142)	757(249)	146(205)
Conductance, µmhos/cm (min.)	43(169)	142(480)	422(142)	365(249)	17(142)
Conductance, µmhos/cm (max.)	560(169)	719(480)	2,260(142)	960(249)	300(142)
TDS[3] (mean)	171(90)	269(311)	909(91)	502(151)	389[4](141)
TDS[3] (min.)	40(90)	106(311)	316(91)	242(151)	3[4](141)
TDS[3] (max.)	344(90)	481(311)	1,620(91)	640(151)	3,770[4](141)
Suspended solids[2] (mean)	nm	67(58)	389(141)	91(135)	34(6)
Suspended solids[2] (min.)	nm	3(58)	3(141)	6(135)	2(6)
Suspended solids[2] (max.)	nm	1,220(58)	3,770(141)	2,240(135)	156(6)
Turbidity, JTU	2(60)	21(82)	365(12)	47(82)	1(1)
Calcium	33(233)	45(439)	112(218)	77(297)	16(60)
Magnesium	5(232)	12(439)	52(218)	24(297)	4(59)
Potassium	2(229)	3(439)	3(222)	5(297)	1(56)
Sodium	14(233)	25(439)	95(218)	53(297)	4(59)
Sulfate	36(230)	85(439)	497(217)	170(297)	9(58)
Chloride	8(229)	9(438)	29(218)	18(297)	3(60)
Iron, µg/L	212(24)	61(55)	1,859(49)	183(23)	30(1)
SAR (Sodium Adsorption Ratio)	0.6(198)	0.8(356)	1.9(193)	1.3(262)	0.5(42)
Bicarbonate	104(188)	144(352)	180(188)	253(251)	75(39)
Hardness ($CaCO_3$)	102(198)	165(356)	492(192)	292(262)	57(43)
Dissolved Oxygen	10(77)	9(250)	9(24)	10(107)	10(16)

Stream Name and Location	Encampment River at Mouth near Encampment, Wyoming	North Platte River above Seminoe Reservoir near Sinclair, Wyoming	Medicine Bow River above Seminoe Reservoir near Hanna, Wyoming	Laramie River near Fort Laramie, Wyoming	Little Snake River near Slater, Colorado

[1] Total number of grab samples analyzed; not every parameter was analyzed in every sample.
[2] Total concentration; except as noted here, all reported values represent dissolved concentrations.
[3] Residue on evaporation, dried at 180 degrees Celsius, water, filtered, milligrams per liter.
[4] Residue, water, filtered, sum of constituents, milligrams per liter.
All units are mg/L except as noted.
nm = not measured
(34) = Number of samples analyzed for that parameter.

Groundwater

The Rawlins Field Office occurs in the Colorado Plateau and Wyoming Basin groundwater regions described by Heath (1984), the Upper Colorado River Basin groundwater region described by Freethey (1987), or Washakie Basin described by Collentine et al. (1981) and Welder and McGreevy (1966). Regional aquifer systems within the field office are discussed by Heath (1984), Freethey (1987), and Driver et al. (1984). Groundwater resources include deep and shallow, confined, and unconfined aquifers. Site-specific groundwater data for the field office are limited. Existing information comes primarily from oil and gas well records from the Wyoming Oil and Gas Conservation Commission, water-well records from the Wyoming State Engineer's Office (SEO), and from USGS (Weigel 1987). Extensive water quality surveys have been performed by USGS, which recently collected data in Carbon and Sweetwater Counties (USGS 2004b, Bartos et al. 2006). Ground water quality conditions vary in the field office and are defined by the geologic conditions in which the water is found.

Aquifers near the ground surface can be found in the Great Divide, Washakie, and Hanna Structural basins. The sediments in these basins contain many confining layers (aquitards), which are generally thick shales and extend over most of the structural basins. The Great Divide Structural Basin is a broad synclinal depression lying west of the Rawlins Uplift and generally north of I-80. North-south trending anticlines, the Rock Springs Uplift and the Rawlins Uplift bound the basin on the west and east. The basin is bound to the north by a series of major structural features and on the south by the Wamsutter Arch, which separates the Great Divide Basin from the Washakie Basin. The Washakie Structural Basin is a deep synclinal depression smaller in area than the Great Divide Basin. The Hanna Basin is a deep closed geologic basin containing sedimentary rock reaching a depth over 30,000 feet; it covers an area of approximately 1,750 square miles in the central portion of the field office. Many of the areas outside of these structural basins contain isolated BLM-managed lands and, other than the higher elevation mountain areas, can be described by these areas.

Quaternary aquifers in these structural basins generally comprise alluvial deposits along major floodplains and isolated windblown and lake sediments. Groundwater flow within the sandy Quaternary aquifers is typically downward toward permeable underlying formations (Collentine et al. 1981). Ephemeral and intermittent drainages also often contain groundwater in the associated unconsolidated valley fills.

Tertiary aquifers in the field office occur in the extensive North Park Formation, in the Browns Park Formation along the Little Snake River flood plain, and adjacent to the Sierra Madre Uplift and the Fort Union Formation, among others.

Aquifers near the surface are recharged from direct downward percolation of precipitation and snowmelt and from seepage losses from streams. Deep aquifers are also recharged by these processes in outcrop and subcrop areas and from slow leakage from overlying and underlying aquifers.

Ground-water recharge primarily originates as precipitation in the mountain areas surrounding the field office where geologic formations outcrop or water resources were deposited during past geologic periods. Aquifers providing usable water in the field office can be found along streams and rivers in the unconsolidated alluvium. These aquifers are termed unconfined, or water table, aquifers. Wells emanating from these aquifers can supply water to ranches and farms as well as to municipalities. Deeper confined aquifers supply water to artesian wells. Artesian wells may be flowing or not, depending on the potentiometric surface of the aquifer. Artesian wells can be used for domestic, municipal, and irrigation uses and are usually found where limestone or sandstone geologic formations are within 2,000 feet of the surface.

Groundwater Quality

Groundwater quality in the Rawlins Field Office is highly variable, in part reflecting the complex geologic history of the region. In most areas within the field office, the shallow groundwater is suitable for livestock. However, these waters can be only marginally suitable or even unsuitable for domestic or irrigation uses, mainly due to high TDS concentrations. Groundwater tends to deteriorate as the distance from recharge sources and the ground surface increases. During its Sweetwater County water quality survey, USGS found high concentrations of sulfate, fluoride, boron, iron, and manganese in several shallow aquifers. Groundwater samples from the Battle Springs aquifer in the Great Divide Structural Basin had high radionuclide concentrations (USGS 2004b).

Some of the local municipal water systems use groundwater for all or part of their supplies; these include Laramie, Rawlins, Elk Mountain, and Riverside. Aquifers used for these supplies are generally in the foothills of topographic features such as Atlantic Rim (in the case of Rawlins) and the Medicine Bow Mountain Range for Elk Mountain and Riverside. Irrigation using groundwater also occurs using some of these same mountain-related aquifers. Livestock watering in these areas is typically a minor use.

Rock Springs Field Office

The Rock Springs Field Office is located in the upper reaches of the Colorado River Basin. There are approximately 1,600 miles of streams and approximately 46,000 acres of lakes, ponds, and reservoirs in the area. The major reservoirs in the area are: Eden Valley Reservoir, Sandy Reservoir, Fontenelle Reservoir, and Flaming Gorge. The major watersheds in the area the Green River, which is part of the Colorado River Basin, and the Sweetwater River which is part of the Missouri River Basin. Annual discharge from these two basins is approximately 1,308,740-acre feet/year and 6,440-acre feet/year, respectively.

Surface Water

Stream flow in the area can be characterized as high magnitude/low frequency due to thunderstorms falling on soils that shed much of the rainfall. Other characteristics which influence high magnitude stream flow on a local basis are lack of vegetation (characteristic of saline uplands), and extensive areas of rock outcrops which allow for 100% runoff.

Stream channels in the Rock Springs Field Office are types A and B (Rosgen 1985) at higher elevations, where there is plenty of cobble and bedrock to armor the channels. Type C channels are found in lower areas where sedimentary geology predominates. Channel stability varies from good to poor, with the majority of streams in the fair to poor category (USDA Channel Stability Evaluation).

Surface Water Quality

Since the area is located in the upper reaches of the Colorado River Basin, salinity is a concern. Table 3-124 lists those streams with the highest levels of salinity in the area. These streams drain the Rock Springs Uplift. The data in Table 3-124 demonstrates that this area is capable of producing high salinity levels under natural conditions and much accelerated levels under disturbed conditions.

Table 3-124. Highest Levels of Salinity in the Rock Springs Field Office

Stream	TDS Range (mg/L)
Jack Morrow Creek	500 - 8,000
Pacific Creek	1,000 - 2,000
Salt Wells Creek	2,000 – 7,000
No Name Creek	1,000 – 9,000
Bitter Creek	1,000 – 9,000+
Little Bitter Creek	3,000 – 8,000

The intent of monitoring is to ensure that the BLM complies with the Wyoming DEQ Water Quality 11 Rules and Regulations, Chapter I (WDEQ 2013a) and Quality Criterion for Water (EPA 2012). Monitoring for physical, chemical, and baseline data is conducted by the Wyoming Department of Environmental Quality. Beginning in 2004, a survey of the Rock Springs Field Office using the Proper Functioning Condition (PFC) method was conducted. PFC is a qualitative methodology that quickly provides an initial estimate of riparian and water quality condition based on riparian vegetation and stream morphology.

Water depletion is an ongoing concern. Cities and towns, trona mining, power plants, oil and gas and mineral development activities, and agriculture all utilize water from the Green and Sweetwater rivers and their tributaries. An exception to this is the town of Superior, which relies on water wells for its water.

Many roads in the field office, particularly those south of I-80, are poorly drained and are bladed to the width of four lanes. This combination allows water, sediment, and associated salt to move down drainage ditches and into intermittent or perennial channels thus causing augmented flows and associated erosion and channel incision.

Other closely related problems are power line roads, some pipelines and old seismic lines which are not water barred or revegetated, and poorly placed or designed well pads. These surface disturbances can create channels down which water moves forming gullies, thus eventually transporting salt and sediment into local drainages. In some instances, pipelines and roads have been located in the inner gorge area of intermittent and ephemeral drainages, increasing sedimentation and gullying. Areas where roads are a particular concern include Sage Creek; the area west of Flaming Gorge (east of Sage Creek Mountain. north of the Henrys Fork River); the Red Creek Watershed; east of LaBarge, including the west side of the Little Colorado Desert next to the Green River; and developed oil and gas fields like Table Rock.

Irrigation return flows have been recognized in the last couple of years to have drastic effects on the condition of stream channels and fisheries. Such actions augment flows to small drainages, which reworks channels by incision. Presently Sculpin Creek, Canyon Creek, Antelope Wash, Long Draw, and parts of the Larson and Prospect Mountain Allotments have been affected by irrigation practices.

Many riparian zones in the field office have been over utilized by grazing animals. Overuse of vegetation causes destabilization of streams, allowing for channel degradation. Degraded riparian areas are non-point source contributors of sediment, salinity, and phosphate to the Colorado River system. Eutrophication reduces available oxygen, thus impacting fish populations in the Flaming Gorge Reservoir. Reductions in phosphate contributions would benefit the fishery resource in the Flaming Gorge Reservoir.

Groundwater

The Rock Springs Field Office is underlain by Quaternary, Tertiary, and Cretaceous geological systems which provide groundwater. Although much has been documented about groundwater occurrence in the area, the aquifer systems are not well defined because of the sporadic nature of occurrence in each geologic layer. Some geologic stratigraphic units which are known to contain groundwater are the Bishop Formation, Bridger Formation, Laney Shale, Wilkins Peak, and Tipton Shale members of the Green River Formation, the main body of the Wasatch Formation, and the Almond and Ericson Formations of the Mesaverde group.

Groundwater Quality

The TDS for each can be found in Table 3-125. Although little has been documented on groundwater recharge in the area, published information alludes to the fact that the following areas can be classified as recharge areas: the Rock Springs Uplift, Wind River Front, north flank of the Uinta Mountains, and localized areas recharging the Bishop Conglomerate (Pine Mountain, Little Mountain, and Cedar Mountain).

Table 3-125. Groundwater Occurrence in the Rock Springs Field Office

Geologic Subdivision	Groundwater Occurrence	TDS Range (mg/L)
Bishop	Possibilities fair	150-300
Bridger	Possibilities poor; yields less than 50 gpm	563-914
Laney Shale	Possibilities fair; up to 75 gpm	650-4,200
Wilkins Peak	Possibilities poor; less than 30 gpm	1,690-8,000
Tipton Shale	Possibilities good; yields 10-170 gpm	1,330 and up
Wasatch Formation	Possibilities good; yields 1-668 gpm	200-3,700

3.18.2 Forest Service

General Planning Area Description

Water resources include surface and subsurface sources. This section focuses on watershed characteristics, the presence and supply of surface and groundwater sources, and the overall quality of those water sources within the planning area.

Water is a resource that affects and is affected by all other resources; any action that can potentially affect the timing, type, location, and/or extent of surface disturbance, the distribution, content, and/or health of the vegetative community, and/or the diversion from and/or introduction of water from both surface and groundwater sources has the potential to affect the water resource.

Water rights and uses are governed by the Wyoming State Engineer's Office. Water rights follow the 'First in Time' doctrine of prior appropriation. Both surface and ground water uses require permits to divert and use water. Typical water uses on National Forest System lands include spring developments, wells and stock ponds for range, wells for campground water use, and irrigation ditches which divert water off forest for agricultural purposes, and water used for administrative sites and summer homes. Reservoirs and lakes located on National Forest System lands are used for both municipal and agricultural uses off forest, as well as for recreational uses such as fishing and boating. A number of municipal wells are also located on National Forest System lands.

The water quality of all the streams, rivers, reservoirs and other water bodies in the state are classified by the Wyoming Dept. of Environmental Quality (WDEQ). Every two years, WDEQ publishes the Integrated 305(b) and 303(d) Report, which describes the water quality of the water bodies in the state and lists the water bodies currently not meeting state water quality rules in the 303(d) list.

Physical stream channel characteristics and riparian vegetation are used as indicators of water quality condition, in accordance with Forest Plan Standards and Guidelines and Wyoming Grazing BMPs (WDEQ 2013b). BMPs are defined in the Wyoming Surface Water Quality Standards as "a practice or combination of practices that after problem assessment, examination of alternative practices, and in some cases public participation, are determined to be the most technologically and economically feasible means of managing, preventing or reducing non-point source pollution" (WDEQ 2013a). The Forest Service identifies BMPs specifically for each project. The State of Wyoming has developed BMPs for silvicultural activities, grazing, and other activities, based in part on Forest Service Handbooks, such as the Rocky Mountain Region FSH 2509.25 and the Soil and Water Conservation Practices Handbook (FSH 2509.22) used in Region 4. BMPs are also included as standards or guidelines in forest and grassland plans, and are applied to all activities on National Forest System lands, per the MOU with WDEQ. BMPs are monitored for implementation and effectiveness, and results are shared with WDEQ annually per the MOU.

Bridger-Teton National Forest

Surface Water

Watersheds

There are approximately 5,200 miles of perennial streams within the outer boundaries of the BTNF. Water originating on the Forest flows to the Green River (headwaters of the Colorado River), Bear River and the Snake River. There are lakes and ponds across the Forest, with the greatest number and density of lakes found in the Wind River Mountains on the Pinedale Ranger District. The large number of lakes resulted from alpine glacial activity in the area. The largest lakes on the Forest are also found along the Wind River Front, including Fremont, Willow, New Fork, Half Moon, Burnt, and Boulder Lakes.

Surface Water Supply and Use

The Town of Pinedale, Star Valley, and the Kemmerer area draw upon stream water coming from the BTNF for municipal needs. Some municipalities, including Alpine and towns along the Star Valley Front, are seeking additional water sources on the Forest to accommodate their growing needs.

Fremont Lake is on the BTNF and is the municipal water source for the town of Pinedale. Pinedale is growing due to expansion of nearby oil and gas fields. This may lead to an increase in the amount of water the Town seeks to withdraw from Fremont Lake. While the Town currently does not filter the water it draws from the lake (due to the lake's high quality water), increased use on and around Fremont Lake may eventually cause this situation to change.

In the Star Valley area, Bedford, Alpine, Afton, Happy Valley, Osmond, Star Valley Ranch, Turnerville, and Etna are dependent upon water from the BTNF.

The Town of Kemmerer operates a reservoir, Kemmerer Reservoir, on the Hams Fork River which supplies water to the communities of Frontier, Kemmerer, and Diamondville in downstream order. Most of the flow in the Hams Fork originates on the BTNF.

In addition to the above uses, numerous diversions draw water for varied uses off-forest, including on-forest summer homes and administrative sites. Additionally, numerous ponds across the BTNF are used for livestock watering. Some of these are natural features, but many have been constructed by range permittees to provide stock water where there is no other nearby sources. These ponds are fed by snowmelt, rain, or they intercept groundwater. Troughs fed by springs and diversions from other sources are also used to provide supplemental or alternative water sources to natural water bodies. There are also requests to construct ponds on the Forest to benefit wildlife, such as swans.

Surface Water Quality

Most of the recent data (1990s to 2000s) gathered by Forest Service personnel on the BTNF have concentrated on stream flow, water temperature, fine sediment levels, and physical stream channel conditions. These are the greatest potential indicators of water quality concerns for most forest activities. Outside agencies (e.g., Wyoming DEQ, Conservation Districts) have gathered other water quality data on the Forest. Results from recent water quality monitoring efforts are summarized in Table 3-126. These results are not a comprehensive summary of water quality data, but do show conditions in a variety of locations across the Forest.

Table 3-126. Water Quality Monitoring Results for the Bridger-Teton National Forest

Monitoring Agency	Date(s)	Location	Results
Sublette County Conservation District	2001-2006	Upper Green River watershed	No exceedance of state surface water standards for chemical or physical parameters.
USGS and National Park Service	1998-2002	Pacific Creek above GTNP boundary, Spread Creek at diversion dam, Ditch Creek below South Fork near Kelly	Ammonia, nitrite, and nitrate met state standards. Some exceedance of EPA recommended total N and total P criteria for forested mountain streams. Pesticides lower than reporting levels. Fecal coliform met recreation standard limits.
USGS	1985-1999	Gaging station near mouth of Greys River	Water temperature met state water quality standards.
USGS, Town of Jackson, Teton Conservation District	1965-2005	Flat Creek, Cache Creek, Game Creek	Runoff from the town of Jackson was determined to be the primary source of water quality degradation in the Flat Creek watershed. At the on-forest Cache Creek gage, it appears to the Forest Service that state standards were met for temperature and nutrients.
USGS, WDEQ	1985-1998	Buffalo Fork above Lava Creek (note: non-forest lands are upstream from here, too)	Water temperature met state standards. One sample for nutrients found non-detectable levels.
Town of Pinedale, Forest Service	2006-2009 (Forest Service)	Fremont Lake	Forest sampling of water and sediments for volatile and synthetic organic compounds (due to incomplete combustion of fuel from motorboats) led to inconclusive results. The Town continues water sampling because the lake is the municipal water supply for Pinedale.

Monitoring Agency	Date(s)	Location	Results
Sublette Co. County Conservation District	2002-2007	Hoback River at Hoback Campground	Turbidity increases during spring runoff (as expected); some dissolved oxygen levels below one day minimum cold water criteria, depending on aquatic life stage; it appears to the Forest Service that state standards were met for chloride, nutrients, pH, and temperature.

Water quality monitoring associated with the Forest's air quality program has detected changes in high elevation lake chemistry near Pinedale.

There are currently no 303(d) listed streams located on the Forest. There are several segments downstream from the Forest on the 2010 303(d) list, but the one that would be of interest in relation to sage-grouse habitat is Flat Creek. The listed segment is between the Snake River and Cache Creek; it is listed for the "threatened" designated uses of aquatic life and cold water game fish; and the source for the listing is storm water runoff from the town of Jackson. As stated in the current Wyoming 305(b)/303(d) report, "a watershed improvement project is underway to reduce sediment loading to the stream. This project includes education and monitoring, snow removal and storage planning and the installation of storm water filtration systems to filter storm water from the rodeo grounds and five urban sites. In addition, the Flat Creek Restoration Project was initiated in 2004, with the goals of improving habitat and allowing the creek to reach its ecological potential."

Surface Water Rights

Wetland and Riparian Areas

According to the National Wetland Inventory, there are approximately 69,300 acres of wetland on the BTNF (excluding ponds and lakes). There are over 109,000 acres of riparian vegetation as mapped by the 2007 forest vegetation inventory, with many of the latter acres overlapping wetland acres. Many riparian areas and wetlands follow stream channels and support a variety of vegetation types.

Overall Watershed Stream Health

As stated above, the condition of riparian areas is an indicator of water quality conditions. Although riparian areas occupy a relatively small portion of the landscape (0 to 16% of a given HUC is mapped as having riparian vegetation), these areas are critical ecological features.

Roads are the greatest potential source of sediment to streams from management activities across the BTNF, and small portions of roads may be important contributors of sediment. Roads constructed in and near riparian areas reduce riparian acreage and affect the movement of water that feeds these areas (e.g., Cottonwood Creek, Dry Creek, Swift Creek), thus reducing their ability to act as stream buffers from upland activities. The Forest is no longer building many roads, and is concentrating instead on relocation, decommissioning, and improvement of existing roads.

In the case of the Middle Fork of the Payette River, Boise National Forest, monitoring showed that 7% of the points monitored delivered 90% of the road-derived sediment at measured drainage points (Black et al. 2012). This analysis intersected the road layer with the riparian vegetation map to produce miles of road per square mile of riparian area. The basic assumption is that the more miles of road within riparian areas, the higher the potential there is to degrade water quality. Table 3-127 shows the ten watersheds with the greatest amount of roads per square mile of riparian area on the Forest.

Table 3-127. Miles of Road per Square Mile of Riparian Area for the Bridger-Teton National Forest

6th Field Hydrologic Unit Code	Hydrologic Unit Code Name	Miles of Road per Mile^2 of Riparian Area
160101020204	Middle Smiths Fork	9.00
170401050108	Dry Creek-Salt River	8.53
170401030205	Lower Flat Creek	8.15
170401030507	Greys River-White Creek	4.48
170401030104	Mosquito Creek	4.04
170401050107	Star Valley	3.70
170401030510	Lower Little Greys River	3.53
160101020203	Coantag Creek	3.42
170401050205	Willow Creek-Salt River	3.30
170401030511	Greys River-Squaw Creek	3.14

Oil and gas exploration and development is a growing management activity on the east and south sides of the Forest. Facilities and activities associated with such development have the potential to affect water resources and quality within sage-grouse habitat, particularly in the Green River basin, Muddy Creek drainage, and Bare Creek drainages.

Livestock grazing in stream channels and adjacent riparian areas have caused local water tables to drop, reducing the extent of riparian vegetation; improved management practices in recent years is allowing many of these areas to recover, while others continue to be degraded. Ponds constructed for stock or wildlife use could potentially provide habitat for West Nile virus. Troughs are not as much of a concern because water flushed through them.

Changes in beaver presence, the presence of elk in managed feed grounds near riparian areas, and changes in natural disturbance regimes have also altered riparian characteristics (e.g., expansion of conifers into riparian areas).

Groundwater

Groundwater Supply and Use

Water flowing off the Forest also feeds regional aquifers for groundwater use on- and off-forest.

Groundwater Quality

Groundwater quality is variable across the Forest: it may be highly mineralized in certain locations due to natural geologic and hydrogeologic conditions. For example, in the upper Green River basin near Pinedale, total dissolved solids and other constituents are naturally high and groundwater quality in the basin generally decreases with depth and with distance from outcrops (WWDC 2010). A groundwater study at the Jackson Hole airport (Wright 2010) found that water quality in the aquifer was generally considered good, though hard to very hard and dissolved iron and manganese were detected at concentrations exceeding the USEPA Maximum Contaminant Levels for drinking water in two monitoring wells. These latter two are non-enforceable, aesthetic, secondary standards. All three components are also likely natural constituents resulting from local geology.

Medicine Bow National Forest

Surface Water

Surface waters include lakes, streams, rivers, ponds and wetlands. These water bodies can be either perennial and flow most of the year, or intermittent or ephemeral, depending on the climate and precipitation patterns and geology of the area.

Watersheds
There are approximately 1,600 miles of perennial streams in public lands within the MBNF. Water originating on the Forest contributes to flow in both the Platte and Green River basins. The majority of the Forest is in the Platte River drainage, with the west side of the Sierra Madre Mountain Range located within the Little Snake River watershed.

Surface Water Supply and Use
The majority of water uses on National Forest System lands are for range stock water. Other uses include water for campgrounds and other facilities, and lakes for fisheries and recreational uses.

Surface Water Quality
Most surface waters on the Forests are believed to be meeting all designated water quality uses, but due to the sampling requirements only a small subset of the waters have recent assessments to support this conclusion. Riparian areas and stream channels that are in good condition act as filters for sediment, bacteria and nutrients. They also provide cover to maintain water temperatures, ensure that stream channels have a form that allows them to transport the sediment being supplied to them from stream bank erosion and from their watersheds, and supply good habitat for aquatic organisms. Where riparian area and stream channel conditions on the Forest are in good condition or have improved, so, by inference, has water quality.

Surface water quality on the Forest is good overall, although there are four stream reaches that are on the state of Wyoming 303(d) list of impaired water bodies (WDEQ 2010) (Table 3-128). The impairments for these streams are either from heavy metals leaching from historical mining or from bacteria levels which exceed the allowable levels.

None of the impaired streams are located in sage-grouse general or core area.

Table 3-128. Forest Water Quality Impairments for Wyoming for the Medicine Bow National Forest

Water Body	Ranger District	Threatened or Impaired	Year First Identified	Impaired Designated Use	Cause of Impairment
Little Snake River Basin, Wyoming					
W Fork Battle Creek	BCH	Yes – 303(d) Impaired	2000	Coldwater fisheries; Aquatic life	Metals
Haggerty Creek	BCH	Yes – 303(d) Impaired	<1988	Coldwater fisheries; Aquatic life	Metals
South Platte River Basin, Wyoming					
N. Branch N. Fork Crow Creek	LRD	Yes – 303(d) Impaired	2004	Contact Recreation	E.coli

Water Body	Ranger District	Threatened or Impaired	Year First Identified	Impaired Designated Use	Cause of Impairment
Middle Crow Creek	LRD	Yes – 303(d) Impaired	2010	Contact Recreation	E.coli

Surface Water Rights

Water rights held by others on National Forest System lands include water developments for public water supplies for the City of Cheyenne and many ditches and small reservoirs which supply water for irrigation uses below the Forest boundary.

Wetland and Riparian Areas

Riparian areas and wetlands are places where water-dependent vegetation lives and grows on the banks of stream, lakes, and rivers. Wetlands are areas that are frequently inundated by surface water or groundwater sufficient to support a variety of characteristic vegetation or aquatic life. Wetland plant and animal communities typically require saturated or seasonally saturated soils to survive. Examples of wetland habitat types include fens, marshes, sloughs, potholes, wet meadows, and playas. Natural and man-made ponds often have wetlands at the outlet or around the perimeter of the pond. Riparian areas are transitional zones between aquatic and upland habitats. They occur as strips of vegetation and are unique from wetlands.

The majority of wetland and riparian areas occur within forested vegetation types. Wetlands in sagebrush habitats tend to be narrow strips along perennial steams and beaver pond meadow complexes in lower gradient stream reaches.

Overall Watershed Stream Health

Within sage-grouse core and general habitat, current management practices related to water resources are range stock water uses and grazing management which has the potential to affect riparian and wetland areas. Stock ponds and stock tanks could potentially provide source habitat for West Nile virus. In channel stock ponds inhibit movement of aquatic species, such as fish and amphibians which prey on the mosquitoes which transmit West Nile virus.

Stock ponds should be evaluated for the potential for source habitat for West Nile virus. Ponds which have the potential to provide breeding habitat should either be modified or reclaimed if no longer needed for range stock water or other uses. Stock ponds are located in T14N, R88W, Section 8 SWSW and Sec 17, NWNW.

Riparian exclosures and reconstructed stock tanks have been installed in the last several years in the Sixmile Area (T13N, R80W, Section 32). These actions should improve riparian habitat and so improve habitat for sage-grouse. The stock tanks should be evaluated to determine if they provide source habitat for West Nile virus.

Groundwater

Groundwater resides in aquifers and supplies water to springs, seeps and other water bodies. Wetlands are often formed where groundwater reaches the land surface. Groundwater is used for many water uses on National Forest System lands, such as for campground wells and spring developments for stock water use.

Groundwater Supply and Use

Most of the MBNF is located in the Western Ranges groundwater region. The majority of the Forest, including portions over 7,500 feet elevation, is underlain by Precambrian aquifers. Lower elevation portions of the Forest are underlain by Pennsylvanian/Cambrian aquifers on the west side of the Laramie Range and

Valley and Terrace Alluvium aquifers on the north edges of the Snowy Range. Precambrian rocks are not a major aquifer; therefore, groundwater storage across most of the Forest is localized and limited. Development of groundwater resources on the Forest tends to only occur in shallow alluvial aquifers.

Thunder Basin National Grassland

Surface Water

Watersheds

The majority of TBNG (except the Spring Creek Unit) lies within the Cheyenne River Watershed, with portions of the north and northwest edges in the Belle Fourche River Watershed. The Spring Creek Unit is split between the Powder River Basin (Little Powder River Basin) on the west and the Little Missouri River to the east.

Surface Water Supply and Use

The majority of water uses on the TBNG lands are for range stock water. There are over 1,000 water rights for range stock water on the TBNG. These include both stock ponds and water systems which have wells, storage tanks, pipelines and multiple points of use. Other uses include few ponds or lakes for wildlife, fisheries and recreational uses. Additionally, the coal mines and oil and gas companies use water for facilities, dust suppression, and flood control.

Surface Water Quality

The majority of streams on TBNG are designated as Class 3B, a subcategory of Class 3 waters. Class 3B waters are tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies and where those uses are not attainable. Class 3B waters are intermittent and ephemeral streams with sufficient hydrology to support communities of aquatic life including invertebrates, amphibians, or other flora and fauna which inhabit waters of the state at some stage of their life cycles (WDEQ 2013a).

Beaver Creek, and Lance Creek, tributaries of the Cheyenne River are designated as Class 2ABWW. The perennial streams and adjacent wetlands in the analysis area are designated as Class 2AB - Fisheries and Drinking Waters. Class 2AB waters are those surface waters known to support or have the potential to support populations of game fish and/or drinking water supplies. They are considered to be high quality waters, which support the beneficial uses of aquatic life, fisheries, drinking water, recreation, wildlife, agriculture and scenic value. The “WW” notation indicates that these streams are considered to support warm water fisheries.

The most recent State of Wyoming 305(b) report identifies two impaired water bodies. The Little Powder River is listed as impaired for contact recreation due to fecal coliform levels from the state line to an undetermined point upstream. The Belle Fourche River is also listed as impaired due to fecal coliform below the National Forest System boundary, possibly originating from the City of Gillette, Wyoming. Water quality assessment reports are available for the Belle Fourche River and for Antelope Creek, Black Thunder Creek and the Cheyenne River are available from WDEQ. These assessments found that these water bodies were fully supportive of beneficial uses with the exception of contact recreation in the Belle Fourche River, with insufficient data to determine whether contact recreation and fish consumption uses were supported for Antelope Creek, Black Thunder Creek and the Cheyenne River.

Wetland and Riparian Areas

There are 1,156 wetlands identified by the National Wetlands Inventory (NWI) on National Forest System lands within sage-grouse core areas on the TBNG. More than half of these are identified as being man-made, either by excavating or impounding waters. In reality, many more are anthropogenic. Most of these ponds are constructed in-channel, inhibiting the flow of water and sediment down the drainage, as well as movement by amphibians and fish. Some of these impoundments have vegetation present around the edges or at the pond outlets. Other wetlands include riverine wetlands along the main stems of the principal drainages, such as the Cheyenne River and Antelope Creek.

Overall Watershed Stream Health

On the grassland, small impoundments along ephemeral drainages were constructed in the 1940's to the 1980's to back up flow to reduce downstream sediment movement. Many additional ponds have been constructed to provide water for livestock grazing, although not all of these ponds reliably hold water. More recently, coalbed methane-produced water has altered the flow regime in some ephemeral drainages to more perennial flow. This has resulted in these drainages now supporting sedges and other wetland vegetation along the stream channels.

Range management has developed multiple well and pipeline systems in the last decade to provide more reliable stock water than was available from the many impoundments in the area. These developments have also been designed to draw cattle away from riparian areas and improve cattle distribution; however, some ponds and stock tanks also have the potential to provide breeding habitat for West Nile virus.

Groundwater

Groundwater Supply and Use

The primary aquifers on the TBNG are quaternary alluvial aquifers and the Lower Tertiary aquifer system. Quaternary aquifers are generally shallow and are made of unconsolidated alluvium deposited along valley bottoms and alluvial fans. The Lower Tertiary aquifer system is a sequence of layers of sandstones and coal seams formed during different eras.

Clinker aquifers are an important groundwater resource in the area. Clinker is formed when a portion of the coal seam burns, leaving hardened nodules with a large amount of pore space in the area of the coal seam. The high infiltration rate of exposed clinker allows precipitation to fill up the aquifer. The water is then discharged to seeps and springs and to streambed. The primary perennial streams on the TBNG are a result of groundwater contribution from the clinker aquifer.

3.19 WILD HORSES

3.19.1 Bureau of Land Management

General Planning Area Description

A wild horse is an unbranded and unclaimed free-roaming horse found on public lands in the western United States or one that has been removed from the public lands and has not lost this status by giving title to an adopter. Wild horses are descendants of animals turned loose or escaped from early Spanish explorers, settlers, ranchers, prospectors, Indian tribes, and the U.S. Cavalry from the 1600s through the Great Depression of the 1930s to more recent times.

The BLM protects, manages, and controls wild horses and burros under the authority of the Wild Free-Roaming Horses and Burros Act of 1971 to ensure that healthy herds thrive on healthy rangelands. The BLM manages these living symbols of the western spirit as part of its multiple-use mission under the 1976 Federal Land Policy and Management Act.

The BLM maintains and manages wild horses or burros in herd management areas (HMAs). In the ten states where BLM manages horses, there are 270 HMAs. In Wyoming, about 3,000 horses are managed within 16 different HMAs scattered across the State. Wyoming has no wild burros. The BLM establishes an appropriate management level (AML) for each HMA. The AML is the population objective for the HMA that will ensure a thriving ecological balance among all users and resources within the HMA (e.g., wildlife, livestock, wild horses, vegetation, water, and soil). Map 3-25—Wild Horse Herd Management Areas depicts the HMAs within the planning area.

Wild horses are not managed in the Casper, Kemmerer, and Newcastle Field Offices.

Pinedale Field Office

Wild horses were removed from the Pinedale Field Office in the early 1990s, as specified in the 1988 RMP. The two herd management areas, Desert Herd and LaBarge Herd, still exist but are not managed for wild horses at present. The removal of the wild horse herds has resulted in decreased conflicts for forage and water. A small wild horse group eluded capture in the 1990s and remains in the Desert Herd management area, mainly in the South Desert Allotment. Currently, the herd number is low (around 12), and conflicts with the resource use in that area are minimal. The consent decree with the State of Wyoming requires all wild horses be removed from this area.

Rawlins Field Office

Following passage of the Wild, Free-Roaming Horse and Burro Act in 1971, BLM identified six areas used by wild horses within the field office. The following three herd areas failed to meet the criteria for suitably maintaining a healthy population of wild horses in accordance with the intent of the Act: Bolten, Checkerboard South, and Muddy Creek (subsequently known as “Doty Mountain/Cherokee”). Management of horses in these areas was not considered for the following reasons:

- The area was more than 50% privately controlled land, and the private landowners showed no interest in having their lands included in an HMA.
- Most of the horses were privately owned and claimed.
- Fencing and other barriers precluded free movement of wild horses to year-round habitat.

Land ownership and current conditions have not changed significantly since these decisions were made;

however, these areas still maintain their herd area status according to the Act. Horses in these herd areas were removed.

The following three herd areas were determined to be able to support viable healthy populations of wild horses: Sand Creek (later renamed "Adobe Town"), Stewart Creek/Chain Lakes, and Cyclone Rim (later renamed "Lost Creek"). Three HMAs currently correspond to these three herd areas. Wild horses that leave designated HMAs are considered excess and are removed.

Herd Management Areas

The following paragraphs briefly describe the habitat and wild horses in the three identified HMAs within the field office.

Adobe Town Herd Management Area

The Adobe Town HMA is located in south-central Wyoming between I-80 and the Colorado-Wyoming border. Topography in the area is varied, with everything from colorful eroded desert badlands to wooded buttes and escarpments. In between these two extremes are extensive rolling-to-rough uplands interspersed with some desert playa and vegetated dune areas. The Adobe Town WSA is contained entirely within the Adobe Town HMA. Off-road restrictions and difficult terrain within the WSA provide a relatively undisturbed location for wild horses.

Total acreages for the HMA are shown in Table 3-129. It should be noted that 6.1% of the HMA is deeded or Wyoming state lands. These privately controlled lands are generally unfenced and freely available to the horses. A disproportionate share of the dependable water sources occurs on these lands. Typically, these lands are controlled by the grazing permittee(s) in the area and used in conjunction with their public grazing operations.

Table 3-129. Rawlins Field Office Wild Horse Appropriate Management Levels and Populations

Area	Public Acres	Other Acres	AML	Average Rate of Annual Increase	Current Estimated Population[1]
HMAs					
Adobe Town	420,000	28,000	700	16%	839
Lost Creek	235,000	15,000	70	18%	143
Stewart Creek	215,000	16,000	150	18%	129
HMA Totals	870,000	59,000	920	-	1,111
Other Areas Affected by Wild Horses					
I-80 North	359,000	195,000	0	24%	19
I-80 South	333,000	356,000	0	23%	111
Bairoil Pasture	6,000	1,000	0	-[2]	-[2]
Other Areas Total	698,000	552,000	0	-	130
Total of All Areas	1,568,000	611,000	920	-	1,241

[1] Population estimate as of December 31, 2003.
[2] Wild horses in the Bairoil Pasture of the Stewart Creek allotment are managed with the excess wild horses in the I-80 North area. Source: BLM 2003g.

Plant communities are very diverse in this large area. The most abundant plant community in the HMA is sagebrush/bunchgrass. Other plant communities present are desert shrub, grassland, mountain shrub, lentic riparian grass/sedge, juniper woodlands, and a very few aspen woodlands. Limited, sensitive desert riparian areas are important features in the landscape, as they provide much needed water resources for wild horses and wildlife.

The appropriate management level (AML) for wild horses in the Adobe Town HMA is 700 adult animals (610–800 management range) plus the unweaned colts of the year. It is estimated that there are currently around 839 wild horses in the HMA. These horses have averaged a rate of annual increase of 16% per year. Genetically, wild horses in the Adobe Town HMA descend from domestic breeds such as escaped domestic saddle stock from surrounding populated areas.

Stewart Creek Herd Management Area

The Stewart Creek HMA is located in the west-central portion of the field office, along the northern border. It is traversed in a north-south direction by the Continental Divide, along Lost Soldier and Bull Springs rims. Adjacent to these rims on either side are strongly rolling uplands. These areas transition to the gently rolling uplands that comprise the majority of the HMA. Although annual precipitation varies between just under seven inches to more than 10, most of the precipitation occurs as snow.

The most abundant plant community in this HMA is sagebrush/bunchgrass. Other communities present are desert shrub and grassland, with limited lentic riparian grass/sedge, juniper woodland, mountain shrub, and desert willow riparian types. Wild horses in the area have proven to be very adaptable to changes in their environment. During harsh winters they get by on coarse woody vegetation in place of grass (BLM 1994a). Limited, sensitive desert riparian areas are important features in the landscape, as they provide much-needed water resources for wild horses and wildlife.

Total acreages for the HMA are shown in Table 3-129. It should be noted that 6.6% of the HMA is deeded or Wyoming state lands. These privately controlled lands are generally unfenced and freely available to the horses. A disproportionate share of the dependable water sources occurs on these lands. Typically, these lands are controlled by the grazing permittee(s) in the area and used in conjunction with their public grazing operations.

The AML for wild horses in the Stewart Creek HMA is 150 adults (125–175 management range) plus the unweaned colts of the year. It is estimated that there are 129 wild horses in the HMA (Table 3-129). The horses in the HMA have averaged a rate of annual increase of 18% per year. The wild horses in the HMA are assumed to have been influenced by the routine escape of domestic saddle stock from the surrounding areas. Genetic testing on horses from the west side of the Lost Soldier Divide has shown them to have some genetic characteristics of the Spanish Colonial Horse.

Lost Creek Herd Management Area

The Lost Creek HMA is located in the northwest corner of the field office. The HMA is joined on the east by the Stewart Creek HMA, on the north by the Antelope Hills HMA, and on the west by the Divide Basin HMA. The Field Office does not manage the latter two HMAs. The Lost Creek HMA lies within the Great Divide Basin, a closed basin out of which no water flows.

Some desert playa and vegetated dune areas are interspersed throughout the HMA. The most abundant plant community in this HMA is sagebrush/bunchgrass. Other plant communities present include desert shrub, grassland, and lentic riparian grass/sedge primarily associated with desert wetland areas. Several sensitive desert wetland/riparian areas occur throughout the area, including both intermittent and perennial lakes and streams.

Total acreages for the HMA are shown in Table 3-129. It should be noted that 6% of the HMA is deeded or Wyoming state lands. These privately controlled lands are generally unfenced and freely available to the horses. A disproportionate share of the dependable water sources occurs on these lands. Typically, these lands are controlled by the grazing permittee(s) in the area and used in conjunction with their public grazing operations.

Genetic testing on the wild horses in the Lost Creek HMA has shown the horses carry a high percentage of genetic markers identified with the New World Iberian (Spanish Colonial) breeds. The Roger's genetic similarity index (a common index used to determine genetic similarity of various breeds) for the wild horses from the Lost Creek HMA was quite high (.845) for the New World Iberian breeds. In other words, the horses in the Lost Creek HMA are genetically more similar to the Spanish Mustang and other New World Iberian breeds than they are to other breeds, such as the American Quarter Horse or the Morgan. This characteristic makes the horses in the Lost Creek HMA unique among the wild horse herds of Wyoming tested so far. The small size of the Lost Creek wild horses positions them rather precariously, in genetics terms, for losing their unique marker through mixing with other wild horses. Fortunately, the Stewart Creek horses on the west side of the Lost Soldier Divide are genetically similar, with a Roger's genetic similarity of .818 to the New World Iberian breeds, and therefore do not represent a significant threat to this genetic resource.

The AML for wild horses in the Lost Creek HMA is 70 adults (60–82 management range) plus the unweaned colts of the year. It is estimated that there are currently 143 wild horses present in the HMA. The horses in the HMA have averaged a rate of annual increase of 18% per year.

Other Areas Affected by Wild Horses

In addition to the three HMAs identified above, areas adjacent to these HMAs are affected by wild horses. As competition for resources within HMAs increases, some wild horses venture outside of HMA boundaries in search of forage and water resources. These horses are considered excess and are removed. There are areas to which wild horses commonly venture, including I-80 North below the Stewart Creek and Lost Creek HMAs, I-80 South above the Adobe Town HMA, and the Bairoil pasture of the Stewart Creek allotment northeast of the Stewart Creek HMA. Populations of horses in these areas are shown in Table 3-129.

Wild horse population fluctuations are influenced not just by the reproductive increases of wild horse populations, but also by their contact with other horse herds outside the field office HMAs. These meta-populations provide increased genetic material to maintain viable populations. Table 3-130 shows the meta-populations of which the wild horses of the field office are a part.

Table 3-130. Wild Horse Regional Meta-Populations Associated with the Field Office

Field Office HMAs		Meta-Populations		HMA(s) in the Meta-Populations	Type of Interaction	Points of Contact
Name	AML	Name	AML			
Adobe Town	700	Stateline	1,250	Adobe Town Salt Wells Creek Sand Wash (Colorado)[2]	Male migration, female exchange	Haystacks, Alkali, Sand Creek, Powder Wash

Field Office HMAs		Meta-Populations		HMA(s) in the Meta-Populations	Type of Interaction	Points of Contact
Name	AML	Name	AML			
Stewart Creek	150	Red Desert[1]	790	Stewart Creek Lost Creek Antelope Hills Divide Basin Green Mountain Crooks Mountain	Male migration, female exchange	Hay Reservoir, Bare ring, Hadsell, Osborne Draw
Lost Creek	70	Red Desert[1]	790	Stewart Creek Green Mountain Crooks Mountain Lost Creek Antelope Hills Divide Basin	Male migration, female exchange	Hay Reservoir Bare Ring, Hadsell, Osborne Draw

[1] Wild horses from the Sweetwater meta-populations (Green Mountain HMA and Crooks Mountain HMA) occasionally mix with wild horses in the Red Desert meta-populations.
[2] Sand Wash HMA is located entirely in Colorado, within BLM's Craig Field Office. Although managed by Colorado BLM, horses from the Sand Wash HMA provide biologically and genetically important interactions with horses from the other HMAs in the meta-populations.

Management of wild horses in the field office is guided by the Rawlins Field Office Wild Horse Management Handbook. The handbook contains policy, practices, procedures, and technical support documentation that affect wild horse management. Specifically, the handbook contains guidelines for wild horse management, such as how AMLs are monitored and adjusted, in addition to other wild horse management practices.

Rock Springs Field Office

In 1979, an agreement with the Rock Springs Grazing Association, the International Society for the Protection of Mustangs and Burros, and Wild Horses established a total population of 1,600 wild horses for the Rock Springs District. This agreement covered all wild horse areas within the Green River Resource Area as well as the Desert Common Wild Horse Area in the Pinedale Resource Area. A population of 1,450 wild horses was judged to be the optimal management level for monitoring purposes. Total acreages for the HMAs are shown in Table 3-131. In 1982, the BLM accepted this management level for horses through an update of the land use plans for the Big Sandy and Salt Wells Resource Areas. The herd numbers for each wild horse management area were designated with regard to the agreement, as well as the size and terrain of the herd area. Monitoring has been carried out in each Wild Horse Herd Management Area. The majority of monitoring has been conducted at the allotment level, with emphasis on vegetative conditions.

Table 3-131. Rock Springs Field Office Appropriate Management Levels and Populations

Area	Public Acres	Other Acres	AML	Average Rate of Annual Increase	Current Estimated Population
HMAs					
Great Divide Basin	562,702	216,200	415-600	20%	*618
Little Colorado	519,541	---	69-100	20%	*148
Salt Wells	724,704	468,579	251-365	20%	*728

Area	Public Acres	Other Acres	AML	Average Rate of Annual Increase	Current Estimated Population
White Mountain	240,416	152,233	205-300	20%	*152
Adobe Town	444,744	28,068	610-800	20%	*566

*Current estimated population numbers were based of 2014 census flights and do not depict the statically corrected numbers

Herd Management Areas

Great Divide Basin Herd Management Area

The Great Divide Basin HMA encompasses 778,920 acres, of which 562,700 acres are BLM-administered public lands. The May 2012 survey documented direct counts of approximately 439 wild horses in the Great Divide Basin HMA. The management area is located 40 miles east of Rock Springs, to the Rawlins/Rock Springs Field Office boundary, west to the Continental Divide, and north of I-80 to just south of South Pass City. The northern portion of the herd management area consists primarily of consolidated public lands with state school sections and small parcels of private land making up the remaining lands. The southern portion is in the checkerboard land ownership area created by the Union Pacific Railroad grant. Topography within the herd area is generally gently rolling hills and slopes with some tall buttes and streams. Elevations range roughly from 6,200 to 8,700 feet. Precipitation ranges 6-10 inches, predominately in the form of snow.

The AML for this HMA is 500 horses. Most horses are bay, sorrel, black, brown, paint, buckskin, or gray, but many colors and combinations are present. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands (4.6 to 5.2 feet) and weighs up to 1,100 pounds mature weight. The health of the horses is good with no apparent problems.

Domestic cattle and sheep utilize the area lightly in summer and moderately in winter. Vegetation in the HMA is dominated by sagebrush and grass intermixed with greasewood and saltbrush. The area also supports significant wildlife populations including elk, deer, and pronghorn.

Little Colorado Herd Management Area

The Little Colorado HMA encompasses 519,540 acres of BLM-administered public lands. The majority of the HMA consists of consolidated public lands along with state school sections and, in the south of the HMA, Bureau of Reclamation lands. The HMA is bounded on the west by the Green River, on the east by Highway 191on the north by the Pinedale/Rock Springs Field Office boundary. The area is mostly rolling hills with significant canyons breaking up the area. Elevations range from approximately 6,300 to 7,900 feet, and precipitation ranges from 6-10 inches, predominately in the form of snow. The area is unfenced except for sections of the boundary fence between the Rock Springs and Pinedale Field Offices, and along Highway 191. The HMA is divided among Sublette, Lincoln, and Sweetwater counties.

The AML for this HMA is 100 horses. Most horses in this area are dark - bay, sorrel, brown, black or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh between 750 and 1,100 pounds mature weight. The horse health is good with no apparent problems.

Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter. Vegetation in the HMA is dominated by sagebrush/grass, with saltbrush, winterfat, greasewood, and meadow species.

Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and sedges. The area supports significant wildlife populations including deer, pronghorn, and Greater Sage-Grouse.

Salt Wells Herd Management Area

The Salt Wells HMA encompasses 1,193,280 acres, of which 724,700 acres are BLM-administered public lands. The majority of the herd management area consists primarily of checkerboard land ownership area created by the Union Pacific Railroad grant in the Northern portion. Consolidated public lands with state school sections and small parcels of private land making up the majority of lands in the southern section of the HMA. Topography within the herd area is generally gently rolling hills. There are several small streams passing through the area, and some high ridges. Elevations range roughly from 6,300 to 7,900 feet. Precipitation ranges 7-10 inches in lower elevations and 15-17 inches at higher elevations, predominately in the form of snow. The area is unfenced other than portions of boundary fence and right-of-way boundaries along I-80.

The AML for this HMA is 365 horses. A full range of colors is present. This herd has a high number of palominos and sorrels with flaxen manes and tails. Other horse's colors are bay, brown, black, paint, buckskin, or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh between 750 and 1,100 pounds mature weight. The health of the horses is good, with no apparent problems.

Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter, cattle use predominating. Vegetation in the HMA is dominated by sagebrush and grass, with juniper, aspen, and conifers interspersed. Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and sedges. The area supports significant wildlife populations including elk, deer, and pronghorn.

White Mountain Herd Management Area

The White Mountain HMA encompasses 392,650 acres, of which 240,420 acres are BLM-administered public lands. The majority of the HMA consists of checkerboard land ownership within the Union Pacific Railroad grant. Consolidated public lands with state school sections and small parcels of private land make up the remaining lands in the northeast section of the HMA. The HMA is a high plateau that overlooks Rock Springs. Elevations range roughly from 6,300 to 7,900 feet. Precipitation ranges 6-10 inches, predominately in the form of snow. The area is unfenced except for portions of boundary fence and right-of-way boundaries along I-80 and 191 north.

The AML for this HMA is 250 horses. A full range of colors is present. This herd has a lot of color in it, many of which are paints. Other colors are bay, sorrel, red roan, black, or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weigh between 750 and 1,100 pounds mature weight. The health of the horses is good.

Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter. Vegetation in the HMA is dominated by sagebrush and grass, with saltbrush, winterfat, and greasewood intermixed. Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and Sedges. The area supports significant wildlife populations including elk, deer, and pronghorn.

3.19.2 Forest Service

There are no Wild Horse and Burro Territories managed by the Forest Service in the planning area.

3.20 Wildland Fire and Fuels

3.20.1 Bureau of Land Management

General Planning Area Description

Wildland fires are any non-structure fires that occur in vegetation and/or natural fuels, and are categorized into two distinct types: wildfires (unplanned) and prescribed fires (planned). Prescribed fire is used for beneficial purposes (such as reducing hazardous fuel accumulation, wildlife habitat enhancement, or forage production) in a controlled manner under a specific prescription and planned effort. Wildfires in the planning area occur from an act of nature, such as lightning, or are caused by humans either accidently or with the intent to cause damage.

The BLM in Wyoming emphasizes a response to wildfire based on consideration of firefighter and public safety, anticipated management costs, resource values at risk, resource benefits, threats to private property, opportunities for reducing hazardous fuels, criteria for fire management units, political and social concerns, and the National Cohesive Wildland Fire Management Strategy. The National Cohesive Wildland Fire Management Strategy provides a framework for the strategic effort to restore and maintain resilient landscapes, create fire-adapted communities and respond to wildfires. Response to wildfire involves a wide range of fire management options, including wildfire for resource benefit, confining or containing a wildfire so it stays within a predetermined boundary, or aggressively and quickly suppressing the fire. On some BLM-administered lands within the planning area, wildfire may be managed to improve natural resources. To reduce wildfire management costs and increase resource benefits, fires may be allowed to burn up to natural fuel breaks, when feasible. Fire suppression on public lands is guided by objectives in the existing RMPs and further clarified by annually reviewed unit fire management plans.

Fire frequency and severity vary by plant community, and extensive suppression has altered natural fire cycles in some areas. In some plant communities in the planning area, this disruption in the natural fire cycle has changed the structure and composition of the vegetation community (i.e., resulted in the reduction of the natural variation of vegetative communities) and could result in undesirable fire behavior and fire effects. Drought also affects fire behavior and fire effects in many ways, such as by reducing the amount of fine fuels and reducing fuel moisture content. Changes in the vegetative community could include increased presence of invasive and/or non-native species.

The full range of fire management activities will be used to help achieve ecosystem stability, including its interrelated ecological, economic, and social components. The Healthy Forests Initiative, Healthy Forest Restoration Act (USC 2003), and the National Fire Plan 2000 also influence the BLM's approach to forest health and fire management in the planning area.

The planning area includes a variety of vegetation communities that vary in their response to fire. For example, sagebrush and grassland communities in the lower elevations and mixed conifer stands in higher elevations are susceptible to fire. In sagebrush and grassland communities, fuel sources include dead vegetation and litter. In mixed conifer stands, fuel sources include dead and downed timber or standing timber with heavy fuel loading due to historic fire suppression and drought. Aspen is not as susceptible to fire as conifers and other woodland species; however, it will burn and carry fire during the late fall and under drought conditions.

Fuel Loading

One objective of the BLM's fire management program in the planning area is to reduce hazardous fuel loads (i.e., the amount of easily ignited vegetation in an area, usually expressed in tons per acre) with an emphasis on the WUI. The WUI includes any area with residential, industrial, or agricultural structures interspersed with or located adjacent to trees and other combustible vegetation. In areas of mixed ownership, such as in checkerboard areas, modification of vegetative fuels on public land alone would only result in a limited reduction of the threat of wildfire to private lands and homes; cooperation among all landowners is strongly encouraged.

Planned, Prescribed Fire, and Fuel Treatments

Prescribed fire currently is used to improve natural resource conditions and reduce hazardous fuels where management objectives have not been met by wildfire or other vegetation treatments. Field Offices in the planning area use prescribed fire in combination with other vegetation treatments, as appropriate, including manual, mechanical, biological, and chemical methods. Prescribed fire is also used to create fuel breaks and reduce hazardous fuels, especially in the spring and late fall when vegetation is dormant and soil moisture is elevated.

General objectives for fuel treatments include removal of excessive brush or woodland canopy in mosaic patterns. The percentage of brush or canopy removed depends on the resource management objectives for the area, including wildlife habitat needs and watershed improvement. Other vegetation treatments are combined with prescribed fire to achieve desired conditions for multiple resources. Mechanical treatments include, but are not limited to, chainsawing, shearing, chipping, mowing, and brush beating. Chemical treatment of vegetation to meet resource and/or hazardous fuel reduction objectives vary among field offices. A summary of the number of fuels treatments for the six BLM field offices for 2002-2011 can be found in Table 3-132.

Table 3-132. Summary of Fuels Treatments

	Casper	Kemmerer	Newcastle	Pinedale	Rawlins	Rock Springs	Total
Annual Average Number of Fuels Treatments							
Total Reported Rx	3.9	1.8	0.7	1.1	4.8	1.1	13.4
Total Reported Non-fire	4.9	1.9	2.1	2.8	8.1	0.9	20.7
Total Treatments	**8.8**	**3.7**	**2.8**	**3.9**	**12.9**	**2**	**34.1**
Annual Average Fuels Acres Accomplished							
Total Reported Rx	1,420	3,390	58	410.0	2,900	3,060	11,240
Total Reported Non-fire	450	550	190	630	4,340	37	6,190
FO Total Treatments	**1,870**	**3,940**	**248**	**1,040**	**7,240**	**3,097**	**17,430**

Sources: National Fire Plan Operations and Reporting System (NFPORS) - comprehensive data set thru and including FY2003 and DOI's Hazardous Fuels Treatments system of record, and Wildland Fire Management Information system (WFMI) - BLM's previous system of record for fuels management accomplishments. Data range 01/01/2002-12/31/2011.

Emergency Stabilization and Rehabilitation

Emergency Stabilization and Rehabilitation refers to activities that may be implemented following wildfire. Common activities may include seeding with native or non-native species, controlling noxious weeds, controlling erosion, repairing fences that were burned, and building new temporary management fences.

Following wildfire, BLM resource specialists evaluate impacts to decide whether stabilization or rehabilitation activities are warranted, based on vegetation condition, soils, fire size and intensity, stream conditions, and slope of the terrain. Wildfires will be evaluated as to whether emergency stabilization (actions to stabilize and prevent unacceptable degradation to natural and cultural resources, minimize threats to life or property from the effects of fire, or repair/replace/construct physical improvements) is necessary to prevent degradation of land or resources.

Management Challenges

Management challenges related to wildfire include the ability of the BLM to manage wildfire; use of wildfire for resource benefit; minimize potential unintended impacts of wildfire on visibility and public health; manage wildfire in the WUI; link together wildfire management activities and resource management goals and objectives; consider natural fire regimes, fire return intervals, and desired future vegetation types; the impacts of wildfire through the spread of invasive nonnative plant species and habitat for wildlife and special status species; post-fire livestock grazing management and rest; and continued coordination and training with local volunteer fire departments. For example, the BLM's fire management strategies must recognize the role of wildfire as an essential ecologic process. At the same time, these strategies must also consider firefighter and public safety, suppression costs, the resource values to be protected, and be consistent with resource program objectives. While protection of human life is the overriding priority in the BLM's fire management decisions, the BLM also considers community infrastructure, private property, natural and cultural resources, and social, economic, and political factors. The BLM generally manages burned areas to provide two growing seasons of rest prior to reinstating livestock grazing. BLM Manual Handbook H-1742-1 Burned Area Emergency Stabilization and Rehabilitation Handbook pg. 35-36 states: Livestock are to be excluded from burned areas until monitoring results, documented in writing, show emergency stabilization and rehabilitation objectives have been met. Objectives must be clearly defined in the Emergency Stabilization and/or Burned Area Rehabilitation Plan. Before livestock grazing can resume monitoring must show that objectives have been met. In the case of treatment failure, other factors may need to be considered. This policy, land ownership patterns, and the economic impact of rest from grazing for two growing seasons limit the number of prescribed fire projects occurring on grazing allotments in the planning area.

A specific management challenge is the ability to protect sage-grouse habitat from wildfire events. To help manage for such events, the BLM has reclassified Fire Simulation System (FSIM) burn probability data into ten separate burn probability classes. The classes range from zero (no probability of fire occurrence) to nine (highest probability of fire occurrence). To determine where Greater Sage-Grouse habitat is at risk from wildfire and ultimately where pre-suppression are most needed and the most aggressive initial suppression actions are warranted, the FSIM burn probability data was compared to sage-grouse core/priority and general habitat areas. Table 3-133 below provides the number of acres of each habitat type that intersect each of the ten burn probability classes (Map 3-32). Areas of core/priority habitat that are within the higher classes would likely be the focus of suppression actions.

Table 3-133. Fire Simulation System Burn Probability Classes

FSIM Burn Probability Class	Acres of Sage-Grouse Core/Priority Habitat	Acres of Sage-General Habitat
0	418,930	1,290,740
1	365,070	519,970
2	2,050,860	2,654,670
3	1,911,070	3,275,540
4	1,982,710	2,573,930

FSIM Burn Probability Class	Acres of Sage-Grouse Core/Priority Habitat	Acres of Sage-General Habitat
5	1,950,070	2,839,850
6	853,940	2,751,030
7	381,010	883,190
8	15,330	223,770
9	180	200

A summary of the annual averages for wildfires along with average acres burned for each of the BLM field offices from 2002-2011 can be found in Table 3-134 below.

Table 3-134. Wildfires Summary

Cause	Casper	Kemmerer	Newcastle	Pinedale	Rawlins	Rock Springs	Total
Annual Average Wildfires by Cause							
Human	9.4	2.5	0.8	0.9	16.6	7.4	37.6
Natural	15.9	4.9	6.4	1.8	18.5	42.6	90.1
Grand Total	25.3	7.4	7.2	2.7	35.1	50.0	127.7
Annual Average Wildfire Acres Burned by Cause							
Human	7,280	540	690	23	320	33	8,900
Natural	9,710	710	3,990	40	2,770	1,750	18,970
Grand Total	16,990	1,250	4,680	63	3,090	1,780	27,870

Source: Wildland Fire Management Information system (WFMI) - BLM's system of record for fire reports of wildfire. Data range 01/01/2002-12/31/2011.

Casper Field Office

Vegetative types and their respective fire regimes vary throughout the Casper Field Office. The number of acres burned is calculated as the annual average since 2002 for both wildfires and prescribed fires. The Casper Field Office coordinates its fire management program with the Forest Service, Wyoming State Forestry Division (WSFD), county fire departments, and local fire protection districts. The Casper Field Office's fire program also complies with federal laws such as NEPA, FLPMA, ESA, Clean Air Act, and Executive Order 13112-1999 (Invasive Species). Fire suppression on public lands is guided by objectives in the existing RMP and further clarified by the annually reviewed district fire management plan.

Full suppression is a strategy requiring an immediate and aggressive attack of the fire and typically relies heavily on mechanized equipment on or off roads. In contrast, limited suppression is a less aggressive strategy, generally used to keep a fire within a specified area. Current fire management planning emphasizes a response to wildfire using limited and full suppression tactics depending upon public and firefighter safety and the value of resources at risk.

Full suppression may provide the most effective tactics to suppress wildfire; however, use of heavy equipment can cause damage to sensitive resources such as wildlife habitat, highly erosive soils, and cultural resources and lead to water quality degradation, and facilitate the spread of invasive species.

Suppression also encompasses the use of fire retardant or foam; however, current practice limits the use of retardant or foam within 300 feet of waterways. No trees are to be cut during suppression activities within 200 yards of an identified bald eagle roost. In areas where full suppression may impact sensitive natural resources, limited suppression tactics may be utilized. In areas not identified as full suppression, heavy equipment usage will be limited to existing roads and trails or immediately adjacent to them. In areas with sensitive resources, no heavy equipment will be used within the following areas, except when human safety is at risk:

- Areas of cultural resource sensitivity
- Riparian/wetland habitat
- Big game crucial winter range habitats
- Greater Sage-Grouse leks
- Areas of highly erosive soils.

Lightning accounts for most wildfires in the field office. Refer to Table 3-134 for a summary of wildfires for 2002-2011. On average, the Casper Field Office had 25 fires per year burning an average 16,990 acres. The largest wildfires in the field office occurred in the sagebrush and grassland vegetative types, relying on the fine fuels of grasses. Surface disturbance and seedbed exposure in these vegetative types resulted in establishment of invasive, non-native plant species, such as annual bromes, which exacerbate the frequency and spread of wildfires in the field office.

The forest and woodlands vegetative types host the majority of the WUI in the field office. The size of individual fires and the total annual forest and woodlands acreage burned have been relatively small; however, the presence of WUI in these vegetative types increases the potential risk of wildfire.

Wildfires may be managed to meet resource objectives on public lands within aspen, juniper, lodgepole pine, true mountain mahogany, ponderosa pine, and big sagebrush (all subspecies) communities. Use of prescribed burning to achieve measurable fifth-order watershed objectives for (1) resources, including, but not limited to: forestry, wildlife, range, vegetation, and watershed; (2) the reduction of hazardous fuels; and (3) the introduction of fire into fire-adapted ecosystems.

An integrated management approach (defined as prescribed fire, mechanical, chemical, or biological, followed by desired reseeding) is used to reduce fuels to protect high priority areas or resource values defined as, but not limited to the following:

- Urban and industrial interface areas
- Developed recreation areas
- Commercial timber areas
- Wildlife habitats
- Range-improvement facilities
- Communication sites
- Municipal watersheds.

Refer to Table 3-132 for a summary of the number of treatments and average acres treated between 2002 and 2011. Fuel management activities on R&PP leases/conveyances are allowed to reduce fuel loads so the threat or impacts from wildfires is minimized.

Kemmerer Field Office

The wildfire season generally runs from July to October. Prescribed fires are usually planned for periods following the peak of wildfire season. Planned ignitions imply a planned fire intended to enhance the resource targeted for treatment (e.g., vegetation). Prescribed fire has been used extensively and successfully in the field office to improve plant communities. Lightning accounts for most wildfires in the field office followed by human-caused fires from fireworks, woodcutting, and campfires.

The field office is included within the Rawlins Interagency Dispatch Center jurisdiction, the High Desert District fire suppression response zone, and the annually reviewed district fire management plan. An annual operating plan is developed between the Kemmerer Field Office and Lincoln, Uinta, and Sweetwater counties to establish operating procedures for coordinated responses and cooperative sharing of resources. The BLM coordinates with the BTNF, NPS, Fossil Butte National Monument, USFWS, Seedskadee National Wildlife Refuge, Wyoming State Forestry Division, and the WGFD to ensure compliance with interagency policy and procedure requirements. The BLM also coordinates with private landowners, as needed.

Table 3-134 shows historical wildfire occurrence between 2002 and 2011 in the field office. An average of seven wildfires per year have occurred in the field office over the period of 2002 to 2011. Acres burned have averaged about 1,250 acres annually over the ten year period. Aggressive fire suppression policies leading to fire exclusion in the field office has caused the general buildup of vegetative fuels and deadwood. In addition, recent successive years of extreme drought in combination with Mountain Pine Beetle infestations, have made vegetation less resistant to fire. Historic fire exclusion in the field office has altered composition of vegetation communities, as well as natural fire regimes. For example, fire exclusion has allowed sagebrush and juniper communities to dominate some sites, causing a reduction in grass and forb production. In forested areas, suppression activities have increased fuel buildup, saplings, and small, early seral stage trees, making these areas more prone to catastrophic fires.

The Kemmerer Field Office has identified current fire management objectives and strategies for BLM-administered lands. For example, the use of heavy equipment for fire management will be minimized on all public lands. Vehicle tracks, fire lines, and emergency access routes will be rehabilitated to prevent erosion and continued use. Additionally, the BLM will promote public education; seek compensation for suppression costs of trespass fires; manage wildfire and prescribed fire to maintain or improve biological diversity and the health of vegetation on public land; and protect resources at risk. Prescribed fire and other fuels treatments have been used extensively and successfully in the Kemmerer Field Office over the years to improve the health of plant communities (Table 3-132). Under the current RMP, prescribed fire, managing wildfire for resource benefit, chemical, biological, and mechanical treatments can be used to meet fire and fuels management objectives, and to improve plant community health and meet other resource objectives. BLM will ensure that all prescribed burning activities are in compliance with, and meet all state and federal air quality standards.

The Kemmerer Field Office will implement the BLM Emergency Stabilization and Rehabilitation standards located in the Department of Interior's Interagency Burned Area Emergency Response Guidebook and BLM Burned Area Emergency Stabilization and Rehabilitation Handbook on wildfires to protect and sustain healthy ecosystems and protect life and property.

Newcastle Field Office

The natural vegetative cover in the Newcastle Field Office is predominantly short grasses or mixed prairie. Much of the range in the area has a sagebrush aspect in which big sage appears to be the dominant shrub vegetation, often comprising one-fourth of the vegetative composition. Other shrubs associated with big sage are silver sagebrush, rabbit brushes, plains prickly pear, wild roses, black greasewood, and sumac.

Along the tributaries and main streams are found willows, cottonwoods, green ash, nut tall service berry, chokecherry, and wild plum. Rocky Mountain juniper, ponderosa pine, and creeping juniper are found along some of the higher ridges and slopes in the north, south-central, and eastern portions of the Newcastle area.

The Newcastle Field Office coordinates its fire management program with the Forest Service, WSFD, and county and local fire departments in cooperation with both the Casper Interagency Dispatch Center and the Northern Great Plains Interagency Dispatch Center in Rapid City, South Dakota. Fire suppression on public lands is guided by objectives in the existing RMP and further clarified by the annually reviewed district fire management plan.

In accordance with the existing RMP, full suppression is used on fires endangering human life or that spread to within 0.25 mile of state or private lands, structures and facilities, oil and gas fields, important riparian habitat, or other sensitive resources. Some methods of suppression are restricted in sensitive areas. Fires in limited-suppression areas are monitored to ensure they do not threaten human life, structures and facilities, state or private lands, oil and gas fields, important riparian habitat, or other sensitive resources. Refer to Table 3-134 for a summary of wildfires for 2002-2011. During this time period, Newcastle Field Office averaged seven fires per year with an average 4,680 acres annually.

All wildfires are evaluated to determine the need for rehabilitation or restoration measures. Restoration of burned areas is by natural succession unless a special need is identified to prevent further resource damage. Using bulldozers in riparian and wetland areas, areas of significant cultural resources or historic trails, and in important wildlife birthing areas generally prohibited. Aerial fire retardant drops and fire retardants containing dyes or chemicals are prohibited within the Whoopup Canyon ACEC. Fire retardants containing dyes or chemicals are prohibited within 200 feet of flowing water, lakes and ponds.

Prescribed burning is used as a resource management tool on BLM-administered public land surface. Activity plans and environmental analyses are prepared for prescribed burning proposals to address site-specific applications and to develop burning prescriptions under which the fires could be contained. Prescribed burning is conducted in accordance with, and to enhance, multiple use resource management objectives. A summary of the number of fuels treatments, including prescribed fire, between 2002 and 2011 is provided in Table 3-132.

Pinedale Field Office

Review of the available historical fire data for the field office indicates that wildfire frequency has been low, with an average of three wildfires per year (Table 3-134). Prescribed fire was used on average once a year between 2002 and 2011 within the field office for an average of 410 acres burned annually (Table 3-132).

The condition class of vegetation communities has been a focus of fire management planning. The condition class refers to the level of departure from the natural historic fire frequency and severity in an area, the associated change in vegetation, and the composition and structure of fuels. It also refers to the ecological risk of losing key ecosystem components because of this departure. Condition Class 1 has low, minimal, or no departure from the historic range of variability; Class 2 has a moderate departure; and Class 3 has a high departure.

The vegetation in the field office can be categorized into fire regime groups II, III, IV, and V. Fire regime group II includes shrub communities that experience a fire return interval of 0 to 35 years at a stand replacement severity. Fire regime group III consists of the shrubland and mixed conifer communities that have a fire return interval of 35 to 100+ years and experience mixed severity fires. Fire regime group IV occurs in the lodgepole stands in which the fire return interval is also 35 to 100+ years but which has a stand replacement severity. Fire regime group V occurs in spruce-fir stands that experience a fire return interval of greater than 200 years at a stand replacement severity.

Five urban interface areas and two industrial interface areas have been identified. They include Hoback Ranches, Upper Green, Pocket Creek, Pinedale, Boulder, and the existing industrial interface and natural gas developments in the Jonah and Anticline Fields. The focus in these areas is on fuel reduction, fire prevention, and fire suppression.

Rawlins Field Office

Lightning is the primary cause of wildfire in the Rawlins Field Office. Natural ignitions occur throughout the area, although some areas, such as the Seminoe Mountains and Laramie Range, have a higher concentration of lightning ignitions. Human-caused fires in the area have also been widespread. The majority of human-caused fires have occurred along the I-80 and railroad corridors, primarily in sagebrush and grassland communities. Historically, wildfires have also occurred in camping and woodcutting areas by accidental ignition caused by fireworks, outdoor recreation fires, and machinery. Fireworks and railroad-associated fires account for the majority of human-caused ignitions in the area. Please refer to Table 3-134 for a summary of fire occurrence from 2002 to 2011.

Using the ecological provinces described in the vegetation section, the Intermountain Semi-Desert Province of shrublands, with pockets of aspen, limber pine, and juniper, historically would have experienced fire frequencies of 35 to 100-plus years, resulting in a mixed severity of effects on the vegetation (Fire Regime III). The Great Plains Dry Steppe Province of mixed and short grass prairies would have experienced a fire frequency of 0 to 35 years, with stand replacement effects (Fire Regime II). The Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest Province consists of mixed shrub communities, forests of pine and spruce in seven mountain ranges in the field office, and alpine tundra. Depending on the species, shrub communities would have experienced fire frequencies of 0 to 35 years with stand replacement severity (Fire Regime II) or frequencies of 35 to 100-plus years with mixed severity (Fire Regime III). The pine forests likely experienced fire frequencies of 35 to 100-plus years with either mixed severities (Fire Regime III) or stand replacement severity (Fire Regime IV). Spruce forests and alpine tundra areas with patches of spruce and fir trees burned with a 200-plus year frequency with stand replacement severity (Fire Regime V).

As noted above, unnatural fuel loading in forest stands and other vegetative types would be reduced through prescribed fire and mechanical, chemical, or biological treatments for the purpose of restoring ecological conditions or other desired vegetative conditions. Most prescribed burns in sagebrush and mountain shrub communities will occur in areas where the percentage cover of shrubs exceeds 30%. To achieve objectives for prescribed fire in aspen stands in the Rawlins Field Office, the stand should have less than 40% canopy cover of aspen and at least 15% cover of sagebrush, or have 40% to 60% conifer cover in the stand. A summary of the average number of fuels treatments from 2002 to 2011 can be found in Table 3-132

Vegetation treatments are used in the Rawlins Field Office to control the buildup of fuels and to meet the needs of other resources (including rejuvenating areas where vegetation has become decadent and setting back local succession so that diverse patches of habitat are present). Areas dominated by cheatgrass or other invasive species are examined case by case during planning of prescribed burns.

Approximately 215,000 acres have been identified in the Rawlins Field Office as having WUI characteristics. WUI are defined as communities in which humans and their development meet or intermix with wildland fuel, where there is a high probability of wildfire occurrence. These areas contain large numbers of dispersed ranches and first and second homes. Sixty-one at-risk communities are located in the field office. WUI and other at-risk communities receive priority for hazardous fuel reduction treatments. In addition, industrial developments located in the field office that are at risk from wildfire also receive priority for fuel reduction treatments.

Community assistance in the Rawlins Field Office consists of cooperative agreements, training, rural assistance, and monetary grants. There are currently six cooperative agreements concerning suppression of wildfires. Wildfire training is coordinated with cooperators to meet their training needs.

Rock Springs Field Office

The Rock Springs Field Office is composed of a combination of basin areas, upland brush (transition zones), and conifer stands. Fuels are typically broken only by water or by bare ground areas at ridge tops, resulting in large (2,000+ acres), infrequent fires. Fire occurrence between 2002 and 2011 is shown on Table 3-134. An average of 50 fires have occurred annually over the 10-year period. Acres burned have ranged from spot fires of less than one acre to large fires several thousand acres in size.

The majority of fires occur south of Rock Springs along a lightning belt extending from Utah (high Uintas) east along the state line. This occurrence pattern may exist because the best opportunity for a sustained ignition is where lightning can strike standing trees. Prior to fire suppression activities and modern civilization, large fires occurred over cyclic periods (depending on fuel system, i.e., sagebrush/grass, juniper/sage, or conifer forest) involving entire drainages. In addition to natural occurrence, 19th and 20th century livestock operations often burned the range lands in the fall of the year. At historic levels of grazing use, the abundance of fine fire fuels were reduced, thus causing a decrease in size and occurrence of fires. Studies of the transition zones indicate large fire occurrence to be common over the last 300 years. As a result of fire suppression over the last 100 years, brush and tree invasion is common on the edges of the basin area particularly in the sagebrush/juniper and aspen/conifer communities.

Fire effects on the ecological systems found in the field office are well documented. When burned, the sagebrush/grass system is generally reduced to perennial grass, which after 20 to 30 years returns to its original brush density. The life cycle of this system is generally 30 to 40 years; however, 70 to 100 years is not uncommon. The juniper/conifer/sagebrush system, when burned, generally sets the system back to a perennial grass, which is re-invaded by sagebrush in ten to 15 years, and is re-invaded by conifers (lodgepole, white bark, juniper, or timber pines) within 75 to 100 years. This is generally the marginal limit of the pine species and a full stand is not expected; rather a broken mixed stand may occur. The transitional zone between the basin sagebrush and upper conifer forest is typified by this system.

When burned, the conifer/mixed conifer system is re-invaded by conifer seedlings and perennial grasses within ten to 15 years. This system generally returns to its original density within 75 to 100 years. Systems such as this often become diseased and bug-infested and develop into fire hazards after more than 150 years. The aspen/conifer or aspen/sagebrush system, when burned, sets the system back to a homogeneous aspen stand. The system is reinvaded by conifers or sagebrush in 75 to 150 years. Most aspen stands in the field office are dependent on fire for periodic renewal. The overall fire effect for the field office has been the opening of dense vegetation (brush or tree) and the setting back of systems to a highly productive perennial grass/brush stage. Age classes have been staggered and a mosaic pattern is maintained. Vegetation patterns are typically highly fragmented in age class and distribution. These effects have been limited as fires in the field office are typically extinguished as soon as possible.

Human activity during the late 19th and 20th centuries has substantially altered fire occurrence and burn patterns. Increased development and recreational activity have resulted in numerous roads, which makes access for wildfire suppression and prescribed burn activities easier but it has also led to increased human use and subsequently more fire occurrences. Active fire suppression programs have led to increased fuel loading in the brush and forest communities. This is resulting in larger, more intense fires once an ignition occurs. Human activity has also created hazards for fire suppression personnel. An example would be unauthorized dumping of hazardous and industrial waste.

As noted above, unnatural fuel loading in forest stands and other vegetative types would be reduced through prescribed fire and mechanical, chemical, or biological treatments for the purpose of restoring ecological conditions or other desired vegetative conditions. Most prescribed burns in sagebrush and mountain shrub communities will occur in areas where the percentage cover of shrubs exceeds 30%. To achieve objectives for prescribed fire in aspen stands in the Rock Springs Field Office, the stand should have less than 40% canopy cover of aspen and at least 15% cover of sagebrush, or have 40% to 60% conifer cover in the stand. A summary of the average number of fuels treatments from 2002 to 2011 can be found in Table 3-132.

3.20.2 Forest Service

General Planning Area Description

The wildfire program is managed to protect life and resources while providing the maximum benefits of both prescribed fire and wildfire to overall resource management. Fire is a management tool used to maintain or increase age class diversity within vegetation communities (e.g., big sagebrush/grassland); rejuvenate fire dependent vegetation communities (e.g., true mountain mahogany/ponderosa pine); maintain or increase vegetation productivity, nutrient content, and palatability; and maintain or improve wildlife habitat, rangeland, and watershed condition. Fire is also considered a management tool for disposal of timber slash, seedbed preparation, reduction of hazardous fuel, control of disease or insects, grazing management, thinning, or species manipulation in support of forest management objectives.

The Forests and Grassland are comprised of a variety of vegetation types that are susceptible to fire including sagebrush and grassland communities at the lower elevations, and mixed mountain shrub, aspen, and conifer stands at higher elevations. In mixed conifer stands, fuel sources include dead and down, as well as standing timber with heavy fuel loading, because of past fire suppression, drought, and insect infestation. Although aspen are not as susceptible to fire as conifers, they will burn and carry fire during the late fall and during drought conditions.

Wildfires occur from natural causes, such as lightning, or are caused by humans either accidentally or with the intent to cause damage. Prescribed fire is used for beneficial purposes (such as reducing hazardous fuel accumulation) in a controlled manner under a specific prescription and planned effort. Wildfires are sometimes managed to achieve resource objectives. The response to a wildfire is based on an evaluation of risks to firefighter and public safety; the circumstances under which the fire has occurred, including weather and fuel conditions; natural and cultural resource management objectives; and resource protection priorities. Wildfire can be used to protect, maintain, and enhance resources and can be allowed to function in its natural ecological role.

Bridger-Teton National Forest

Wildfire and prescribed fire have been key ecosystem processes in maintaining desired vegetation and watershed conditions on the Forest. Many plants and animals on the BTNF are considered "fire dependent," and require fire, (or possibly a surrogate disturbance) to flourish.

The appropriate use or management of fire provides benefits, including range betterment, scenery enhancement, timber production (site preparation), wildlife habitat improvement, and hazardous fuels reduction. On the other hand, unwanted fires can cause negative social and economic effects both on federal and adjacent private lands. Unwanted fires include fires that were ignited accidentally or through arson, or fires that burn with effects that are uncharacteristic of the historic disturbance regime and create undesired fire effects.

Prior to European settlement of the area covered by the BTNF, fire occurred as a product of lightning with a minor contribution from human induced ignitions by indigenous peoples. A policy of "fire exclusion" was the result of an active fire suppression that began in the early 1900s, and lasted into the 1970s. Fire was prevented from playing its proper role as a disturbance process and altered historic fire regimes resulted. During this period, most fires were successfully suppressed at small acreages with only an occasional fire growing beyond 1,000 acres, and only two fires growing beyond 10,000 acres; the 1931 Gravel Creek Fire (10,980 acres) and the 1934 Fall Creek Munger Mountain fire (12,000 acres).

The most significant changes to fire regime have occurred in the lower elevation "short interval" fire types such as sagebrush/grass and aspen, along with some shrub communities. In addition to fire suppression, livestock grazing in grasslands has reduced the amount of herbaceous fuels (grasses) and consequently reduced fire frequency and spread. In shrub communities, grazing combined with fire suppression has caused a shift to dominance by woody vegetation. In some cases the herbaceous understory is significantly reduced as the shrubs become more and more dense. Depending on shrub spacing and density, this can lead to either very rapid fire spread under moderate to extreme fire conditions or little or no spread under low to moderate conditions.

Much of the subalpine vegetation of the BTNF commonly burns in a large size with a mixed to high severity pattern. On the other hand, successful suppression of numerous small to mid-sized fires in these vegetation types has led to changes to the patch size and homogeneity of the fuels.

Since 1987, there has been a general trend towards larger wildfires, and more acres burned per year. This increase in acres burned may be attributed to several factors. The past 20 years have seen numerous years with dry and warm weather conditions, leading to favorable fire conditions for large fire growth. Many areas on the Forest burned between the late 1700's and late 1800's, and vegetation in these areas had reached older age classes that were receptive to fire ignition and growth. Successful fire exclusion efforts further increased the homogeneity of the fuels versus a mosaic of fuel classes, which would increase the likelihood of large fire spread and severity. An increased prescribed fire and fire use or managed fire program has also contributed to an increase in acres burned.

The most significant fire season was the 1988 fire season when over 270,000 acres on the BTNF burned. Much of the acreage burned was in the Teton Wilderness, which because of topography and fuel types lends itself to large fires.

During the mid-1970's managers realized the importance of wildfire in the ecosystem, and began implementing landscape prescribed burns on the Forest. Before this, prescribed fire treatments were limited to treatment of post-harvest slash.

The prescribed burn program has treated 52,520 acres on the Forest. Early burns were focused on range and wildlife improvement, with most acres burned in lower elevation sagebrush/grass and aspen. While much of the prescribed burning still occurs in these types, more burning now occurs in conifer. Much of the prescribed burning during the 1970's and 1980's was focused in several areas, including the Gros Ventre drainage, Buffalo Valley and Labarge Creek. Several years of little or no prescribed burning followed the 1991 Dry Cottonwood prescribed burn escape, with a gradual increase in the program through the late 1900's. Following the 2000 fire season, priority shifted to treating wildland urban interface areas, with a resultant decrease in prescribed burn treatments. With the stabilization of the wildland urban interface program, landscape burning has slowly increased since 2003.

In 1976, wildfires managed for resource benefit was approved for the Teton Wilderness, allowing naturally occurring fires to burn under certain weather and fire behavior conditions. Similar plans were approved for the Bridger Wilderness (1980), and Gros Ventre Wilderness (1996). From 1976 to 1988, a relatively conservative fire use strategy was employed, with only 14 fires managed. None of these fires grew beyond one acre. Following the 1988 fire season, wildfire for resource benefit was suspended, pending several regional and national reviews. Over the course of the next few years, the two original plans (Teton and Bridger) were brought back on line, along with the new Gros Ventre plan.

Beginning in 2001, larger and more complex fire use projects were managed. In 2004 the Forest Plan was amended to clarify ability to use wildfire for resource benefit throughout the Forest, allowing fire managers maximum flexibility to manage wildfire efficiently and safely while maximizing resource benefits from acceptable wildfires.

From 1952 through 2006, the total acreage burned including wildfire and prescribed fire was 457,350 acres, for an average of 6,850 acres per year. Approximately 15% of the Forest has burned in this time, or an average 0.27% per year. It should be noted that this acreage represents "mapped perimeter," and that much of the acreage was only burned in low to moderate severity.

Current Management Practices

The BTNF currently utilizes the full spectrum of fire management practices. Wildfires on the BTNF are assessed according to their location, current conditions, Forest Plan objectives, values, and current and projected fire behavior to determine the most appropriate response to ensure firefighter and public safety, protect values, and manage for ecosystem health. Fires, or portions thereof, that pose a significant threat to values are suppressed as safely and quickly as possible. For wildland fires, management action points are utilized as planning tools to inform actions that may need to occur based on values for a specific fire. The BTNF also utilizes prescribed fires to treat fuels in pre-identified areas to either reduce fuel build up or create diversity in age classes of vegetation types.

Sagebrush habitat types on the BTNF are over represented by late seral stage classes and is proven by the BTNF 2007 Vegetation GIS Layer with a large majority of sagebrush canopy cover in the greater than 25% categories. Also, sagebrush vegetation classes on the BTNF do not meet recommended percentages of vegetation classes in the 'Landfire biophysical setting model' for Inter-Mountain Basins Montane Sagebrush Steppe. In this model, Class C is over represented and would show Fire Regime Condition Class (FRCC) for sagebrush on the Forest in either FRCC2 or FRCC3. The cause for heavy shrub cover is due to the absence of fire as a disturbance mechanism over the last 100 years.

Medicine Bow National Forest

The Brush Creek/Hayden and Douglas Ranger District's encompass a variety of different vegetation communities in a range of seral stages. Vegetation communities that are susceptible to fire include sagebrush, shrubland, and grassland communities at the lower elevations, mixed mountain shrub, aspen, and conifer stands at mid elevations, and subalpine fir and Engelmann spruce and the highest elevations. Notable changes in vegetation on the Districts include spruce mortality due to the spruce bark beetle, SAD (Sudden Aspen Decline), conifer encroached aspen, juniper encroaching on shrublands, landscape level lodgepole pine mortality due to mountain pine beetle epidemic, and a variety of other insects and pathogens, at endemic levels, effecting various tree species.

Current Management Practices

Natural ignitions (wildfire) are managed (when practical) to achieve resource objectives when they occur within defined prescriptive parameters and as outlined and allowed in the Revised Land and Resource Management Plan (2003) and the Fire Management Plan (2011). Current fire management options in the critical sage-grouse habitat on Brush Creek/Hayden and Douglas District's include Direct Control (not specifically identified but always an option), Perimeter Control, and Prescription Control, depending upon the specific location.

Thunder Basin National Grassland

Most fires in Greater Sage-Grouse core habitat occur in July and August, after the wetter months of May and June. Some fires will occur in the early spring (pre green-up) and in the fall after curing, but these are not normally problem fires. Green-up begins in spring (April), curing in mid-summer (July-Aug), and freezing temperatures may be expected in early fall (late September). Continuous snow cover is generally less than two months in duration.

The primary fire cause is lightning and many of these fires remain small and are knocked down by rain from thunderstorms. Large fires can occur during dry thunderstorm events with wind. Most of these fires are single burning period events in the sagebrush/grass fuel type, but can be longer if they occur in or burn into timber.

The dominant fuel types in the analysis area are sagebrush and mixed-grass prairie with ponderosa pine stands near ridge tops. Fire spread is primarily through the fine herbaceous fuels, with plant litter and stem wood from the shrub or timber over story contributing to fire intensity.

Current Management Practices

Due to the proximity of Forest System lands to private land, initial attack suppression action is taken on all fires. The TBNG lies within four Wyoming counties: Campbell, Converse, Niobrara and Weston. The Forest Service and these Counties have Interagency Cooperative Fire Management Agreements that are updated yearly and documents the way wildfire suppression will be managed in a cooperative and efficient manner. Cooperating agencies are used for initial attack, extended attack and large fire support on TBNG. The Grasslands have few limitations to accessibility for initial attack. Initial attack response is usually immediate, although response times can be long due to travel distances, and in most cases is accomplished by engines. Starting in 2007 and continuing into 2012 there has been an active prescribed fire program that has burned 11,900 acres on TBNG. The purpose of these prescribed burns is to reduce hazardous fuels and move vegetation resources toward desired conditions that would enhance plover and prairie dog habitat.

3.21 WILDLIFE AND FISHERIES

3.21.1 Bureau of Land Management

General Planning Area Description

The BLM is responsible for managing the habitat for wildlife and fish. The State of Wyoming has jurisdiction over all wildlife in the state, placing species under management of either WGFD or the state Department of Agriculture. The WGFD manages resident wildlife populations and migratory game birds within seven regions (Casper, Green River, Jackson, Lander, Laramie, Pinedale and Sheridan) encompassing the planning area. The USFWS provides regulatory oversight for all species that are listed, proposed for listing, or are candidates for listing under ESA (See Special Status Species.) The USFWS also administers the Migratory Bird Treaty Act, which protects migratory bird species such as waterfowl, which are hunted; and songbirds, which are not hunted. Although the planning area spans approximately 11 million acres of public lands throughout the state, similar species occur within each field office. These species and their habitat are discussed in the beginning of this section. Unique wildlife and fisheries information for each field office are discussed under each field office heading. If a species or species group is not mentioned in the field office sections, no additional or unique information was provided.

Wildlife habitat is best characterized by the vegetation types discussed in the Vegetation section of this chapter. Such factors as fire management; Forest Management; rights-of-way; livestock grazing; oil, gas, and other energy developments (e.g., wind power and coal mining); OHV use and other recreation; and wild horses also influence the quality of habitat, as do management actions applied throughout BLM-administered lands. Wildlife species generally use vegetation on the basis of its physiognomy (e.g., structure [height and spacing] and growth form [gross morphology and growth aspect] of the predominant species, and leaf characteristics of the dominant or component plants). This means that a given species may use a shrub of a particular height and growth form irrespective of its species. Especially important habitats are mountain shrub (mountain big sagebrush and antelope bitterbrush); monotypic stands of bitterbrush and true mountain mahogany; and coniferous, rockland, aspen, riparian, and lowland sagebrush (primarily Wyoming big sagebrush on flatlands and basins below 7,000 feet) (Wichers 2002). It is important to manage each vegetation zone for maximum diversity in terms of age, height, and density so that the biodiversity and ecological health and resilience of the plant communities and their wildlife inhabitants are maintained. At the same time, excessive fragmentation of vegetation zones is to be avoided so that wildlife species requiring large tracts of a similar physiognomic type can complete their life cycles.

Wildlife and Habitats in the Planning Area

The planning area contains all of the major Level III ecoregions throughout the state, with the majority being within the Wyoming Basin ecoregion. Grasslands, sagebrush, and desert shrub vegetative types dominate the planning area. Grasslands provide forbs and grasses for big game and smaller mammals; and hunting opportunities for raptors such as the Swainson's hawk, northern harrier, and prairie falcon and predatory animals. More than 350 species of flora and fauna depend on the sagebrush vegetative type for all or part of their existence (Connelly et al. 2004). Sagebrush provides crucial winter range for big game and is essential for Greater Sage-Grouse and other sagebrush obligates.

Compared to grasslands and sagebrush, forest and woodlands are less abundant in the planning area; however, they add structural and biological diversity to the landscape. Vegetative types included in the forest category include ponderosa/lodgepole pine with Douglas fir and subalpine fir at higher elevations and moister sites. Woodlands include limber pine, Rocky Mountain juniper, and quaking aspen. Forest and woodlands provide summer cover for big game and are prime habitats for American marten, blue grouse, and northern goshawks. Calliope hummingbird, Williamson's sapsucker, Townsend's warbler, and brown creeper also are species of interest (Cerovski et al. 2001). Aspen is another vegetative type included in the woodlands category and represents an important component of biodiversity in the planning area. Aspen stands typically have a diverse understory component and, thus, provide abundant forage and cover for big game, particularly females with young. Aspen also supports an abundance and diversity of animal species, including birds such as the blue grouse, red-naped sapsucker, and warbling vireo. Some locations within the planning area have experienced a decline in aspen. Fire management, land development, climate, and ungulate grazing continue to affect the quantity and distribution of aspen in the planning area.

Mountain shrubs vegetative type is dominated by xeric species, such as true and curl-leaf mountain mahogany and antelope bitterbrush. Other common species are chokecherry, snowberry, currant, Wood's rose, and serviceberry. Mountain shrub communities provide important forage, hiding, or thermal cover for a variety of wildlife, including deer and elk, nongame birds, and small mammals. A second shrub vegetative type occurring within the planning area is the arid desert shrubs and saltbush greasewood flats. Although not regarded as highly palatable to most species, pronghorn do forage on greasewood and mule deer use this vegetative type as spring habitat.

Large and small rim rock complexes in canyons and along ridge lines provide cliff and rock slope habitats that are primary nesting sites for swallows, rock doves, golden eagles, falcons, turkey vultures, and ferruginous and other species of hawks in the planning area. Rocks and canyons also provide denning sites for mountain lions and bobcats, and yearlong homes for many small mammals, including ground squirrels, woodrats, and rabbits. Abandoned cabins, mineshafts, and adits in the planning area provide potential and occupied habitat for numerous species of bats.

Riparian and wetland vegetative types occur on a very small percent of the public lands within the planning area; however, it is estimated that 70% to 85% of Wyoming's wildlife use riparian habitats for at least a portion of their life-cycles. Many amphibian species, as well as muskrat, beaver, mink, and various waterbirds and waterfowl, occur in riparian or wetland areas only. Songbirds are attracted to the structural and vegetative diversity for both nesting and migrating habitat (Knopf et al. 1988). The Wyoming Partners in Flight have categorized riparian habitats as a top priority for conservation of neotropical migrant birds (birds that breed in the United States and Canada, and winter in Latin America) (Cerovski et al. 2001).

The various lakes, reservoirs, streams, and associated riparian vegetation provide food, cover, and travel corridors for a variety of avian wildlife species. Seeps and springs provide water and meadow habitats important during birthing and rearing for big game. The proximity of aquatic habitats to wetland and upland habitats provide breeding, migratory, winter, or year-round habitats for numerous waterfowl. Diving ducks, such as mergansers and goldeneye, require open and deep water that supports fish and aquatic insects. Dabbling ducks, such as mallards and teal, require migration and winter habitats with a mix of open water for loafing and emergent vegetation for food and cover. Small, shallow lakes, reservoirs, ponds, and wetlands provide seasonal habitats for resident and migrant waterfowl and shorebirds, including American avocet, killdeer, long-billed curlew, Canada geese, mallard, and cinnamon teal. Quality breeding habitats for mallards and teal exhibit nesting cover sufficiently close to water bodies to support emergent vegetation for secure cover. In addition, young ducklings require an abundant supply of aquatic insects for food.

Historic activities from agriculture, development, fire management, OHV use, recreation, and transportation, have, in some areas, contributed to the degradation of wildlife habitats in the planning area. Examples of historic activities that have contributed to the degradation of wildlife habitats include livestock concentration areas (e.g., water sources), which have trampled and removed vegetation and compacted soil; utility and pipeline corridor installation, which has disturbed soil and provided opportunities for the spread of invasive, non-native plant species; fire suppression, which has depleted or completely removed the natural fire regime with which habitats evolved; oil and gas well and associated infrastructure development, which has disturbed soil for well pad and road development, thereby contributing to soil erosion and habitat fragmentation; improper OHV use, which has spread invasive, non-native plant species and disturbed wildlife; recreation activities, which have disturbed wildlife; and road placements, which have contributed to habitat fragmentation in the planning area. The historic activities mentioned above have occurred to various degrees and primarily in isolated areas within the planning area. Consequently, current wildlife habitats in the planning area exhibit a range of existing conditions from habitats in PFC to habitats in something less than PFC and from large, contiguous blocks of habitats to small, fragmented patches of habitats.

In other instances, historic activities have improved habitats or the ability to manage wildlife habitats. Examples of historic activities that have improved wildlife habitats or improved the management of habitats in the planning area include prescribed fire to maintain or restore desirable vegetative types and restore a natural fire regime, livestock water developments as sediment traps and as water sources for native ungulates and other wildlife, use of OHVs to manage and monitor wildlife habitat in remote locations within the planning area, and granting of public access for hunting as a tool for big game management.

BLM and WGFD guidance documents are available regarding BMPs and management of wildlife habitats (WGFD 2004b; BLM 2005f). Due to the relationship between wildlife habitats managed by BLM and wildlife species managed by the WGFD, a statewide agreement was established to facilitate cooperation between these agencies relative to wildlife (WGFD and BLM 1990). In accordance with the cooperative relationship between these agencies, the following description of priority wildlife species in the planning area is organized by Wyoming statutory categories: big game, trophy game, furbearers, predatory animals, small game, game birds, migratory game birds, and nongame (raptors, neotropical migrants, mammals, and reptiles and amphibians).

Mammals

Numerous species of nongame mammals are known or suspected to occur in the planning area, including shrews, bats, squirrel family species, gophers, mouse, and rat species. For a complete habitat description and distribution of nongame mammals, refer to the *Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming* (Cerovski et al. 2004). Most nongame mammals are widely distributed in the state, although population trend data and specific habitat requirement information are lacking for many of these species.

Bat species, such as the eastern red bat, hoary bat, and eastern pipistrelle, are considered a management priority. These species utilize a wide variety of habitats, including caves, abandoned mines, forests, and riparian areas for foraging, roosts, nurseries, and hibernacula. Management challenges currently focus on increasing the understanding of habitat requirements for these and other species and maintaining the presence of these species in occupied habitats. Ongoing conservation efforts for nongame mammals include invasive, non-native plant species and managing hazards, such as contaminants and developments.

Big Game

The planning area contains habitat for six species of big game: pronghorn, mule deer, white-tailed deer, Rocky Mountain elk, moose, and bighorn sheep. The diversity of habitats and landscapes within the planning area cumulatively provide important areas for meeting all life requirements including breeding, foraging, migration, and winter range.

Winter is a crucial and stressful time for wild ungulates; therefore, crucial winter range for the most abundant big game species (pronghorn, mule deer, and elk) is often the focus of management and a criterion for analyzing the impacts of resource management on big game. Pronghorn, deer, and elk are migratory, generally moving to a winter range during November and remaining there until April or May. Although specific characteristics of winter ranges may vary, essential factors are the quantity and quality of available forage (Short 1981). Winter ranges typically occur on relatively low-elevation shrubsteppe habitats (Carpenter and Wallmo 1981), which support nutritious browse plants accessible above snow cover. Pronghorn, mule deer, and elk avoid deep snow, which can cover preferred winter forage and inhibit escape from predators (Wilson and Ruff 1999). Important winter browse in the region includes big sagebrush, mountain mahogany, rabbitbrush, bitterbrush, and serviceberry (Kufeld et al. 1973).

Basic requirements of summer ranges are thermal and visual cover and adequate forage, particularly for females with young. Summer ranges for mule deer occur in shrublands and in aspen and juniper woodlands. Woody riparian areas are important year-round for mule deer. Elk tend to move to higher elevation aspen and conifer woodlands during summer. Adjacent upland meadows, sagebrush and mixed grass, and mountain shrub habitats are used for foraging. Woody riparian corridors often are important for hiding cover and forage during migration periods.

Established population size “objectives” guide management strategies for each big game herd unit. These objectives are established by the WGFD through a public and interagency review and input process and are set at a biologically sustainable and socially acceptable level. Management challenges for big game species include poor habitat conditions, fire management, drought, increased development and urbanization, habitat fragmentation, OHV misuse, disease, and the impacts of livestock grazing on the frequency, quality, and composition of key forage species. Migration bottlenecks are also an issue for many big game species. The BLM and the WGFD continually coordinate and evaluate actions affecting herd units and habitat conditions to determine appropriate management direction. Currently, Chronic Wasting Disease (CWD) is present in deer and elk populations throughout the planning area. Another emerging management issue for big game is the placement and use of livestock forage supplements that may contain chemicals toxic to wildlife. The impacts of these issues at the population level are not well understood.

Pronghorn

Pronghorn are a unique animal of the western plains and are the only living species in their taxonomic family (*Antilocapridae*). Herds of up to 1,000 individuals once inhabited the plains; now, herds commonly exceed 100 individuals, especially during winter. During winter, herds undertake local migrations to areas that are more protected from the natural elements or that have more available forage. Pronghorn show strong fidelity to territories and ranges. Any disturbance on summer and transitional ranges influences pronghorn populations through disruption of reproduction (Deblinger and Alldredge 1989). Wyoming is the center of the pronghorn range, and the planning area has one of the highest densities of pronghorn in the world (Kotter 2002; Lanka 2002). Pronghorn inhabit a wide variety of open rangeland habitat types throughout the planning area and forage primarily on Wyoming big sagebrush and other shrubs. Preferred pronghorn habitat is usually characterized by the presence of summer water and sagebrush in combination with rabbitbrush and antelope bitterbrush. Pronghorn generally do not inhabit areas in which sagebrush exceeds two to three feet in height (Sawyer and Lindzey 2000). Map 3-26—Pronghorn Habitat Locations shows habitat used by pronghorn throughout the planning area.

Summer and winter habitat is present throughout the planning area. The availability of browse, especially sagebrush, appears to be the limiting factor for pronghorn on winter range. Under severe winter conditions, pronghorn are further confined to limited crucial range generally occurring on lower south-southwest facing slopes that remain open during adverse conditions. Salt desert shrubs also are an important forage species in some areas (BLM 2008b).

Pronghorn require readily accessible water, which may be a limiting factor on the summer range (USDA 2002). The water requirements are met through foraging on plants and consumption of snow and natural surface water. However, adequate water is also available in reservoirs, pits, troughs, and wells during May and June. During dry years, water availability may be limited in late summer and fall when reservoirs may be dry and some wells are deactivated.

Livestock grazing occurs on the majority of the pronghorn summer range. Cattle and pronghorn generally have very little dietary overlap and, therefore, some cattle grazing is compatible with pronghorn habitats.

Cattle can directly compete with pronghorn for the same vegetative resources when their ranges overlap in shrub communities (e.g., Gardner's saltbush, winterfat, and bitterbrush are all palatable to both), and when cattle grazing affects forb species availability and composition on overlapping summer ranges. Also, Bleich et al. (2005) outlined some indirect adverse impacts from cattle grazing, including (1) reduction in the vigor of plants and their quantity and quality, (2) elimination or reduction in a plant's reproductive capacity, (3) reduction or elimination of locally important cover types and replacement with less favorable types or communities, and (4) alteration of composition of plant communities due to season of use, which can consume favorable plants and increase the growth of undesirable plants or weeds. The diets of domestic sheep, however, have considerable overlap with the pronghorn diet and, therefore, sheep can out-compete pronghorn for forage (BLM 2003c).

In most herd units, pronghorn populations are being raised through conservative harvests. Habitat conditions are generally good in terms of supporting pronghorn, and the long-term trend of decreasing domestic sheep numbers has probably benefited pronghorn by reducing competition for forage, particularly on winter ranges. Current management issues affecting pronghorn are varied, but the most important one is livestock fencing that restricts animal movement. Many historic fences were constructed to control domestic sheep and do not meet current fence standards needed to control cattle grazing. During the severe winter of 1983–84, many pronghorn were caught in the corners of these fences and eventually died. Because pronghorn tend to crawl under fences rather than jump over them, BLM fence specifications require placing the bottom wire high enough to allow pronghorn to pass without affecting the containment of livestock. Although any new public land fences are constructed within specifications of the *BLM Fence Handbook 1741-1*, older fences are not, and new fences constructed on state or private lands are not restricted to these specifications. Occasionally, snow may build up in the area between the bottom wire and the ground where it may impede herd movement. When problems with herd mobility are identified, the fences are modified or gates on these fences are opened, especially during severe snow years.

Another management issue is maintaining crucial winter range in terms of both health and acreage. During severe winters, animals concentrate on these habitats, and browse use of key species often reaches 100%. During more mild winters, pronghorn spend more time on adjacent transition habitat that allows the crucial winter range areas to recover. Development in or loss of this transition habitat is a concern in terms of maintaining pronghorn crucial winter range.

Mule Deer

Mule deer are distributed throughout the seasonal ranges in the planning areas and generally prefer habitat types in the early stages of plant succession, with numerous shrubs. They use the woody riparian, shrublands, juniper woodland, and aspen woodland habitat types extensively during spring, summer, and fall. These habitat types provide adequate forage areas, with succulent vegetation for lactating females and adequate cover for security and fawning. During winter, mule deer move to lower elevations to avoid deep snow that covers their forage. They are often found in juniper and limber pine woodlands, big sagebrush/rabbitbrush, bitterbrush/sagebrush steppe, and riparian habitat types (BLM 1987). The winter diet of mule deer may be supplemented by true mountain mahogany, rabbitbrush, bitterbrush, and serviceberry; however, these shrubs are often limited in quantity. Winter and crucial winter ranges are very important components of mule deer range. Summer and transition ranges also play an important role in the survival of the species. Map 3-27—Mule Deer Habitat Locations shows habitat used by mule deer throughout the planning area.

Livestock grazing occurs on the majority of mule deer summer and winter range. Cattle and mule deer have some dietary overlap, but generally cattle grazing is compatible within mule deer habitats. However, heavy cattle stocking may convert shrub-grassland habitats into less palatable shrublands, making them less useful for mule deer. The diets of domestic sheep, however, have considerable overlap with the mule deer diet, which can affect mule deer forage.

Loss of crucial winter range along valley bottoms and movement being restricted by transportation corridors and other fences are limiting factors to growth in mule deer herds. In some locations, conditions of crucial winter range are generally fair to poor. Plant communities are heavily used and shrublands are being taken over by juniper woodlands. Although summer habitats are in better condition, shrublands in many locations are becoming more mature and decadent, with mountain shrubs and aspen converting to predominantly sagebrush. In addition to their habitat, other mule deer management issues include restrictive fencing (described under "Pronghorn"), increased disturbance and stress due to industrial development and recreational off-road vehicle use, expansion of chronic wasting disease, and housing encroachment into historic habitat.

White-tailed Deer

White-tailed deer use woody riparian habitats (willow, waterbirch, and cottonwood) along the major creeks and rivers for both forage and cover. In general, white-tailed deer have increased throughout central and eastern Wyoming over the last 15 years; however, mule deer are far more abundant than are white-tailed. White-tailed deer populations continually fluctuate due to Epizootic Hemorrhagic Disease outbreaks. Map 3-28—White-tailed Deer Habitat Locations shows habitat used by white-tailed deer throughout the planning area.

Rocky Mountain Elk

Rocky Mountain elk are distributed throughout the planning area, especially adjacent to and in areas of higher elevation that have woody cover. Elk occur in herds to a greater extent than do the other big game mammals. During the winter, elk are widely distributed on lands at lower elevations, in areas with windswept ridges, or at elk feedgrounds. Crucial winter habitat is found along windblown ridges and south-southwest facing slopes. In winter, elk forage in sagebrush/mixed-grass, big sagebrush/rabbitbrush, and mountain shrub habitat types, in windswept areas where snow depth is less. Shrubs are consumed year-round but are especially important on the winter range when forbs and grasses are less accessible as a result of snow cover. During severe weather, elk concentrate in crucial winter range—areas within their normal winter range that are most likely to provide thermal cover and forage. Map 3-29—Elk Habitat Locations shows habitat used by elk throughout the planning area.

Most elk migrate in the summer to areas where cover is adequate and disturbing activities are minimal (BLM 1985). In summer, elk use aspen and conifer woodlands for security and thermal cover, ranging out into upland meadows, sagebrush/mixed-grass, and mountain shrub habitat types to forage. Dense aspen stands with dead falls that provide particularly good security cover and succulent forage are vital and serve as parturition areas. Elk diet consist mostly of grasses and forbs, with grasses being the dominant forage in spring and forbs being the dominant forage in summer months (Clark and Stromberg 1987). Aspen is also recognized as a preferred forage plant for elk in the summer.

Livestock grazing occurs on the majority of elk summer and winter range. Cattle and elk have considerable dietary overlap and over utilization of cattle may be detrimental to elk, especially on winter range areas. The diets of domestic sheep, however, have less overlap with elk diet, so sheep are less likely to compete with elk for forage.

Winter feedgrounds were incorporated into the planning area during the late 1940s and early 1950s to contain and provide supplemental food for elk that were damaging private haystacks during the winter. These feedgrounds reduced elk depredation of rancher's haystacks. The WGFD, through an MOU with the BLM, administers ten winter feedgrounds within the Pinedale Field Office. The establishment of the feedgrounds halted the migration of elk to traditional winter ranges in the Little Colorado desert and other lower-elevation areas. However, even with the existence of the feedgrounds, elk occasionally use private lands during the winter months.

Moose

Moose can be found along willow-covered riparian communities and on the aspen-conifer foothills throughout the year (BLM 1985). Moose are generalist browsers and are known to eat willow, bitterbrush, Douglas fir, serviceberry, subalpine fir, mountain ash, white-barked pine, cottonwoods, sedges, rushes, and blue spruce (BLM 1985, Clark and Stromberg 1987). Some intermediate areas between the stream bottoms and higher summer range are used during spring and fall. Winter populations are considerably larger than summer populations, because moose summering at higher elevations migrate to the lower stream bottoms to escape extreme snow depths (BLM 1985). Crucial winter and yearlong habitat is found along most major drainages throughout the planning area. Map 3-30—Moose Habitat Locations shows habitat used by moose throughout the planning area.

Bighorn Sheep

Bighorn sheep historically ranged within the planning area as indicated in early accounts by mountain men and settlers. Petroglyph panels at the Sugarloaf, White Mountain, and Cedar Canyon rock art sites in the Rock Springs Field Office and elsewhere depict bighorn sheep as important to prehistoric inhabitants of the region and they were probably common at that time. The populations found in Wyoming are a result of reintroductions of the species. Map 3-31—Bighorn Sheep Habitat Locations shows habitat used by bighorn sheep throughout the planning area.

Bighorn sheep prefer open grassy ridgetops, slopes, or benches within 100 meters of rocky outcrops, precipitous cliffs, or steep rocky slopes. They most commonly use rockland, upland meadow, sagebrush/mixed-grass, big sagebrush/rabbitbrush, and mountain shrub habitat types, foraging on forbs and grasses from early summer to late fall when they begin browsing on sagebrush, rabbitbrush, and bitterbrush as snows cover their other forage. Browse species are important foods during fall and winter. In desert or regions where lack of moisture limits grass growth, shrubs and trees are major food items. Bighorns are attracted to and seek out mineral and salt licks during spring and early summer. The species is not well adapted to deep and crusted snow and are forced to winter on the confines of southern exposures or wind-blown slopes near escape terrain. Distribution depends upon available water supplies, predators, and human disturbance.

Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) were introduced into the Laramie Range within the Casper Field Office in the early 1970s and late 1980s. This population did quite well for several years after the introductions, but has experienced an overall decline during the past 15 years. This is not surprising and has been observed in other similar introduction efforts. Bighorn sheep were also reintroduced into/augmented in the Ferris Mountains/Seminoe Reservoir area, near Encampment, in the Saratoga Valley, and at Laramie Peak in the Rawlins Field Office (BLM 1987).

There has been a dramatic shift in distribution of sheep from "traditional" habitats to areas further south that were more or less unoccupied. It is likely that the bighorn sheep that originally occupied suitable habitats in the planning area were the now extinct subspecies *Ovis canadensis auduboni*. This subspecies was well adapted to the smaller, xeric mountain ranges in central and southeastern Wyoming. The WGFD indicates that future introductions of bighorn sheep in this area should focus on the California bighorn sheep (*Ovis canadensis californiana*). This subspecies is nonmigratory, utilizes a greater proportion of browse in its diet, and occupies environments similar to suitable habitats in Wyoming. Bighorn sheep are managed cooperatively by the BLM for habitat and by the WGFD for population.

Other management issues concerning bighorn sheep include disturbance, stress from off-road vehicle use, housing encroachment into habitat, and alteration of natural fire cycles.

Trophy Game

Black Bear

Black bears occur within the planning area and primarily inhabit forested habitat types (i.e., Laramie Range, Wind River Range, Muddy Mountain, and the South Bighorns) at higher elevations. They are found within the aspen-conifer areas during spring and early summer (BLM 1985). These bears appear to move to higher, more remote areas during midsummer and fall. Along the Wyoming Range, black bear are found in the timbered areas along the Bridger-Teton National Forest.

Black bear are omnivores and opportunistic feeders who consume foods essential to replenishing body fat for the winter hibernation and for reproductive success. Due to a bear's secretive nature, population estimates are difficult to obtain and population objectives are not established, but rather bears are managed based on harvest and population trends. The BLM and WGFD utilize management guidelines established by the WGFD's Black Bear Management Plan (WGFD 2003a) to help direct management activities on BLM-administered land.

Mountain Lion

Mountain lions are fairly common but generally reclusive, with sightings reported occasionally. This species has one of the widest distributions of any native mammal in the western hemisphere and therefore occupies a wide variety of plant communities and habitats. Typical mountain lion habitat in western North America is open woodland and shrubland, especially oak scrub, pinyon, juniper, ponderosa pine, spruce, fir, and aspen, as well as shrublands such as sagebrush, desert shrub, mountain-mahogany, and snowberry, especially where these communities are interspersed with grasslands or meadows. Mountain lions also inhabit deep, rocky, vertical-walled river canyons containing riparian vegetation such as cottonwood and willows.

As an obligate carnivore, the mountain lion selects for large (deer/elk sized) prey. Research indicates that 80% to 90% of a lion's diet is ungulate sized prey; on average, an adult with an established territory will kill almost one deer sized-prey per week. Other prey species include elk, bighorn sheep, pronghorn, and smaller mammals. Mountain lions reside throughout the planning area; however, they are more common in areas associated with the canyons and foothills of mountain ranges where prey concentrate.

The main habitat component affecting mountain lion distribution in the planning area is the absence of large, undisturbed, remote wild areas. Most of the planning area is easily accessible; human presence and activities throughout the animal's habitat will probably continue to have some impact on mountain lion population distribution. Similar to black bears, population estimates for mountain lions are difficult to obtain. Mountain lion harvest levels are monitored; management direction for this species may be adjusted based on the age and gender structure of mortalities. The BLM and WGFD utilize management guidelines established by the WGFD's Mountain Lion Management Plan (WGFD 2006a) to help direct management activities on BLM-administered land.

Furbearing Animals

Furbearing animals in the planning area include badger, beaver, bobcat, marten, mink, muskrat, and weasel. Badger, bobcat, and weasel are habitat generalists, occupying all vegetative types in the planning area with appropriate prey base. Marten primarily utilize mixed-conifer forest and aspen communities within the ponderosa and lodgepole pine forests and the aspen, juniper, and limber pine woodlands vegetative types. Beaver, muskrat, and mink typically are found in the aspen and riparian and wetland vegetative types. Short-tailed weasels are found in coniferous forest, riparian shrub and meadow habitats, while long-tailed weasel are typically found in rock outcrops near water in desert shrub, grassland, and riparian shrub habitats (Cerovski et al. 2004).

Management challenges for beaver on BLM-administered lands are of two types: (1) restoring or maintaining beaver in riparian and aquatic communities, and (2) controlling beaver damage to other resources. Beaver can be beneficial in restoring degraded riparian and aquatic systems by raising the water level and helping to maintain high water tables, thereby encouraging recovery of hydrologic functions and reestablishment of riparian vegetation. Conversely, beaver can remove trees in well-established riparian systems and cause damage to facilities (e.g., damming road culverts, irrigation ditches, etc.).

Due to the wide distribution of other furbearing animals throughout Wyoming, no management challenges have been identified in the planning area. The primary management effort by the BLM is directed at maintaining the continuity of ecosystems in the planning area.

Predatory Animals

According to Wyoming statute, predatory animals include coyote, jackrabbit, porcupine, stray cat, gray wolf, red fox, raccoon, and skunk (striped and spotted). On June 7, 2013, the USFWS proposed to remove the gray wolf (*Canis lupus*) from the list of threatened and endangered species. From the standpoint of BLM management, most of the efforts and attention are focused on coyote, red fox, and skunk animal damage-control activities. The BLM does not conduct any habitat management activities for predatory animals.

Predatory animal damage-control activities on public lands are conducted by the U.S. Department of Agriculture APHIS-Wildlife Services in accordance with the national MOU and local action plans (BLM 1994b; BLM 1997b; BLM 1995b; BLM 2000a). These activities are conducted in response to requests from individuals, organizations, and agencies experiencing damage caused by wildlife. Animal damage control activities primarily include mechanical (trapping, shooting, and denning), chemical (poison), and nonlethal methods (noise devices, aversive conditioning, etc.). Through the Animal Damage Management Board, the State of Wyoming also conducts animal damage-control activities, particularly those actions involving rabies and other diseases. The management challenges of animal damage-control activities are to conduct a program that responds to predation problems and remains socially acceptable and safe in accordance with applicable laws and regulations.

Small Game

Small game in the planning area include the cottontail rabbit, snowshoe hare, red squirrel, fox squirrel, and gray squirrel. Cottontail rabbits are habitat generalists, occupying all vegetative types in the planning area. Snowshoe hare and red squirrel primarily utilize mixed-conifer forest and aspen communities within the ponderosa and lodgepole pine forests and the aspen, juniper, and limber pine woodlands vegetative types. Fox and gray squirrel typically occur in deciduous gallery forests. Populations of all small game species tend to be cyclic in nature. Due to the wide distribution of small game species throughout Wyoming, no management challenges have been identified in the planning area. The primary management effort by the BLM is directed at maintaining the continuity of ecosystems in the planning area.

Game Birds

Game bird management direction for the BLM is identified in the *BLM and Fish and Wildlife 2000 Upland Game Bird Habitat Management Plan* (BLM 1992c). All game bird species in Wyoming are managed for recreational use (e.g., hunting, bird watching, etc.).

Game birds include the ring-necked pheasant, blue grouse, ruffed grouse, wild turkey, sharp-tailed grouse, Greater Sage-Grouse, Hungarian partridge, and chukar partridge. The ring-necked pheasant is a game farm bird in Wyoming and generally occupies river-bottom agricultural lands and adjacent habitats on which the BLM has minimal management authority. Blue grouse typically utilize mountain and foothill forested habitats of the planning area. Wild turkeys generally are associated with river-bottom habitats and in the pine savannahs and foothills throughout the planning area. Sharp-tailed grouse, Hungarian partridge, and chukar partridge occupy grassland habitats within the planning area. Sharp-tailed grouse tend to be associated with sites dominated by native grasslands and woody draws, while Hungarian partridge are often associated with agricultural strip farming and mountain shrub communities. Sharp-tailed grouse are also frequently associated with sagebrush and mountain shrub communities. Habitats for the chukar partridge typically are broken topography and steep terrain. Greater Sage-Grouse are discussed in detail under the Special Status Species section of Chapter 3.

Management challenges focus on maintaining or enhancing the presence of game birds and the habitats upon which they depend. Management actions for game birds generally are directed at activities around delineated breeding and nesting habitats (e.g., sharp-tailed grouse leks). Some opportunities for wild turkey introductions in cooperation with the WGFD may exist in the planning area.

Migratory Game Birds

Migratory game birds in the planning area include waterfowl, mourning dove, and sandhill crane. Sandhill cranes typically occupy similar habitats as waterfowl. In Wyoming, mourning doves are typically associated with river-bottom lands and agricultural areas that provide necessary food, water, roosting, and breeding areas. BLM-administered public lands typically provide limited habitats for migratory game birds. These habitats generally are associated with water bodies and riparian and wetland areas that provide suitable nesting or roosting sites. Several HMPs have been developed on public lands in the past to increase the quantity and quality of these habitats; however, the majority of these habitats occur on state and private lands.

In general, small wetlands represent the most available habitats to waterfowl during spring and early summer. More permanent wetland habitats (e.g., large marshes, lakes, and reservoirs) and agricultural fields are used by migrating game birds during fall migration. Open river channels, warm water canals, tailraces below reservoirs, and agricultural habitats are used during the winter.

Water availability and water quality are two habitat parameters that influence waterfowl use of a site. The current drought in Wyoming has reduced wetland habitat quantity and quality within the planning area. Moreover, poor vegetation growth associated with the drought has reduced residual cover for upland nesting ducks. Like other states, Wyoming struggles with the degradation of wetland and adjacent upland habitats due to increased urbanization, agricultural conversion, and improper livestock grazing practices. During most years between 1952 and 1999, the WGFD flew a May duck breeding ground survey. Based on these counts, Wyoming was ranked sixth in duck production among the states. However, the May duck counts did not correlate with the low number of duck broods in the state during July. Recent research by the cooperative unit at the University of Wyoming indicates that ducks that do nest in Wyoming are productive, disproving a hypothesis, that Wyoming was a duck sink. An alternative hypothesis for the high number of ducks during April and May is that Wyoming provides good spring migration habitats for ducks during good water years.

Historic activities in watersheds that have contributed to loss or degradation of habitat in the planning area include recreation, agriculture, forest management, fire management, urbanization, and land development. Management of wetlands and riparian areas in this arid climate continues to be a challenge. Other challenges include access to public lands during breeding season, contaminants, invasive, non-native plant species, and water quantity and quality.

Nongame Species

Existing conditions for four categories of nongame wildlife (raptors, neotropical migrants, mammals, and reptiles and amphibians) are briefly described below. Raptors and neotropical migrants are afforded protection under the Migratory Bird Treaty Act. Additional detail about nongame wildlife occurring with the planning area can be found in the WGFD's *Atlas of Birds, Mammals, Amphibians and Reptiles in Wyoming* (Cerovski et al. 2004, Orabona et al. 2012, WGFD 2010c).

Raptors

Raptors include eagles, hawks, owls, falcons, and vultures. The planning area provides seasonal and yearlong habitat for a multitude of raptor species. Raptor utilization for specific and region wide areas varies greatly year-to-year and season-to-season depending on prey availability, habitat quality, level of raptor populations, and other factors. Common breeding raptors in the planning area include Swainson's hawk, ferruginous hawk, red-tailed hawk, northern harrier, golden eagle, prairie falcon, American kestrel, and great-horned owl. Of these raptors, golden eagle and great-horned owl are yearlong residents, and smaller winter populations of red-tailed hawk and northern harrier occur within the planning area.

Other raptor species adapted for open areas found during various times of the year include rough-legged hawk, a winter resident; snowy owl, a rare winter visitor; long-eared owl, a denizen of open and forested areas; and short-eared owl. Ospreys are common summer residents in the planning area along the major river and stream systems. Forest raptors occurring in the planning area include sharp-shinned hawk, Cooper's hawk, northern goshawk, and northern saw-whet owl. Burrowing owls and bald eagles are also considered "common" in parts of the planning area. Table 3-135 describes many of the common raptor species found within the planning area.

Table 3-135. Common Raptor Species within the Planning Area

Name		Nesting Habitat	Prey
Prairie falcon	*(Falco mexicanus)*	Low rock outcroppings to tall vertical cliffs	Cottontail rabbits, prairie dogs. horned larks, snakes, and ground squirrels
American kestrel	*(Falco sparverius)*	Dead snags, clay streambanks, and rimrock	Insects. small birds, and small mammals
Swainson's hawk	*(Buteo swainsoni)*	Dry plains, open foothills, open forest, sparse trees, and riverbottoms	Rabbits. other small mammals, grasshoppers, and birds
Ferruginous hawk	*(Buteo regalis)*	Low cliffs, buttes, trees, on the ground. and artificial nesting platforms	Primarily rodents
Red-tailed hawk	*(Buteo jamaicensis)*	Riparian zones and timbered areas	Cottontails, jackrabbits, rodents, reptiles, and birds
Northern harrier	*(Circus cyaneus)*	Commonly on the ground or in dense vegetation	Rodents, amphibians, reptiles, and birds
Golden eagle	*(Aquila chrysaetos)*	Cliffs, ledges, and pinnacles that provide a view of the area	Rabbits, rodents, and carrion
Great horned owl	*(Bubo virginianus)*	Cliff holes, rock crevices, and trees	Small mammals and juvenile prairie falcons

Management direction for the BLM is identified in the *BLM Fish and Wildlife 2000 Raptor Habitat Management Plan* (BLM 1992d). Management procedures and activities for raptors have been identified by the USFWS management guidelines (USFWS 2002d) and Avian Protection Plan guidelines (APLIC and USFWS 2005). Golden eagles also are protected under the Bald and Golden Eagle Protection Act. The *Wyoming Partners in Flight Wyoming Bird Conservation Plan Version 2.0* identifies habitat requirements and threats for raptor species (Nicholoff 2003).

Ravens are common in the planning area. Ravens are opportunistic and intelligent. They are scavengers, feeding on carrion, eggs (including sage-grouse eggs) and garbage. Studies are being conducted to determine the extent of raven predation on sage-grouse chicks. Wyoming classifies ravens as a pest; however, they are protected by the Migratory Bird Treaty Act (MBTA).

Management challenges for raptors generally are directed at activities around nesting habitat, concentration sites (e.g., winter roosts), and foraging areas. Management of power lines and contaminants for raptor conservation are ongoing issues in the planning area. Emerging issues for raptors in the planning area are wind energy development and the impacts of the West Nile virus on raptor populations.

Neotropical Migrants

More than 400 avian fauna species have been documented in Wyoming; 73 of these use riparian habitats. Most of the avian species are classified as passerine or songbirds, and more than half of these are considered year-round residents. Many of these species breed in Wyoming, others rely on habitats within the state during migration, and a few species breed to the north and winter in Wyoming. Most songbirds in the planning area are those adapted for open areas. The vast sagebrush component of the planning area provides important habitats for major indicators of that type: sage thrasher, Brewer's sparrow, and sage sparrow. Forests, riparian areas, and water resources within the planning area also provide habitats for multitudes of other species. Preferred habitats for these species range from sagebrush and grasslands to marshes and wetlands to coniferous and deciduous forests.

Neotropical migrant management direction for the BLM is identified in the *BLM Fish and Wildlife Nongame Migratory Bird Conservation Plan* (BLM 1992e). *Wyoming Partners in Flight Wyoming Bird Conservation Plan* provides habitat requirements for neotropical migrant species and identifies their threats (Nicholoff 2003).

The United States has ratified international conventions regarding the protection of migratory birds. The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC § 703-711) implements the protective measures of these conventions. The MBTA prohibits "taking," which is the killing, possession, or transport of any migratory bird or its eggs, parts, or nests except as authorized by a valid permit. These actions may be permitted only for educational, scientific, and recreational purposes, and harvest is limited to levels that prevent over utilization. Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, was issued in January 2001 and emphasizes that federal actions are subject to the MBTA. It directs federal agencies (such as BLM) to evaluate the effects of agency actions in NEPA documents.

Under the MBTA, permits can be issued by USFWS for the intentional take of specific birds and nests that have been identified prior to application for the permit; however, no permits can be issued for take that is incidental to the action being taken (i.e., incidental take). For example, if by constructing a livestock water development an active migratory bird nest is destroyed, the action would constitute an "incidental take" of the nest where the intent of the action was not to destroy the migratory bird nest but to construct a livestock water development. Therefore, taking the nest is incidental to constructing the development.

Management challenges focus around maintaining or enhancing the presence of these species and the habitats upon which they depend. Management actions for neotropical migrants generally are directed at activities around nesting habitat and migration corridors. Ongoing conservation issues for neotropical migrants include managing hazards such as power lines, communication towers, contaminants, and wind turbines.

Reptiles/Amphibians

Reptiles have become adapted to living and reproducing entirely on land. They include turtles, lizards, and snakes. Their skin is dry and normally covered with either horny scales or bony plates to reduce loss of water from the skin and to serve as a protective armor. Their digits are armed with horny claws. The eggs of reptiles are covered by a leathery shell and are normally deposited in soil or sand.

The climate and habitat types in the planning area restrict the diversity and abundance of reptiles and amphibians. In general, reptiles occurring in the planning area, including aquatic (turtles), rock outcrops (lizards), and a variety of terrestrial vegetative types (snakes and lizards occupy a variety of habitats). Amphibians occurring in the planning area occupy aquatic habitats, including springs, wetlands, riparian corridors, or open water for the first phase of their life-cycles. Amphibians represent a food source for many mammals, birds, snakes, and fish. Their principal defense against predators is their ability to move and hide quickly and to produce toxic substances with their skin glands. Breeding calls of male frogs and toads attract mature adults of the same species to suitable breeding sites. Management challenges for reptiles and amphibians primarily include maintaining a variety of habitat types and components (e.g., rock outcrops, riparian, and wetlands) in proximity to provide for the requirements of these species.

Invasive, Nonnative Species

The proliferation of invasive, nonnative species (INNS) including invasive nonnative plant species (INNPS), as well as other organisms, such as insects, mammals, and pathogens, contributes to loss of rangeland productivity, reduced water availability, reduced structural and species diversity, loss of wildlife habitats, and, in some instances, is hazardous to human health and welfare. Federal and state laws regulate INNS control on federal lands. In accordance with these policies, the BLM works cooperatively with the State of Wyoming and the County Weed Control districts through a cooperative weed and pest management program to preserve and enhance all resources within the planning area. Other pests classified as INNS include any biological life form that poses a threat to human or ecological health and welfare. Table 3-136 shows a list of designated pest species within the planning area.

Table 3-136. Wyoming Weed and Pest Control Act Designated Pests

Common Name
Grasshopper
Mormon cricket
Prairie dog[1]
Ground squirrel
Mountain pine beetle
Beet leafhopper

[1]Prairie dogs are currently addressed as a special status species; refer to the Special Status Species section of this document for more information on prairie dogs.
Source: Wyoming Weed and Pest Council 2005. Designated Pests W.S. 11-5-102 (a)(xii).

Although applying pest-control measures has been limited until this time, it is reasonable to conjecture that issues such as the West Nile virus, bird flu, other invasive and noxious weeds, nonnative animals, tree pathogens, may need to be addressed in the foreseeable future. APHIS is currently the BLM's agent for controlling animal pests.

Fisheries

Public lands within the planning area provide habitats for up to 49 species of native fish and 29 non-native fish. These species have adapted to a variety of stream habitats, from the cold rapid waters of mountainous areas to the slow turbid waters of the high desert. The BLM is responsible for managing fisheries habitats, while management of fish species is overseen by state and federal wildlife management agencies. The WGFD manages resident fish populations. Fisheries habitats include perennial and intermittent streams, lakes, and reservoirs that support fish through at least a portion of the year.

Fisheries habitats conditions are closely allied with the ecological conditions of riparian plant communities. Riparian vegetation occurs along drainages and serves to moderate water temperatures, control erosion by adding structure and stability to stream banks, provide in-stream habitats for fish, and provide organic material and nutrients to aquatic macroinvertebrates. Vegetation within the floodplain of drainages also serves to dissipate stream energy, store water for later release and provide areas for groundwater infiltration and rearing areas for juvenile fish. In addition to physical habitat features such as vegetation, water quality also influences aquatic habitats. Specifically, water temperature, turbidity, and dissolved oxygen determine the quantity and quality of aquatic habitats usable by various fish species. Other factors influencing aquatic habitats in the planning area include adjacent land use and the location of such habitats relative to natural landscape features.

Agriculture, vegetation management, fire management, development, OHV use, and recreation have historically influenced fisheries habitats in the planning area and continue to have effects. Another factor impacting fisheries habitats and conditions is water quality, which is regulated by the Wyoming DEQ. Historic and current water withdrawals for irrigation and other beneficial uses seasonally restrict the amount and distribution of aquatic habitats available for fisheries; however, water use in the planning area is regulated by the Wyoming State Engineer's Office. Although irrigation and other types of reservoirs can contribute to water depletion, they also trap sediment, which can degrade aquatic habitats, thereby reducing the sediment load downstream.

In addition to water depletion from historic activities (e.g., irrigation diversions), activities that result in soil compaction or erosion; increased sedimentation of streams; removal and degradation of riparian vegetation; changes in water temperature, velocity, volume, or timing of flows; and spread of INNS in riparian corridors have altered aquatic habitats in the planning area; some continue to do so. For example, in some riparian areas, historic improper livestock grazing contributed to aquatic habitat degradation through accelerated loss of streamside vegetation, compaction of soil, and increased stream bank erosion and silt deposition. To address these historic issues and the health, productivity, and sustainability of BLM-administered land in Wyoming, the BLM currently employs standards and guidelines for managing public rangelands toward the following fundamentals (BLM 1998a):

- Watersheds are functioning properly
- Water, nutrients, and energy are cycling properly
- Water quality meets state standards
- Habitats for special status species are protected.

Historic vegetation removal that impacted aquatic habitats primarily occurred through vegetation treatment, fire, improper livestock grazing, development, and involved erosion and sedimentation. The development of private lands within the planning area also contributed to effluent discharge, stream channelization, stream diversions and dams for reservoirs and power plants, and changes in water temperature and water quality.

In addition to the historic activities described above, sport fish stocking occurs in designated multiple-use reservoirs in the planning area suitable for fisheries. Introductions of nonnative game fish to Wyoming have occurred as early as 1880. Introducing game fish has had positive economic impacts for the state through recreational fishing; however, in some instances, there have been adverse impacts to native cutthroat populations through competition (space and forage), predation, and hybridization.

Casper Field Office

Wildlife

This section includes a description of the existing conditions and management challenges of habitat types and statutory wildlife groups unique to the Casper Field Office. The Casper Field Office straddles the transitional zone between three major ecoregions: the Great Plains and Palouse Dry Steppe, the Southern Rocky Mountains, and the Intermountain Semidesert and Desert provinces (Bailey 1995).

Grasslands cover 3,091,710 acres (36%) of the field office (22% of BLM-administered land). The open grassland, sagebrush, and shrubland vegetative types are home to many raptor species, such as the Swainson's hawk, northern harrier, and prairie falcon. The Casper Field Office administers 165,000 acres of forests and woodlands. Mountain shrub habitat covers 204,220 acres, or only 2% of the field office (approximately 3% of BLM-administered land). Riparian and wetland vegetative types occur on less than 1% of the public lands within the Casper Field Office.

The sagebrush vegetative type covers 2,408,100 acres (28%) of the Casper Field Office (46% of BLM-administered land). Sagebrush provides crucial winter range for big game and is essential for sagebrush obligates, such as the Brewer's sparrow, sage sparrow, and sage thrasher (Cerovski et al. 2001). Many other species utilize the sagebrush vegetative type, including a number of reptiles and invertebrates.

Due to the importance of the sagebrush vegetative type to wildlife, the WGFD, in cooperation with the BLM, is conducting habitat inventories and evaluation studies of two sagebrush habitat areas in the field office: Bates Hole and Rattlesnake Hills (WGFD 2005c). For the Bates Hole area, WGFD calculated a utilization (i.e., browsing by livestock and wildlife) threshold of approximately 35 percent for the current year's big sagebrush production. In other words, when 35 percent or more of the current year's growth of a big sagebrush plant is utilized, detrimental impacts on individual big sagebrush plants and the big sagebrush community as a whole may occur. For seven of ten years (1993 to 2002) of monitoring by WGFD, big sagebrush plants and communities exhibited excessive utilization and detrimental impacts. The WGFD study also determined that spring (April-June) precipitation patterns play an integral role in big sagebrush production.

The WGFD monitoring of big sagebrush plants and communities in the Rattlesnake Hills area identified a 35% utilization threshold for the current year's growth of big sagebrush. Moreover, contrary to the Bates Hole study, results of the Rattlesnake Hills 9-year (1994 to 2002) study revealed that only two of the nine years exhibited excessive utilization of the current year's production or detrimental impacts to big sagebrush plants and communities. However, during one of these two years (2000), the WGFD documented a dramatic increase in utilization of the current year's growth of big sagebrush, primarily from wintering domestic sheep.

Table 3-137. Habitat Management Plans for the Casper Field Office

Habitat Management Plan	Acres	Management Focus
33-Mile Reservoir HMP (BLM 1974a)	150	Waterfowl and shorebird habitats
Bald Eagle HMP for the Platte River Resource Area and Jackson Canyon ACEC (BLM 1992a)	14,230	Bald eagle habitats
Bates Creek Trout HMP (BLM 1973)	1,350	Fisheries habitats
Bates Creek Reservoir HMP (BLM 1972a)	1,820	Waterfowl habitats
Bishop Waterfowl HMP (BLM 1972b)	120	Waterfowl habitats
Bolton Creek Action Plan (BLM 1988b)	440	Riparian habitats

Habitat Management Plan	Acres	Management Focus
Ferris-Seminoe HMP (BLM 1983)	Approximately 50,000	Wildlife and fisheries habitats
Goldeneye Wildlife and Recreation Area (BLM 1978)	890	Fisheries, wildlife, and recreation
Laramie Peak Big Horn Sheep HMP (BLM 1995a)	Approximately 10,000	Bighorn sheep habitats
Teal Marsh Reservoir HMP (BLM 1974b)	120	Waterfowl habitats

Note: Acreage is BLM-administered surface.

The BLM developed HMPs for site-specific areas within the field office containing one or more of the vegetative types described above that have the potential for improvement. For these areas, the Casper Field Office uses HMPs to focus management on habitat conservation and improvement for fish and wildlife species. Table 3-137 summarizes the name, approximate size, and management focus of existing HMPs for the field office.

Big Game

The field office contains 1,124,830 acres of designated crucial winter range for big game, 25% (281,160 acres) of which occurs on lands managed by the BLM. Crucial winter ranges for some big game species overlap. The field office encompasses all or part of 41 big game populations or herd units (12 pronghorn, 15 mule deer, three white-tailed deer, ten elk, and one bighorn sheep).

Pronghorn and Mule Deer

Population sustainability of pronghorn and mule deer at their objective level depends, in part, on habitat quality, quantity, and availability on public lands. Currently, nine of 12 (75%) pronghorn and 13 of 15 (87%) mule deer populations within the field office are below objective. Overall, winter habitat conditions for pronghorn and mule deer are in poor condition due to a variety of reasons resulting in poorer fawn production, survival, and recruitment, and, thus, lower population levels. Over the past ten years, it has become apparent, in many herd units, that habitat conditions cannot sustain pronghorn or mule deer numbers at the current levels. The BLM and the WGFD have cooperatively developed and implemented a number of habitat enhancement projects to reduce this trend. In addition, the WGFD is reviewing population objectives and management options to address habitat and population concerns.

Of the 496,930 acres of pronghorn crucial winter range in the field office, 114,920 acres (approximately 23%) occur on BLM-administered land surface. Similarly, of the 635,160 acres of mule deer crucial winter range in the field offices, 170,720 acres (approximately 27%) occur on BLM-administered land surface. Many of the pronghorn and mule deer populations in the field office experienced large-scale die-offs during the winter of 1983-1984. Populations recovered, but during the winter of 1992-1993, pronghorn and mule deer experienced another year of winter mortalities. In 2000, the onset of a severe drought and its impact on the rangelands has hampered the populations' abilities to recover. As a result, populations remain below levels observed in the early 1990s.

Elk

Unlike pronghorn and mule deer, elk populations have thrived. Of the ten elk herd units within the field office, seven are above objective and one is at objective. Of the 130,210 acres of elk crucial winter ranges in the field office, approximately 33,630 acres (26%) occur on land surface administered by the BLM. In general, elk populations have increased throughout the field office over the last 15 years. CWD has been documented in some of the elk herd units within the field office. The impacts of this disease at the population level are not thought to be a significant factor for elk; however, these impacts are not completely understood.

White-tailed Deer

White-tailed deer populations in the field office are healthy and occupy cottonwood galleries and riparian habitats mostly on private lands near riverine corridors. Of the three white-tailed deer herd units within the field office, one herd has a population objective. In the remaining two herd units, population dynamics is not managed actively due to the preponderance of private lands.

Bighorn Sheep

Introduced populations of Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) from Whiskey Mountain are found in the Laramie Range. This population did quite well for several years after the introductions, but has experienced an overall decline during the past 15 years. The Laramie Peak Bighorn Sheep Herd is the only bighorn sheep herd unit within the field office. This herd is believed to be below objective, although no accurate population estimate exists. Of the 13,600 acres of bighorn sheep crucial winter range in the field office, 790 acres occur on BLM-administered land. In 1995, the BLM entered into a MOU for the preparation of the Laramie Peak Bighorn Sheep HMP to conduct a series of vegetative treatments and management actions aimed at increasing sheep population. The BLM will continue to support future bighorn sheep introduction efforts by the WGFD.

Trophy Game

Trophy game, found on BLM-administered land in the field office, include black bear and mountain lion. Black bears occur within the field office and primarily inhabit forested habitat types (i.e., Laramie Range, Muddy Mountain, and the South Bighorns) at higher elevations. These areas are encompassed in the WGFD's Laramie Peak bear management unit (BMU) and the Bighorn BMU.

Mountain lions reside throughout the field office; however, they are more common in areas associated with the canyons and foothills of mountain ranges (i.e., Laramie Range, Rattlesnake Hills, the South Bighorns, and the Pine Ridge) where mule deer concentrate. Lions within the field office are encompassed in the WGFD's southeast lion management unit (LMU), the Bighorn LMU, the north central LMU, and the southwest LMU. Management challenges for trophy game are similar to those discussed for big game. In addition, bear baiting around developed recreation areas poses an ongoing management challenge.

Migratory Game Birds

The Casper Field Office includes parts of two joint venture areas (Intermountain West and Northern Great Plains). Ducks Unlimited has developed a national conservation plan (Ducks Unlimited 2004) that addresses waterfowl management needs, including those in Wyoming. In addition, several HMPs have been developed for the field office to address site-specific areas of waterfowl habitats (Table 3-137). The BLM will continue to look for opportunities to develop and enhance migratory bird habitats within the field office.

Nongame Wildlife

Existing conditions for four categories of nongame wildlife are briefly described below.

Raptors

Raptors include eagles, hawks, owls, falcons, and vultures. Ten species of diurnal raptors and five species of owls are known or suspected to occur within the field office. Nine of the ten raptor species breed in Wyoming; the remaining species—the rough-legged hawk—is a winter resident. Four of the owl species are year-round residents in the state, while the snowy owl is a winter resident only. Raptors can be found collectively in all vegetative types in the field office. Table 3-138 summarizes the potential number of raptors and nongame bird species in the field office.

Table 3-138. Summary of Potential Number of Raptor and Nongame Bird Species in the Casper Field Office

Season/Time of Year	Number of Diurnal Raptor Species	Number of Owl Species	Number of Nongame Bird Species	Total Nongame Avian Species
Breeding/Year-round	9	4	127	140
Winter/Migration	1	1	41	43
Total	**10**	**5**	**168**	**183**

Source: WGFD 2005d

Currently, approximately 2,000 raptor nests have been documented in the field office. Not all these nests are occupied; however, the BLM and the WGFD regularly survey and monitor raptor nest activity.

Neotropical Migrants

For the purposes of this RMP, neotropical migrants include birds that breed in the United States and Canada and winter in Latin America (Nicholoff 2003). The terms “neotropical migrants” and “nongame birds” are used interchangeably for this discussion. Approximately 168 nongame bird species are known or suspected to occur within the Casper Field Office. This includes waterbirds, shorebirds, marshbirds, and a range of songbirds, both residents and neotropical migrants. More than 120 of these species breed in Wyoming and more than 40 rely on habitats within the state during migration. A few species, such as the snow bunting and American tree sparrow, migrate to Wyoming in the autumn and remain during the winter.

Mammals

Twenty-nine species of nongame mammals are known or suspected to occur within the field office (WGFD 2005e). Four bat species (eastern red bat, hoary bat, silver-haired bat, and the eastern pipistrelle) potentially occurring within the field office are considered a management priority; however, no specific habitat components have been delineated on public lands in the Casper Field Office.

Reptiles/Amphibians

Amphibians potentially occurring in the Casper Field Office include tiger salamanders, toads, and frogs. Population data for reptiles and amphibians in the Casper Field Office are unknown.

Fisheries

The BLM has developed several activity plans to focus management of site-specific fisheries and aquatic habitats in the Casper Field Office, including the Bolton Creek Action Plan, Bates Creek Aquatic Habitat Management Plan (HMP), and the Goldeneye Wildlife and Recreation Area HMP. These activity plans are in various stages of implementation. Their management focus is identified in Table 3-137. In addition, the WGFD has developed Basin Management Plans that identify fish species present, describe the miles of stream by class and acres of standing water, and identify habitat challenges for management basins located in the field office.

Approximately 57 fish species occur within the field office; a few fish-bearing streams occur on BLM-administered public surface due to the fragmented land ownership pattern. Most fish-bearing streams occur on lands under state or private ownership. Where fish-bearing streams do occur on public lands, they generally occur on small, isolated land parcels. Drainages providing fisheries habitat within the field office include the North Platte, Cheyenne, Powder, Wind, and Niobrara watersheds.

Species identified by the WGFD as a priority for management include 22 sport fish and ten fish species classified as NSS. Twenty-six other fish species, not categorized as either sport or NSS, occur in the field office. The black bullhead is classified as both NSS and sport fish.

Management actions for fish generally address water sources and rights; habitat restoration, improvement, and conservation; impacts from other BLM resource program authorized activities; floodplain connectivity; land-tenure adjustments; recreational; and other MAs.

Kemmerer Field Office

Wildlife

This section provides wildlife and habitat information unique to the Kemmerer Field Office. Please see the Wildlife section at the beginning of the Wildlife and Fisheries section for wildlife and habitat information that spans the entire field office.

Wildlife and Habitats in the Kemmerer Field Office

The field office is within the ecoregions of the Southern Rocky Mountain and the Intermountain Semidesert provinces (Bailey 1995). The convergence of these zones results in a diversity of vegetative types, as listed in Table 3-98. The habitats and wildlife within the field office are representative of northern Great Basin flora and fauna. Vegetation zones in the field office are mostly the foothills scrub zone dominated by sagebrush, with timbered mountain slopes, some desert and basin zone, river bottoms, and limited alpine zones. These provide a broad range of diverse habitat types supporting the assemblages of species that live within the field office.

Sagebrush, conifer forest, and desert shrubs vegetative types dominate the field office (Table 3-98). Sagebrush covers 2,095,200 acres of the field office, of which 1,049,350 acres is BLM-administered surface land. Although only representing approximately 3% of the field office, riparian and wetland habitats provide important areas for wildlife use and avifauna nesting. Riparian habitats occur primarily in association with the major tributaries and main stems of Thomas Fork, Smiths Fork, Hams Fork, and Blacks Fork; Fontenelle, Raymond, Coal, and Rock creeks; and the Green and Bear Rivers.

The Bear River Divide, Rock Creek Ridge, and Sublette Range form a major ridgeline that runs north and south along the west side of the field office. Commissary Ridge, Oyster Ridge, and the Hogsback form a ridgeline running north and south through the central portion of the field office. These two major ridgelines are very important migratory pathways for migratory raptors and neotropical migrant birds. Based on GAP vegetation data, approximately 21% of the field office (822,810 acres) is forested, of which 114,310 acres are on lands administered by the BLM.

Current wildlife habitats in the field office exhibit a range of existing conditions from habitats in proper functioning condition to habitats in something less than proper functioning condition, and large, contiguous blocks of habitats to small, fragmented patches of habitats. Through habitat management and restoration, the BLM intends to maintain and reestablish populations of native species that have historically used the range located within the field office boundaries. Hunting occurs throughout the field office in accordance with the State of Wyoming regulations. In addition, the field office currently is a "Bighorn Sheep Non-management Area" (Wyoming State-wide Bighorn/Domestic Sheep Interaction Working Group 2004).

Big Game

BLM-administered lands in the Kemmerer Field Office provide the majority of crucial winter range for pronghorn, mule deer, and elk populations that occur between the Wyoming and Uinta mountain ranges. The field office encompasses all or part of 18 big game populations or herd units (4 moose, 4 mule deer, 3 pronghorn, and 7 elk). Of these, four moose, two mule deer, three pronghorn, and three elk herd units include lands administered by the BLM. Much of the information presented below on big game herd units was taken from the WGFD job completion reports at http://gf.state.wy.us/wildlife/index.asp (WGFD 2009a).

Pronghorn

Three pronghorn herd units occur in the Kemmerer Field Office: the Sublette, Carter Lease, and Uinta Cedar Mountain herd units. Pronghorn herd units occupy approximately 3,313,350 acres in the field office, of which approximately 1,419,940 acres (43%) are BLM-administered surface lands. Pronghorn post-season population estimates for the Sublette Herd Unit averaged 52,520 between 2000 and 2009. The 2009 estimate was 57,000 pronghorn, surpassing the population objective of 48,000 pronghorn. Hunt area 93 is the only hunt area within the herd unit that extends onto BLM-administered lands. The population objective level for hunt area 93 is 8,000 pronghorn. The post-season population estimate for this hunt area was 7,177 in 2005. Pronghorn population estimates for the Carter Lease Herd Unit averaged 7,107 between 2000 and 2009. The 2005 estimate was 9,207, far greater than the herd unit population objective of 6,000 pronghorn. Pronghorn population estimates for the Uinta Cedar Mountain Herd Unit averaged 7,075 between 2000 and 2009. The population appears to be decreasing, with the 2009 estimate of 6,903 pronghorn, falling below the herd unit objective of 10,000.

Approximately 466,370 acres of pronghorn crucial winter range occur in the field office, of which approximately 224,470 acres are BLM-administered surface and 294,300 acres are federal mineral estate. Major winter range areas are associated with lower Fontenelle and Slate creeks and the Green River. The largest winter range area is associated with lower Hams Fork, Blacks Fork, and Muddy Creek. Smaller winter range areas are south of Interstate 80, west of Sage Junction and Albert Creek along State Highway 189. The availability of browse, especially sagebrush, appears to be the limiting factor for pronghorn winter range.

Mule Deer

Mule deer occupy a wide range of habitats and almost all of the BLM-administered surface lands in the Kemmerer Field Office constitute summer range for mule deer. Limited use occurs in the area bounded by State Highway 412, U.S. highways 189 and 30, and I-80. Population sustainability of mule deer at their objective level depends, in part, on habitat quality, quantity, and availability on public lands. Two mule deer herd units (Wyoming Range and Uinta) occupy approximately 3,930,900 acres in the field office, of which approximately 1,423,950 acres (36%) are BLM-administered surface lands. The Wyoming Range Herd Unit has shown a downward population trend from an estimated 37,639 mule deer post-season 2000, to an estimated 26,057 mule deer post-season 2009. The population is currently 81% below the population objective of 32,000. High mule deer mortality during the winters of 2001- 02, 2003-04, and 2004-05, combined with drought conditions on summer and winter ranges resulting in poor fawn production, have kept this population depressed.

In the Uinta Herd Unit, mule deer populations generally are stable. The average post-season population estimate between 2000 and 2004 was 19,580 animals. The 2005 population estimate was 18,536, slightly below the herd unit objective of 20,000 mule deer. Because of herd mixing across the Utah-Wyoming state line and differing data collection methods between states, confidence in the accuracy of population estimates is low. Drought conditions and over-winter morality have been somewhat less severe in the Uinta Herd Unit than in the Wyoming Range Herd Unit. Fawn production data from 2003-2005, as well as fairly high buck ratios, point to good recruitment and an increasing population.

There are approximately 467,350 acres of mule deer crucial winter range in the field office, of which approximately 244,350 acres (52%) are BLM-administered surface lands. The largest winter range is more than 60-miles long and is associated with the western and southern portions of the Bear River Divide, Rock Creek Ridge, and the Sublette Range. Fontenelle and Slate creeks provide winter range in the northeastern portion of the field office. Other areas of winter range include Muddy Creek and Blacks Fork near Piedmont and other smaller scattered areas in the field office. No winter feeding program occurs for mule deer in the field office.

Rocky Mountain Elk

Within the Kemmerer Field Office, BLM-administered lands provide less cover for elk and have a higher degree of road access than the adjacent National Forest System lands. Almost all the BLM-administered lands in the Kemmerer Field Office could be considered summer range for elk. However, the elk are migratory, and most migrate to the Bridger-Teton or Wasatch National Forests in the summer. Some elk remain on higher elevation BLM-administered lands throughout the summer in areas where cover is adequate and disturbing activities are minimal. Only those areas north of Kemmerer, south of Mountain View, and along the northern portion of the Bear River Divide are considered occupied summer range. Nonetheless, they are important because the long stringers (continuous strands) of cover along ridges allow elk access to forage and winter range. High country areas along the Forest boundary (aspen-conifer associations) support considerable spring and fall and some summer elk use. These areas also are used for calving. Winter range appears to be the main limiting factor for elk in the field office; however, poor forage conditions from drought conditions are contributing factors to low calf production and survival.

There are approximately 461,060 acres of elk crucial winter range in the field office, of which approximately 272,480 acres (59%) are BLM-administered surface lands. Elk crucial winter range is concentrated in five major locations, mostly in the northern portion of the resource area. These areas strongly overlap with mule deer wintering areas, but also include areas with deeper snow. The two largest winter range areas are to the northeast and northwest of Kemmerer in the north-central portion of the field office, associated with the western side and southern aspects of Rock Creek Ridge, and an area associated with Fontenelle and Slate creeks. There are many smaller areas scattered from Lake Viva Naughton and the Sublette Range north. Two moderate-sized winter ranges are located south of I-80, one in the vicinity of Hickey Mountain and the other southwest of Fort Bridger. Weather conditions influence the use of these two southern winter ranges. In mild winters, many of the animals never completely move out of summer range areas in Utah.

Seven elk herd units occur in the field office, of which three—the Afton, West Green River, and Uinta herd units—occupy BLM-administered surface lands. The Afton Herd Unit elk population has generally been stable for the last few years. The post-season population estimate averaged 2,385 elk between 2000 and 2009. The 2005 population estimate was 2,102, slightly below the population objective of 2,200. Some elk from Idaho Herd Units winter in Wyoming. Mixing of elk between Wyoming and Idaho and variability in the timing of movement complicates an accurate determination of population numbers. The principle issues concerning elk management in the Afton Herd Unit are related to damage to private landowner forage and numbers of animals on the two-winter feed grounds in this unit. These two feed grounds, the Alpine feed ground and the Forest Park feed ground occur in the field office. The purpose of the Alpine feed ground is to alleviate private property damage and motor vehicle collisions; while the purpose of the Forest Park feed ground is to prevent starvation of animals. Neither feed ground is on BLM-administered lands, but there have been instances of emergency feeding, such as during the severe winter of 1996 and 1997.

The West Green River Herd Unit population estimate averaged 4,452 between 2000 and 2009. The 2009 estimate was 7,107 elk, substantially greater than the population objective of 6,000 elk. Drought conditions affect elk through reduced forage production and poor body conditions, which could lower calf production and survival. Elk numbers observed on trend counts have remained stable on these winter ranges.

The Uinta Herd Unit management objective is for 600 wintering elk. The population is thought to have been at or near objective since 2000. However, confidence in the population estimate is low because of herd mixing across the Utah-Wyoming state line and differing data collection methods between states. Wintering numbers and harvest levels highly depend on weather conditions affecting timing and extent of elk seasonal movements. Drought conditions do not seem to have affected elk populations as much as mule deer or pronghorn.

Moose
Moose occupy a narrow range of habitats in the Kemmerer Field Office. Winter populations of moose are larger than summer populations in the field office. Moose generally summer in the Bridger-Teton and Wasatch National Forests and migrate to the lower elevations (e.g., stream bottoms) in the field office in the winter to escape extreme snow depths. A limiting factor to all moose herds is the condition and trend of riparian communities (moose winter ranges), in the field office, particularly willows and other palatable riparian shrubs.

Four moose herd units occur in the field office and include the Lincoln, Sublette, Bear River Divide, and Uinta moose herd units. Moose herd units occupy approximately 3,930,930 acres in the field office, of which approximately 1,423,960 acres are BLM-administered lands. The Lincoln Herd Unit postseason population has averaged approximately 735 moose between 2000 and 2009. The 2009 population estimate was 687, well below the herd population objective of 1,620 moose. The Sublette Herd Unit post-season population averaged approximately 4,193 moose between 2000 and 2009. The 2009 population estimate was 4,701, well below the herd unit objective of 5,500 moose. The Bear River Divide Herd Unit contains a small moose herd (an estimated 120 moose) that is scattered over a large expanse of nontypical open habitat. This area acts as an “over flow” area for adjacent larger populations of moose in the Uinta and Lincoln herd units. The Uinta Herd Unit post-season moose population averaged approximately 950 between 2000 and 2004. The 2005 population estimate was 925, and the Herd Unit objective was 900. The Uinta moose herd is an interstate herd occupying the north slope of the Uinta Mountains of Wyoming and Utah.

A majority of the moose winter in Wyoming and summer in Utah. No working models address the interstate nature of this herd and population estimates are unreliable. Some of the greatest threats to the moose in the Bear River Divide Herd Unit may be the loss of aspen due to plant succession and the lack of fire, and potential increases in energy development and winter recreation on winter ranges resulting in direct loss of habitats and disturbance, reducing the availability of the remaining habitats.

Approximately 283,360 acres of moose crucial winter range occur in the field office, of which 89,470 acres are BLM-administered surface and 219,220 acres are federal mineral estate. In general, crucial winter range for moose is separate from deer or elk winter range in the field office; however, two areas of overlap do occur. One area of overlap is located in the Rock Creek and Raymond Canyon areas north of Sage Junction and Cokeville; the second area of overlap occurs in the Chapman Butte and Blacks Fork area north of Cap White Ridge in the southern portion of the field office.

Trophy Game
Black Bear
Limited black bear populations occur in aspen-conifer areas in higher elevations of the northern portion of the field office. The goal within the field office is to maintain a healthy bear population capable of providing a broad range of recreational opportunities (including hunting and viewing in existing occupied habitats) while considering public safety, economic concerns, and other wildlife species.

Mountain Lion
Mountain lion populations generally occur in the northern, northwestern, and southern edges of the field office at higher elevations. The seasonal range of mountain lions generally follows that of their prey. The field office encompasses portions of two WGFD lion management units (southwest and west) and three lion hunt areas. Management goals generally focus on sustaining mountain lion populations, maintaining

prey (mule deer) populations, and providing recreation and hunting opportunities, while considering human safety, economic concerns, and the needs of other wildlife species.

Small Game

Three mammal species can be harvested as small game in the Kemmerer Field Office: cottontail rabbit, snowshoe hare, and red squirrel. No specific management objectives exist for these species in the field office.

Game Birds

Game birds include Greater Sage-Grouse, ruffed grouse, blue grouse, chukar, and Hungarian partridge. Except for Greater Sage-Grouse, no specific management areas are designated for these species. In general, increased water availability and improvement to riparian habitats in the conifer zone are current management objectives for these species.

Migratory Game Birds

At least 24 species of waterfowl are known to occur in the field office. Most species are migratory, but some nest in the Kemmerer Field Office. Aquatic resources are scattered throughout the field office. The main areas used by waterfowl include the Bear River and Green River and their tributaries and adjacent wetlands. The Wheat Creek Meadows Wildlife Habitat Area north of Kemmerer is managed to enhance waterfowl and other wetland species breeding, nesting, and rearing habitats.

Nongame

Raptors

Swainson's hawk, ferruginous hawk, red-tailed hawk, northern harrier, golden eagle, prairie falcon, American kestrel, and great-horned owl commonly breed in the field office. Golden eagle and great-horned owl are yearlong residents, and smaller winter populations of red-tailed hawk and northern harrier occur within the field office. Other raptor species found during various times of the year include osprey, rough-legged hawk, snowy owl, long-eared owl, and short-eared owl. Forest raptors occurring in the field office include sharp-shinned hawk, Cooper's hawk, northern goshawk, and northern saw-whet owl.

Mammals

At least 43 species of nongame mammals are known or suspected to occur in the field office, including five shrew species, 12 bat species, nine squirrel family species, two gopher species, 14 mouse or rat species, and the porcupine. Inventories of bats and other small mammals have not been completed within the field office.

Reptiles and Amphibians

Ten species of reptiles and amphibians are expected to occur in the field office: tiger salamander, boreal toad, Great Basin spadefoot, boreal chorus frog, northern leopard frog, spotted frog, eastern short-horned lizard, northern sagebrush lizard, rubber boa, and wandering garter snake. No estimates of population size are known for any of these species.

Fisheries

Public lands within the field office provide habitats for 30 species of fish. Three regional watersheds (3rd-order) providing fisheries habitats within the field office are described under surface water quality in the Water section of this document and include the Green, Bear, and Snake rivers. Within these drainages and their tributaries, aquatic habitats vary by vegetation types, water quality and quantity, land use, and landscape setting.

Using valley length as the measure, approximately 403 miles of streams exist in the field office. Using stream meander as the measure, approximately 509 miles of streams exist in the field office. Base flows of the perennial streams vary from less than one cubic feet per second (cfs) to more than 800 cfs in the Green River. Of the 509 miles of streams in the field office, approximately 139 miles are suitable for maintaining a fishery with the rest unsuitable at this time due to things such as very small intermittent flows, high water temperatures, and generally lacking habitat.

Approximately 30% of streams in the field office are in proper functioning condition (BLM 2003c). Of the 139 miles containing a fishery, approximately 38 miles of streams are in proper functioning condition (BLM 2003c). The BLM uses several types of management plans to focus management of site-specific fisheries and aquatic habitats in the field office, including the Thomas Fork Aquatic Habitat Management Plan (HMP), three Conservation Agreements and Strategies (for Colorado River cutthroat trout, Bonneville cutthroat trout, and '3-species'), WGFD basin management plans, and three CRMPs: Willow Creek CRMP, Smithsfork CRMP, and Cumberland CRMP. The Thomas Fork Aquatic HMP focuses on the Bear River (Bonneville) cutthroat trout, while the Willow Creek and Cumberland CRMPs focus on the Colorado River cutthroat trout, the Bonneville cutthroat trout, and the recovery of riparian areas in the Cumberland-Uinta allotment, respectively.

Common carp occur in the lower Hams Fork River, Green River, and possibly the Blacks Fork River. Introducing game fish has had positive economic impacts for the state through recreational fishing; however, in some instances, there have been adverse impacts to native cutthroat populations through competition (space and forage), predation, and hybridization.

Newcastle Field Office

Wildlife and Fisheries

The Newcastle Field Office provides potential habitat for 447 species of wildlife. Of these, 282 species of birds, 76 species of mammals, 30 species of reptiles and amphibians, and 59 species of fish have been documented as occurring in the area or adjacent similar habitats.

Five big game species inhabit the resource area: pronghorn, mule deer, white-tailed deer, elk and bighorn sheep. Pronghorn prefer the open plains areas of all three counties and elk use on public land is restricted to the timbered habitat types in Weston and Crook counties. Elk are also found in sage/grasslands in the western portions of Weston and Niobrara counties, especially in winter. Bighorn Sheep utilize the open canyons of Elk Mountain along the South Dakota state line in eastern Weston County. Mule deer occur in most habitats in the field office with the greatest concentrations on public land occurring in foothill areas and the rough, broken plains areas. White-tailed deer occur in the timbered habitats found along the Wyoming-South Dakota state line in Weston County and in association with riparian zones. Crucial winter ranges, including 9,080 acres of public lands, have been identified for both deer species in the field office.

Only one trophy game species is present in the area, mountain lion.

Upland game species include sharp-tailed grouse, ruffed grouse, Greater Sage-Grouse, Hungarian partridge, and wild turkey. Waterfowl species are not common on public lands in the area, but when suitable aquatic and riparian habitats exist they are usually occupied by ducks, geese, shore-birds, and other water birds. The field office falls in the central flyway but is not in any of the heavily used migration routes. Nesting occurs where adequate water and cover exist and use of surface waters are made in the spring and fall as resting and loafing areas for ducks and geese.

In 1982 and 1992 surveys of prairie dog towns on public lands were conducted in Crook, Weston, and Niobrara counties. Prairie dogs are extremely prolific and have the capability of expanding their towns very rapidly when conditions are favorable. Since 1982 three control efforts have taken place on 970 acres of public land. In all instances only approved pesticides for rodent control were allowed and were applied either by APHIS or another applicator under their supervision.

Pinedale Field Office

Game Species

Big Game

BLM-administered public lands, state lands, and private lands provide habitat for pronghorn, mule deer, white-tailed deer, elk, and moose. Furthermore, BLM-administered lands provide the majority of the crucial winter habitat for mule deer and elk populations found in the Upper Green River Basin. Table 3-139 shows the acreage of public land managed as big game crucial winter range and parturition areas. Table 3-140 shows the status of big game populations.

Table 3-139. Big Game Crucial Winter Range and Parturition Areas

Type of Crucial Winter Range	Acres (public land only)
Big game crucial winter range	
Pronghorn	125,400[1]
Elk	107,050[1]
Mule deer	319,300[1]
Moose	81,450
Total	**495,340[1]**
Parturition area	
Pronghorn	21,790
Elk	58,570
Mule deer	16,710
Total	**97,250**

[1] Crucial winter ranges may overlap crucial winter range for other big game species.

Table 3-140. Big Game Population Status

Species	Herd Unit	Hunt Areas	Population Estimate[1] 2009 Post-Season	Population Trend	Average Buck: Doe	Population Objective[2]
Pronghorn	Sublette	85–93, 96, 107	52,520	Increase	100:57	48,000
Mule deer	Sublette	130, 138–142, 146, 150–156, 162	26,057	Decrease	100:37	32,000
	Wyoming Range	134, 135–137, 143–145, 147	26,057	Stable	100:37	32,000
Elk	Upper Green River	93, 95, 96	2,639	Stable	100:23	2,500
	Pinedale	97, 98	1,980	Stable	0.23:1	1,900

Species	Herd Unit	Hunt Areas	Population Estimate[1] 2009 Post-Season	Population Trend	Average Buck: Doe	Population Objective[2]
	Piney	92, 94	3,485	Increasing	100:25	2,400
	Hoback	86, 87	1,076	Stable	100:17	1,100
Moose	Sublette	3–5, 10, 20–25	4,701	Decreasing	100:63	5,500

[1] Data from Wyoming Game and Fish Department Annual Big Game Herd Unit Report, 2009.
[2] Postseason populations.

Pronghorn

The Sublette pronghorn herd unit encompasses 10,546 square miles. The majority of the field office falls within this large area. The herd unit is managed for a postseason population objective of 48,000 pronghorn. An estimated population of 49,500 was present in 1999, with a five-year average (1994–1999) of 43,260 (WGFD 1999). Summer and winter habitat is present throughout the field office.

Pronghorn herds are known to migrate up to 150 miles between summer ranges in the Jackson Hole Valley and wintering areas along the Green River near Seedskadee National Wildlife Refuge south of the field office (WYDOT 2002). Most of the migration between Grand Teton National Park and the Upper Green River occurs on National Forest System lands, whereas the remainder of the migration, from the Upper Green River south into Green River Basin, occurs on BLM-administered and private lands. During spring migration, pronghorn travel across the top and western edge of the Mesa and through the Trapper's Point Bottleneck. Archaeological records suggest that this area has been a migratory bottleneck for thousands of years.

Mule Deer

Mule deer from the Sublette and Wyoming Range herd units are found in the field office. The Sublette mule deer herd is highly migratory, often spending five to six months per year on transition ranges. Winter and crucial winter ranges are very important components of the Sublette mule deer herd's range. Summer and transition ranges also play an important role in the survival of the species. The relative importance of each will likely change annually, but the loss or degradation of one will not be compensated for by the others, and the mule deer population will suffer in the long run. The two most important mule deer migration bottlenecks are at Trapper's Point and the south end of Fremont Lake.

Public lands in the Pinedale Field Office provide more than 100,000 acres of summer habitat for mule deer. According to the Sublette Mule Deer Study (Sawyer and Lindzey 2001), most deer seasonally migrate 40 to 100 miles north/northwest during the summer to portions of five different mountain ranges: the Gros Ventre Range, Wind River Range, Snake River Range, Wyoming Range, and Salt Range. Important features of mule deer migration routes include highway crossings, river crossings, and migration bottlenecks. Common transition areas include Beaver Ridge, Boulder, Fremont, Willow and New Fork Lakes area, and the Hoback Basin. Sawyer et al. (2006) report a 46% reduction in wintering mule deer on the mesa portion of the Pinedale Anticline associated with a 2% direct habitat disturbance during five years of development.

Rocky Mountain Elk

Most elk migrate to the Bridger-Teton National Forest in the summer. However, some elk remain on the higher-elevation BLM-administered lands throughout the summer in areas where cover is adequate and disturbing activities are minimal (BLM 1985). The WGFD, through an MOU with the BLM, administers ten winter feedgrounds within the Pinedale Field Office.

Moose
The field office supports the Sublette herd unit. Winter populations are considerably larger than summer populations, because moose summering at higher elevations on the Bridger-Teton National Forest migrate to the lower stream bottoms to escape extreme snow depths (BLM 1985). Crucial winter and yearlong habitat is found along most major drainages throughout the field office.

Trophy Game
Black Bear
Black bear are found within the aspen-conifer areas along the Wind River Range during spring and early summer (BLM 1985). Along the Wyoming Range, black bear are found in the timbered areas along the Bridger-Teton National Forest boundary and on the Hoback Rim. Some bears appear to remain in this area year-round, whereas others use the area for hibernation and early spring range, moving into the higher Bridger-Teton National Forest during summer and fall.

Waterfowl
The scattered aquatic resources in the Upper Green River Basin provide habitat for at least 24 species of waterfowl (BLM 1985). The amount and quality of aquatic habitats potentially suitable for waterfowl fluctuate yearly based on hydrologic conditions. Main waterfowl use areas in the north include the Upper Green River, its tributaries, and adjacent wetlands; the New Fork River and its tributaries; and the New Fork Pothole area. Main waterfowl use areas in the south include South Soda Lake and Fontenelle Reservoir and associated water bodies. The most abundant species found include canvasback, mallard, green-winged teal, northern pintail, and ring-necked ducks, common goldeneye, and common merganser. Large portions of the waterfowl populations are migrants.

Portions of the Green River and its tributaries and the New Fork Potholes area provide habitat for populations of nesting waterfowl. The New Fork Potholes may be a significant nesting area for the canvasback duck. However, waterfowl nesting habitat in the field office typically is not abundant because of the low availability of water and lack of dense vegetative nesting cover adjacent to shorelines.

Small Game Mammals
Three species of small mammals are harvested as game animals: cottontail rabbit, snowshoe hare, and red squirrel. No assessments of habitat condition, estimates of population size, mortality or natality rates, or hunter effort are known for any of these species.

Nongame Species

Raptors
Common raptors within the Pinedale Field Office include golden eagle, red-tailed hawk, sharp-shinned hawk, Cooper's hawk, northern harrier, prairie falcon, osprey, American kestrel, northern saw-whet owl, great horned owl, and long-eared and short-eared owls.

Mammals
The field office is inhabited by at least 42 species of nongame mammals, including five species of shrews, 12 species of bats, nine species of the squirrel family, two species of gophers, 14 species of mice/rats, and porcupines (Clark and Stromberg 1987).

Reptiles and Amphibians
Although the climate and habitat types found in the field office restrict the diversity and abundance of reptiles and amphibians, ten species of reptiles and amphibians inhabit the area. These include tiger salamander, western boreal toad, Great Basin spadefoot toad, boreal chorus frog, northern leopard frog, Columbia spotted frog, eastern short-horned lizard, northern sagebrush lizard, rubber boa, and wandering garter snake.

Riparian forest, shrubland, and herbaceous meadow/wetland make up roughly 54,450 acres within the field office. All of the salamander, toad, and frog species require quiet water for springtime breeding and are therefore seldom found far from ponds and transient pools. The spadefoot toad digs itself into soft earth. The frogs remain in marshy aquatic habitats year-round, but in the winter they hibernate in the mud. Of the three frog species, the Columbia spotted frog is the most aquatic, whereas the boreal chorus frog is the least aquatic and may occupy seasonally flooded areas with little year-around water.

The two snake species, and especially the two lizard species, occupy drier habitats because they are not dependent on water for breeding. Nonetheless, the rubber boa and wandering garter snake are typically found in moist locations, with the boa frequenting coniferous forests and the garter snake frequenting grassy meadows. The eastern short-horned and northern sagebrush lizards occur in dry areas that may have clumps of brush, stumps, and surface litter or are rocky and may have scattered or no trees. The eastern short-horned lizard also may occur in areas of hardpan or otherwise consolidated crust and in sandy soils. No estimates of population size are available for any of these species.

Fisheries

Fisheries in the field office are restricted within the Upper Green River Basin above Fontenelle Reservoir. The reaches of the Green River and its tributaries in this area are moderately productive cold-water fisheries, with some reaches having limited fisheries potential. The area is currently managed as a trout fishery and serves as a key management area for the Colorado River cutthroat trout (the only native trout species in the field office).

Many of the native species that were historically common throughout the area are either uncommon or have been extirpated. Several of the large Colorado River fishes, including the Colorado pikeminnow and razorback sucker, may have periodically been found in stream reaches in the Pinedale area. However, the area was likely the extreme northern extent of their range, and no documented collections have been located for this area.

Fisheries Distribution

The majority of the field office lies within the Upper Green River and New Fork River watersheds in the Green River Basin of the Upper Colorado hydrologic region. Additional portions of the area lie within the Big Sandy and Slate watersheds, also part of the Green River Basin and the Upper Colorado hydrologic region. A small area near Hoback Rim drains into the Snake River watershed.

Approximately 300 miles of stream and riverine habitat and 2,500 acres of lake and reservoir habitat occur in the field office. However, not all of these areas support fish. Fisheries within the area consist of native and non-native game and nongame species. Several listed species or species of concern also are found within the area. Native fishes within the field office have been greatly impacted by previous management actions. In September 1962, approximately 445 miles of the Green River and tributaries above Flaming Gorge Dam were poisoned with rotenone. In addition, hydromodification of the Green River and its tributaries for agricultural, mining, drilling, and recreational interests has played a role in the reduction of habitat for native fishes.

Productivity and Use of Fisheries

The WGFD classifies streams within the Green River Basin and field office according to the relative productivity of each reach's trout fishery (States West 2000). The following four classifications are used to describe the quality of each river reach that has been assessed:

- Blue waters: Premium trout waters and fisheries of national importance with trout production greater than 600 pounds of trout per mile.

- Red waters: Very good trout waters and fisheries of statewide importance with trout production of 300 to 600 pounds of trout per mile.
- Yellow waters: Important trout waters and fisheries of regional importance with trout production of 50 to 300 pounds of trout per mile.
- Green waters: Low-production water and fisheries of local importance with trout production of less than 50 pounds of trout per mile.

Within the field office, no reaches are classified as blue waters. However, four reaches, three on the Green River above Fontenelle Reservoir and one on the New Fork River near Boulder, have been identified as red waters. The remainder of the stream and river reaches within the field office have been classified as yellow or green waters, with some waters having no classification.

The WGFD has developed habitat quality indices for streams in the Pinedale area. These indicate that habitat quality in the Pinedale area is sufficient for maintaining game and nongame fisheries. However, the data provided appear to indicate that instream cover and water temperature values could be improved in some areas in the Pinedale region to enhance existing habitats. In 1988, supply and demand for fisheries resources in the Green River Basin above Flaming Gorge Reservoir indicated that total fishing demand was about 51% of the total supply for lakes and reservoirs in the basin (States West 2000). However, streams and rivers in the basin had about 91% utilization, whereas standing water had only 36% utilization.

Annual angler effort for standing water types (i.e., ponds, lakes, and reservoirs) in the Pinedale portion of the Green River Basin was estimated at 85,097 angler days by the WGFD (States West 2000). Of this angler effort, 90% was in natural alpine (70% of total) and lowland lakes (20% of total). The remaining 10% of the angler effort was in alpine reservoirs (9% of total), lowland reservoirs (less than 1%), and trout farm ponds (less than 1%).

Annual angler effort for streams and rivers was not separated for the Pinedale portion. However, for the Green River Basin above Flaming Gorge Reservoir, angler effort has decreased during the past 20 years (States West 2000).

Water Quality Effects on Fisheries

The majority of the waters in the field office are listed as Class 2AB waters by the Wyoming DEQ, Water Quality Division (WDEQ 2001a). Class 2AB waters are defined as those waters known to support game fish populations or spawning and nursery areas at least seasonally, perennial tributaries and adjacent wetlands, and areas in which game fishery and drinking water use is otherwise attainable (WDEQ 2001a). Additional protections of Class 2AB waters include "nongame fisheries, fish consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture and scenic values" (WDEQ 2001a).

Other water quality designations within the field office include Class 1 and Class 3B waters. Class 1 waters are defined as "outstanding waters" (WDEQ 2001b). This designation is made for all waters for which water quality degradation, other than that originating from dam discharges, is not allowed. Class 3B waters include tributaries that are not known to support fisheries or drinking water supplies. They typically are intermittent or ephemeral in nature but have the hydrologic conditions necessary to support invertebrate populations, amphibians, and obligate or facultative wetland plant species.

Game Species

Game fish found within the field office consist primarily of non-native species. However, several native salmonid species do exist within the Green River and Snake River drainages. The Colorado River cutthroat trout and the mountain whitefish are native to the Green River Basin. Geographically, Colorado River cutthroat trout are widely distributed throughout much of their historic range. However, populations have declined and are limited to smaller headwater tributaries. Colorado River cutthroat trout are no longer found in the larger river systems. Mountain whitefish are widely distributed throughout their historic range and are abundant. They reside in both smaller and larger river systems. The Snake River fine-spotted cutthroat trout is native to the headwaters of the Snake River drainage and has been introduced to areas within the field office. A species similar to the Snake River fine-spotted cutthroat trout, the Yellowstone cutthroat trout, has also been introduced into the area. (However, it is still unresolved whether the Yellowstone cutthroat trout and the Snake River cutthroat trout are separate subspecies or are the same.) Additional game fish in the area include other introduced salmonids such as the rainbow, brook, and brown trout.

According to WGFD data, native and non-native game fish populations generally are stable in the Pinedale area. Brown trout populations average between 125 and 300 fish per mile in the Green and New Fork Rivers, respectively. Brook trout populations average between six and eight fish per mile for the New Fork and Green rivers. Rainbow trout populations vary and range from 16 fish per mile in the New Fork drainage to 245 fish per mile in the Green River. Much of the variation in these estimates could be attributed to the habitat availability in the Green River versus that in the New Fork River.

Colorado River cutthroat trout populations are stable and average between approximately 100 and 200 fish per mile throughout their current range in the Pinedale area, although individual streams vary from less than 50 per mile to more than 400 (Hirsch et al. 2006). The stability of these populations is attributed in part to the implementation of management objectives described in WGFD basin management plans. These plans identify specific strategies to ensure the survival of wild native fish stocks while providing consistent yields from recreational fisheries.

Nongame Species

Most of the fish species in the field office are native or non-native, nongame species, including mottled sculpin, five species of suckers, redside shiners, three species of dace, carp, and several species of chub. Distribution and abundance of these species varies throughout the area. Generally, these species occupy the same water bodies as the game species. The nongame species are somewhat more adaptable to poorer water quality than are the game fish species, but are still negatively affected by habitat degradation such as erosion and sedimentation; wide temperature fluctuation; and decreases in food sources, suitable spawning sites, and cover.

Rawlins Field Office

Wildlife

More than 374 vertebrate species have been documented in the Rawlins Field Office (BLM 1987). This section provides wildlife and habitat information unique to the Rawlins Field Office. Please see the Wildlife section at the beginning of the Wildlife and Fisheries section for wildlife and habitat information that spans the entire planning area.

Wildlife and Habitats in the Field office

The habitat diversity within the Rawlins Field Office is extreme, ranging from alpine barren areas in the Sierra Madre and the Snowy Range in the south-central portion of the field office to desert barren areas in the Red Desert in the southwestern portion, with extensive grassland, shrub, and forest/woodland communities in between. Important habitats in the Rawlins Field Office are mountain shrub (mountain big sagebrush and antelope bitterbrush); monotypic stands of bitterbrush and true mountain mahogany; and coniferous, rockland, aspen, riparian, and lowland sagebrush (primarily Wyoming big sagebrush on flatlands and basins below 7,000 feet) (Wichers 2002).

The most historically important of these habitat types, on the basis of total species, number of breeders, number of sensitive species, and availability, are open aquatic, riparian (grassland, willow-waterbirch, aspen, and cottonwood), mountain shrub, juniper, aspen, aspen/conifer, ponderosa pine, Douglas fir, rockland in the Laramie Peak and North Platte Valley, and wet forested meadow (BLM 1987).

Big Game

Big game species in the Rawlins Field Office include pronghorn, deer (mule deer and small numbers of white-tailed deer), elk, moose, and bighorn sheep. Three WGFD regions (Laramie, Green River, and Lander) cover much of the field office. The big game populations evaluated most extensively in all three regions are pronghorn, mule deer, and elk. In the Laramie Region, white-tailed deer, moose, and bighorn sheep populations are also evaluated. Of these, pronghorn, mule deer, and elk are the primary species present on BLM-managed lands within the Rawlins Field Office.

Information considered in the WGFD evaluation process includes population indices and harvest statistics for individual herd units. Population indices are such indicators as the number of bucks per 100 does and the number of fawns per 100 does—information that provides perspective on population balance and health. Depending on species, a variety of methods are used to determine herd unit ratio data and data on population trends. Population estimates, considered together with population trend, range condition, weather, management objectives, and the socioeconomic factors of hunter demand and license revenues, are used to develop population objectives for each herd unit. Using WGFD information that was averaged from 1997–2001, comparisons can be made about the species richness and productivity across Wyoming. When numbers for pronghorn, mule deer, and elk are combined for similar-sized geographic units, the harvest data for the Sierra Madre/Snowy Range area within the field office are similar to those for the Sublette region around Pinedale, which is considered to be the most productive big game region in the state. In addition, recreational days and the economic benefits associated with hunting were 50% higher for the Sierra Madre/Snowy Range area when compared with those for the Sublette region.

Pronghorn

There are 3,860,670 acres of crucial winter range for pronghorn within the Rawlins Field Office. This acreage includes federal, private, and state lands. BLM-administered lands include 544,300 acres. These areas are found especially in the open flatlands, in locations like the eastern side of the Great Divide Basin, close along the Wyoming-Colorado state line west of Baggs, the Shirley Basin south to Medicine Bow, and north of Saratoga in the rolling topography east of the North Platte River.

Deer Habitat

Mule deer populations across the field office are being maintained or increased through reduced harvest. Although recent events like the winter conditions of 1992–93 have kept mule deer numbers at lower levels than desired, it is unlikely that the high population of mule deer observed in the 1960s and 1970s will be repeated. Loss of crucial winter range along valley bottoms and movement being restricted by transportation corridors and other fences are limiting factors to growth in mule deer herds. In some locations, such as the Little Snake and North Platte River valleys, conditions of crucial winter range are generally fair to poor.

There are 1,468,890 acres of crucial winter range for mule deer within the Rawlins Field Office. This acreage includes federal, private, and state lands. BLM-administered lands include 368,700 acres. These areas are generally found in three types of places: on the flanks of mountains (e.g., the Sierra Madre and the Snowy, Laramie, Seminoe, Shirley, and Ferris Mountains), along the drainages (e.g., North Platte and Medicine Bow Rivers), and in the badlands along the Wyoming-Colorado border, centered on Baggs.

Elk Habitat

Elk are distributed throughout the Rawlins Field Office, especially adjacent to and in areas of higher elevation that have woody cover. Areas of particular importance to specific elk herds are in the vicinity of Baggs, the Ferris Mountains and Seminoe Reservoir, Shirley Mountain, Encampment, the Saratoga Valley, Laramie Peak, Jelm Mountain, Wick-Beumee, and Pennock Mountain (BLM 1987). Particularly important characteristics of these areas are as follows:

- **Baggs.** Provides summer, winter/yearlong calving and crucial winter range habitat for elk that migrate from summer range in Miller Hill, the Sierra Madre, and the Medicine Bow National Forest on the east and from Colorado on the south to crucial winter range in the vicinity of Baggs. Most of the calving area for this herd is in Medicine Bow National Forest (BLM 1987). Part of this area is within the Jep Canyon ACEC (BLM 1990c).
- **Ferris Mountains/Seminoe Reservoir.** Provides summer, winter/yearlong, and crucial winter range for elk that migrate from summer range in the Ferris Mountains to crucial winter range on the north side of the mountains, as well as from summer range in the vicinity of Bradley Peak and Seminoe Mountains/Bear Mountain (south of the Ferris Mountains) to crucial winter range southwest of the lower portions of Pathfinder Reservoir. Calving areas have not been identified.
- **Shirley Mountain.** Provides summer, winter/yearlong, and crucial winter range for elk that migrate from summer ranges on Shirley Mountain and the Freezeout Mountains to crucial winter range around Chalk Mountain on the south side of the Freezeout Mountains and southeast of the Miracle Mile.
- **Encampment.** Provides winter/yearlong and crucial winter range for elk.
- **Saratoga Valley.** Provides calving areas, summer, yearlong, and crucial winter range for elk.
- **Laramie Peak.** Provides summer, winter/yearlong, and crucial winter range for elk.
- **Jelm Mountain.** Provides primary crucial winter range for elk that summer in Medicine Bow National Forest.
- **Wick-Beumee.** Provides winter/yearlong and crucial winter range and parturition habitat for elk on BLM-managed public lands.
- **Pennock Mountain.** Provides winter, winter/yearlong, and crucial winter range and parturition habitat for elk on BLM-managed public lands.

Management issues concerning elk include restrictive fencing, disturbance, and stress from off-road vehicle use; expansion of chronic wasting disease; and housing encroachment into historic habitat, particularly the Laramie Range. Elk populations are also more influenced by movement across the state line with Colorado, making management and population assessments much more difficult than with pronghorn or mule deer.

There are 604,760 acres of crucial winter range and 200,910 acres of parturition areas, which reflect the areas of importance discussed above. This acreage includes federal, private, and state lands. BLM-administered lands include 206,500 acres of elk crucial winter range. North of I-80, winter range is identified on the northeast flanks of the Ferris and Seminoe Mountains; south of I-80, winter range is identified on the west slopes of the Sierra Madre in the North Platte River Valley, between and north of the Sierra Madre and the Snowy Range, on the northeast flanks of the Snowy Range, and east of Laramie on the east side of the Laramie Mountains. Crucial winter range is often an area within the general winter range that has the best thermal cover and most available forage even in the most extreme weather conditions. These areas are in the Ferris Mountains, the Seminoe Mountains, the Shirley Mountains, and the Snowy Range, in each case on the lower slopes where microclimates provide conditions needed for survival. Parturition areas are similarly in microclimates, where hiding cover and moist, succulent forage provide shelter and adequate moisture for nursing mothers and young elk calves. These areas are around the flanks of the Snowy Range and on the east side of the Sierra Madre.

Moose
There is a single WGFD management area for moose within the Snowy Range. No additional data for moose is available for the Rawlins Field Office.

Bighorn Sheep Habitat
The Rawlins Field Office contains crucial winter range and lambing areas for bighorn sheep. BLM-administered lands include 25,000 acres of crucial winter range. Bighorn sheep have been reintroduced into/augmented in the Ferris Mountains/Seminoe Reservoir area, near Encampment, in the Saratoga Valley, and at Laramie Peak (BLM 1987). Bighorn sheep are managed cooperatively by the BLM for habitat and by WGFD for population.

Trophy Game
Within the field office there are WGFD management areas for black bear (Laramie Peak, Snowy Range, and Sierra Madre) and mountain lion (Iron Mountain, Laramie Peak, Snowy Range, Seminoe, Sierra Madre, and Haystacks). These represent areas where populations of these species are sufficient to support hunting and to warrant hunting management by WGFD. Data are not readily available to characterize the individual management areas for these species.

Upland Game Bird Habitat
Upland game birds in Wyoming that are native to the state include blue grouse, ruffed grouse, Greater Sage-Grouse, sharp-tailed grouse, and mourning doves. Upland game birds that are introduced include pheasant, chukar, gray partridge, and turkey. Greater Sage-Grouse are an important indicator species, especially on BLM-administered lands. Greater Sage-Grouse are discussed in the BLM Wyoming State Director's Sensitive Species List section of this document. BLM habitat management is directed toward native species.

There are two species of grouse and one sub-species that are known to occur within the Rawlins Field Office. These species include the plains sharp-tailed grouse and the blue grouse. The Columbian sharp-tailed grouse is a sub-species of the plains sharp-tailed grouse. Columbian sharp-tailed grouse are discussed in the BLM Wyoming State Director's Sensitive Species List section of this document.

The range of the plains sharp-tailed grouse extends eastward from the divide. The current range of the plains sharp-tailed grouse includes eastern Wyoming, northeastern Colorado, and portions of Nebraska. This species has the potential to occur throughout the eastern portion of the Rawlins Field Office wherever remnants of appropriate habitat occur. In Wyoming, the populations are highest in Goshen County and eastern Platte and Laramie Counties. The optimum habitat includes an interspersion of plant communities with extensive ecotones, including grassland, grassland-shrub mixtures, and mixed-grass prairie occasionally broken by brushy draws. Dancing grounds are located in these mixed shrub-grassland habitats, and broods are reared in habitats where shrubs are interspersed with dense herbaceous cover. Wintering habitat includes aspen parklands and stands of chokecherry, aspen, cottonwood, green ash, and willow, especially when the snow is deep.

Blue grouse are found primarily in the Ferris and Seminoe Mountains, the Laramie Peak area, and throughout forest fringes associated with the Medicine Bow National Forest. Blue grouse tend to use habitat that contains mountain shrubland, aspen/conifer woodland, aspen woodland, ponderosa pine/Douglas fir forest, limber pine woodland, and lodgepole pine forest. These grouse prefer to occupy the borders between these habitat types as well as small, interspersed riparian areas for breeding, nesting, and brood rearing (BLM 1987).

Waterfowl
The Rawlins Field Office includes the Central Flyway (east of the Continental Divide except for the Great Divide Basin) and the Pacific Flyway (west of the Continental Divide and the Great Divide Basin). Important lakes and reservoirs for waterfowl are Seminoe Reservoir, Pathfinder Reservoir, Bucklin

Reservoir, Shirley Basin Reservoir, Teton Reservoir, Little Sage Creek Reservoir, Flowing Well Reservoir, Wheatland Reservoir, Lake Hattie, Cooper Lake, James Lake, and the Muddy Creek wetlands complex, but even small pits, reservoirs, and playa lakebeds provide important habitat when adequate water is available. Development of water sources in normally dry desert regions has created habitat and increased production of waterfowl and other bird species. Because of unlimited nesting habitat in the rangelands around these waters (compared to farming around prairie potholes), nesting success and brood sizes are often larger. In addition, pools in the numerous streams and their tributaries provide important habitat. Only some of these aquatic resources are on BLM-managed public land.

Nongame Species

Raptors

Concentrations of ferruginous hawks or golden eagles and prairie falcons (depending on the nesting substrate) have been identified in the past at Shamrock Hills, Brown Canyon Rim, Seminoe, Red Rim, Atlantic Rim, Cherokee, Muddy Creek, Doty Mountain, Delaney Rim, Bolten Rim, Hanna, and Platte-Divide (BLM 1987). Identification of these nesting concentrations was based in part on a raptor study that began in 1975 and that has continued through the present, resulting in extensive documentation of raptor nesting in the Rawlins Field Office.

The intensity of this study has varied in response to proposals for development in the Rawlins Field Office. Extensive data were collected in the Shamrock Hills area beginning in 1988 in response to potential development of coalbed gasification. These efforts were renewed in 1997 through 2001 and are ongoing (Apple 2002a). In addition, beginning in 1998, extensive data collection was initiated in an area about 25 miles west of Rawlins and extending both north and south of I-80 in the vicinity of Wamsutter (Apple 2002a), where natural gas development occurs. An associated study focuses on the use of artificial nest sites (a project that began in 1988), and there is also a ferruginous hawk banding program (began in 1993) (Apple 2002b).

The long-term database on nest locations is very effective in characterizing the raptor species that nest in the Rawlins Field Office and their nests. The data show not only the relative number of nests of each species, but the height and type of substrate on which they are built. This study provides extremely well-documented information on many of the species, especially the ferruginous hawk, which has been the primary focus of this effort. Of the total nests, 54.3% were on BLM-managed public land and 37.4% were on private land, with the remainder on Forest Service, state, other, or unrecorded land ownership types. The more focused portions of this overall study provide extensive additional data. For example, between 1998 and 2001, active ferruginous hawk nests were more often successful on artificial nest sites (81%) than on natural nest sites (65%). Overall nesting success for active nests of all species was 85.5% based on 2001 data, while in the Shamrock Hills Study Area, Continental Divide/Wamsutter II North of I-80, Continental Divide/Wamsutter II South of I-80 (Northern Segment), Continental Divide/Wamsutter II South of I-80 (Southern Segment), and other incidental areas, success of active nests was 92%, 80%, 80%, 93.9%, and 78.3%, respectively (Apple 2002b). These areas were undergoing varying degrees of development at the time these data were collected. The Jep Canyon ACEC was established in part to maintain the productivity of nesting raptor pairs (BLM 1990c), as was the Shamrock Hills ACEC.

Data have also been collected on prey items noted in ferruginous hawk nests between 1993 and 2001 (Apple 2002b). Wyoming ground squirrels are by far the predominant prey species. Other prey species recorded at least once on the basis of prey remains were 13-lined ground squirrel, vole, sagebrush vole, cottontail rabbit, least chipmunk, prairie dog, western harvest mouse, short-tailed weasel, white-tailed prairie dog, northern pocket gopher, Greater Sage-Grouse, horned lark, sparrow species, and other songbirds. Voles, cottontails, and prairie dogs were regular if not frequent prey items. The remaining prey species appear to be incidental food items.

Neotropical Migratory Bird Habitat

All migratory bird species likely to be found within the Rawlins Field Office are protected under the MBTA, with the exception of the house sparrow, European starling, Eurasian collared dove, and rock dove. Any un-permitted take of these protected species (except the house sparrow, European starling, Eurasian collared dove, and rock dove) would constitute a violation of the MBTA.

Reptiles Habitat

Turtle species located within the Rawlins Field Office include the Western painted turtle and common snapping turtle. Turtles are the most primitive of the reptiles, having evolved nearly 200 million years ago. Most turtles are aquatic, although a few live entirely on land. Turtles have unique methods of breathing and a reduced metabolism, which allows certain turtles to pass the period of winter dormancy in pond bottoms.

Lizard species located within the Rawlins Field Office include the many-lined skink, northern sagebrush lizard, red-lipped prairie lizard, northern prairie lizard, eastern short-horned lizard, and northern earless lizard. Lizards are small, active reptiles. They are able to regulate their body temperature to permit activity over a broad range of air temperatures. Behavior, agility, and insectivorous habits make the lizard one of the more successful groups of cold-blooded vertebrates. Lizards are found in grasslands and shrub deserts, boulders, cliffs, trees, and loose sand.

Snake species located within the Rawlins Field Office include the plains hognose snake, western smooth green snake, pale milk snake, Great Basin gopher snake, bullsnake, wandering garter snake, western plains garter snake, and prairie rattlesnake. Snakes are legless reptiles with a body covering of scales. They are adapted to preying on small rodents and lizards. Snakes are mostly diurnal, terrestrial predators. Some are aquatic, some live in trees, and some live in burrows (Baxter et al. 1980).

Amphibians Habitat

Twelve species of amphibians are found in Wyoming: one species of salamander and 11 species of frogs and toads. The tiger salamander is found within the Rawlins Field Office and is easily recognized by its conspicuous mottled, barred, or vermiculated color pattern, its moist skin, and the presence of a tail. Tiger salamanders require a fairly moist environment and are found throughout the Rawlins Field Office in rodent burrows and lentic habitats during the breeding season and in moist, aquatic, or underground habitats throughout the remainder of the year. Tiger salamanders prey on insects, earthworms, and occasionally small vertebrates.

Toad species located within the Rawlins Field Office include the plains spadefoot, Great Basin spadefoot, boreal toad, Wyoming toad, and Woodhouse's toad. Spadefoots are adapted to arid habitats and burrow into soil to prevent desiccation, forage at night, and breed irregularly through the summer in response to periods of heavy rain. The loud call of the breeding male serves to attract other breeding adults, both male and female, to breeding congregations over long distances. Spadefoots spend the winter buried deep within the soil to avoid desiccation and to spend dormancy below the frost line.

Frog species located within the Rawlins Field Office include the bullfrog, northern leopard frog, wood frog, and boreal chorus frog. Frogs are slim-waisted, long-legged, smooth-skinned amphibians. True frogs usually have distinctive breeding calls; some also have warning calls and release calls. Eggs are usually laid in large masses that rest on the pond bottom rather than being attached to submerged vegetation (Baxter et al. 1980).

Fisheries Habitat

Public lands within the Rawlins Field Office provide habitat for eight fish families. There are 3,233 miles of perennial and intermittent streams that support fish and are managed by the BLM. BLM Wyoming has classified five species as sensitive: the Colorado River cutthroat trout, bluehead sucker, flannelmouth sucker, roundtail chub, and hornyhead chub. Three drainages occur within the Rawlins Field Office: the Colorado River watershed in the western portion, the North Platte River watershed in the eastern portion, and the Great Divide Basin in the northwest. Several introduced trout species are widely distributed in the Rawlins Field Office, occupying the vast majority of suitable coldwater habitats. For example, brook trout can be found in most mid-high elevation coldwater streams within the Rawlins Field Office.

Rock Springs Field Office

Wildlife

Over 350 species of wildlife are found on a variety of habitats on the public lands in the Rock Springs Field Office. This section provides wildlife and habitat information unique to the Rock Springs Field Office. Please see the Wildlife section at the beginning of the Wildlife and Fisheries section for wildlife and habitat information that spans the entire planning area.

Big Game
Wintering populations of big game in the area include an estimated 170 moose; 1,800 elk; 12,600 mule deer; 45 white-tailed deer; and 51,000 pronghorn. Over 55% of the Rock Springs Field Office has been identified as crucial big game habitat. Included in this crucial habitat are fawning and calving areas and winter ranges. Some crucial yearlong habitat has been identified for the unique Steamboat Mountain-Sand Dunes elk herd.

The WGFD manages big game on a herd unit concept. Herd unit boundaries do not generally match BLM resource area boundaries, making analysis and correlation of resource data and big game population data difficult. The WGFD revises its strategic population numbers for each big game species based on new habitat information, population trends, and recreation demand. The Rock Springs Field Office is broken into several complete habitat units under criteria established in 1975, which provided boundaries for wildlife habitat areas.

Pronghorn
The Rock Springs Field Office provides an estimated 3,880,000 acres of preferred pronghorn habitat (this includes all lands administered by private landowners and other federal agencies). Suitable summer pronghorn habitat is found in most vegetative communities and includes about 4,662,000 acres within the Rock Springs Field Office. Six designated pronghorn herd units are either completely or partly within the field office: Bitter Creek, South Rock Springs, Uinta-Cedar Mountain, West Green River, Sublette, and Red Desert.

The 1988-89 post-harvest wintering pronghorn population in Wyoming was estimated at 363,150. Nearly 66,000 animals (about 18% of the Wyoming pronghorn population) occupy the field office during various seasons of the year. An increase in the strategic population objective for the Sublette pronghorn herd from 19,400 to 30,000 is not an increase in actual pronghorn numbers for this herd. New information gathered by the Wyoming Game and Fish Department indicates that the Sublette pronghorn herd population historically was approximately 50,000 to 60,000 animals. At this time, the Sublette pronghorn herd is below population objective numbering approximately 27,000.

Probably the single most important factor affecting pronghorn populations is weather. Severe winters with deep, crusted snow and below zero temperatures cause high pronghorn mortalities. An example of weather-induced population dynamics is the drastic reduction of pronghorn numbers in the field office due to severe winter storms in the early 1970s. Mortality losses by herd unit in 1971-72 were: Red Desert-55%, Sublette-74%, West Green River-46%, and South Rock Springs-47%.

Over 1,600 miles of fences affect pronghorn movement in the field office. Of these, about half are on public land for the purpose of controlling livestock. About 475 miles are highway right-of-way fences, of which 230 miles are woven wire. Woven wire fences form a barrier to pronghorn movement. About 43 miles of fence have been identified as causing wildlife conflicts.

The Little Colorado area supports a large resident herd as well as a large number of winter migrant pronghorn. The migrant herd summers from Farson to the Wind River Mountain foothills to Jackson. As the seasons change in late September and October, the animals move southward to near Farson and as far south as Rock Springs. Winter range for pronghorn from the Oregon Buttes area is also near Farson and Eden. As fall approaches, these animals move southwest and congregate with other migrant herds in low lying areas east and south of Farson. During spring, pronghorn are seen grazing crested wheatgrass along reclaimed rights-of-way near Farson as they migrate northeasterly toward spring and summer ranges. Migratory patterns of pronghorn north of Black Rock are uncertain, although their yearlong residence there is noteworthy.

Deer

Mule deer are distributed over most of the field office in seven herd units which occur fully or partially within the field office. Economic analyses in this document are based only on the portion of the herd units within the field office. Current population figures are derived from computer population models which may or may not have good statistical confidence depending on the quality and quantity of data fed into the program.

In winter, mule deer move into good cover and ample browse at the Seedskadee National Wildlife Refuge and the Green River Breaks near LaBarge. During late fall, deer move from Bridger National Forest into lower elevations near Prospect Mountain. They winter along major drainages and ridges north of Highway 28 until April when they again move back toward the mountains. Some herds move south into Jack Morrow Creek and the area between Essex Mountain and Tule Butte. Pine, Cedar, and Long canyons offer good winter and spring habitat for several hundred deer, with many remaining there yearlong.

Cooper Ridge, Beans Spring, Red Creek Basin, South Baxter Basin, and sagebrush flats along Flaming Gorge are important winter ranges for the South Rock Springs Unit herds. Preliminary data from a recent deer study suggests that Cooper Ridge is a primary winter range for a portion of the South Rock Springs herd unit. In an attempt to relieve the pressure on overused water resources and to more evenly distribute deer in unused areas in the summer months, the Bureau and the Wyoming Game and Fish Department have installed 23 wildlife guzzlers throughout the field office.

White-tailed Deer (*Odocoileus virginianus*) is present in low numbers north of the city of Green River between the Green River and Blue Rim Road. The WGFD does not report on this herd. Some whitetail deer activity has been recorded along the Green River and near Willow Creek in the Wind River Mountains, but meaningful population estimates are not available.

Rocky Mountain Elk

Four elk herd units are designated in the field office. The South Rock Springs Herd unit and the Steamboat unit are completely within the field office, while only portions of the Uinta-Cedar Mountain and South Wind River units are within the field office.

The Steamboat and Little Mountain elk herds were established after several transplants from the Jackson Hole area. Some of the Steamboat elk migrate south to North Table Mountain and South Table Mountain and winter from Hatcher Mesa to Long Canyon and Pine Canyon. This migration has not been observed since about 1985, probably because of mild winters and minimal snow. Small resident elk herds are now found along Alkali Creek, Natural Corrals, Ten Mile Draw, and other areas. In the winter of 1975-76, nearly 300 elk were observed on the Red Desert near "the pinnacles" and headwaters of Alkali Creek.

The Little Mountain and Pine Mountain elk population has been steadily increasing. This population peaked in 1972-73 and has declined since but is still at a level above objective. Disease and predation effects on local elk are not known but appear to be minimal.

Some elk use occurs during severe winters in areas adjacent to the Green River near Bird and Chapel canyons. These animals come from the Bridget National Forest near Big Piney.

Elk populations west of Flaming Gorge were relatively stable from 1966 through 1978. Since then, the herd has gradually increased. Populations were over objective in both 1983 and 1989. These animals do not seem to be as seriously affected by weather conditions as other elk herds in the field office.

Moose
The moose population is static to slightly increasing as a result of vigorous law enforcement and mild winters. Some calving occurs on tributaries of the Sweetwater River, the upper Big Sandy River, and along the Green River above the Green River Golf Course. Moose calving also occurs in aspen stands and along drainages in the upper Henry's Fork River, both on and off National Forest System lands.

During early winter, moose migrate from the forests into Blucher Creek, Lander Creek, the lower Sweetwater River, and the Henry's Fork. They are yearlong residents along the entire Green River system to below the County Recreation area. Yearlong residence is common in the Sweetwater and both Big and Little Sandy River watersheds. Good yearlong riparian habitat exists from Fontenelle to Big Island, with preferred habitat on Seedskadee Refuge. During the winters from 1976 through 1985, moose were observed using the lower Big Sandy River, from Big Sandy Reservoir upstream.

Moose may also be seen along the Blacks Fork, in very low quality habitat south of Blue Point. Population densities between Granger and Green River are very low with occurrence classed as low common to uncommon. A few moose also inhabit small riparian areas on Pine and Little Mountains.

Parts of the upper Sweetwater, the Henry's Fork, and other areas indicate declining moose habitat quality resulting from heavy livestock grazing of woody plants and a decrease in beaver activity. Habitat problems include changes in browse composition, lack of vegetative undergrowth, and siltation of beaver ponds and stream pool eddies.

Bighorn Sheep
Suitable bighorn sheep habitat occurs on Little Mountain, Richards Mountain, Pine Mountain, and the Haystacks. No bighorns presently inhabit the resource area, although populations in Utah may soon expand over the state line.

Trophy Game
Mountain Lion
The wide distribution of mountain lion (*Puma concolor*) observations indicates that this species is presently found throughout much of the Rock Springs Field Office area within suitable habitat. Indications are that distribution is widespread. Mountain lions reside in the broken juniper and rimrock areas south of Wilkins Peak to the Utah border and in the Haystacks. Cats have been observed on Cooper Ridge, in Adobe Town, on Steamboat Mountain, Little Mountain, and in the Wind River foothills. The main habitat component restricting mountain lion populations in the field office is the absence of large, undisturbed, remote wild areas or adequate prey therein.

Black Bear

Suitable bear habitat exists over about 189 square miles of land in the field office. Black bear occupy timbered habitats along the Wind River Mountains and near the Colorado border. The BLM has found evidence of bear activity on Little and Pine Mountains. Occasionally, black bears are seen or tracks noted along the Sweetwater River and its tributaries and upper reaches of Little and Big Sandy Creeks, with a slight increase in sightings/tracks likely related to natural dispersal of young male black bears in the past few years. Most of the legally harvested bear are taken in the Bridget National Forest.

Waterfowl

The Rock Springs Field Office lies within the Pacific Flyway. Species such as the Barrow's goldeneye are resident for only parts of the year, wintering in western Wyoming. Geese follow the same migration pattern as ducks with the exception of spring migration and breeding periods. They migrate into the area by early March and begin establishing nesting territories. Mating occurs by mid to late April. At this time of year, geese are common along the Green River, Blacks Fork and Big Sandy and are not usually found staging on Flaming Gorge or Fontenelle Reservoir. As fall arrives and still waters become ice covered, geese congregate on Eden Reservoir, Fontenelle Reservoir, and the Green River. They remain here, feeding on submerged vegetation or Eden Valley grain fields until ice covers open waters. They then move southward into Colorado and Utah to spend the remainder of the winter. Shovelers, gadwalls, mallards, pintails, and teal are the most common summer resident species.

Waterfowl nesting in freshwater lakes of the sand dunes has become nearly nonexistent within the past ten years. The Red Desert region has historically had fair to good duck production as a product of human-made reservoirs and flowing wells. However, available water and adjacent cover necessary for nesting and escape have been reduced.

Wading birds are water birds that usually do not swim or dive for their prey, but wade in shallow edges of lakes, ponds, creeks, and other waters for food not available on shore. The great blue heron (*Ardea herodias*), white-faced ibis (*Plegadis chihi*), and Sandhill crane (*Grus canadensis*) are wading birds common to Rock Springs Field Office area. The heron and ibis use the broad range of habitats, foraging in wetlands and shallow riverine areas and nesting over water in cottonwood trees or tall shrubs. Sandhill cranes utilize wetland/marshy areas and grass/forb habitats for foraging and nesting.

Shorebirds are most often found foraging for food along water margins. Shorebirds use the Resource Area during migration and also for nesting. Shorebirds frequent open water areas, riverine, and wetland habitats on the Rock Springs Field Office area. Common shorebird species utilizing area include: killdeer (*Charadrius vociferus*), spotted sandpiper (*Actitis macularia*), greater (*Tringa melanoleuca*) and lesser yellowlegs (*Tringa flavipes*), willet (*Catoptrophorus semipalmatus*), long-billed dowitcher (*Limnodromus scolopaceus*), Wilson's phalarope (*Phalaropus tricolor*) and common snipe (*Gallinago gallinago*).

Divers and swimmers are water birds that swim or dive for their prey. The common merganser (*Mergus merganser*), pied-billed grebe (*Podilymbus podiceps*), and American coot (*Fulica americana*) use open water areas, tall emergent marshes, and nest in the Rock Springs Field Office area. The double-crested cormorant (*Phalacrocorax auritus*) and American white pelican (*Pelecanus erythrorhynchos*) subsist on a diet of fish and frequent riverine and open-water habitats. Exposed river rocks, cottonwood trees, and graveled shorelines provide roosting habitat.

Nongame Species

Raptors

There are 27 species of hawks, eagles, and owls that have the potential to nest in the field office. Other species are wintering populations, migrants, or possible migrants. Raptor species that are commonly seen in the field office include prairie falcon. American kestrel, burrowing owl, ferruginous hawk, red-tailed hawk, Swainson's hawk, northern harrier, golden eagle, and great-homed owl.

Approximately 70% of the field office has been surveyed for nesting raptors. About 40% of the field office was surveyed for "special habitat features" in 1979 with most potential cliff-nesting habitat identified. A 1980-1981 raptor inventory was conducted within the Rock Springs Known Recoverable Coal Resource Area by BLM biologists and survey crews to satisfy coal leasing suitability criterion. Raptor inventories have not been completed on all potential habitats in the field office. Raptor studies are currently driven by specific development projects and data are collected to determine raptor management conflicts.

Many of the more than 1,600 known raptor nests occur on hilltops, low cliffs, and rock escarpments found within the sagebrush steppe community. Maintenance and management of this habitat component is of primary importance.

Neotropical Migratory Birds

Neotropical migrants are birds that breed in North America, but winter in Central and South America or the West Indies. The following species are those that are more commonly found on the Rock Springs Field Office area during migration, but many nest on the Resource Area as well. These species include: tree swallow (*Tachycineta bicolor*), rufous hummingbird (*Selasphorus rufus*), Western (*Tyrannus verticalis*), and Eastern kingbird (*Tyrannus tyrannus*), yellow warbler (*Dendroica petechia*), Lincoln sparrow (*Melospiza lincolnii*), common nighthawk (*Chordeiles minor*), and the yellow-rumped warbler (*Dendroica coronata*).

Great blue herons, which nest atop cottonwood trees on the Green River and Henry's Fork, may be found along the Sandy, the Green River, and Antelope Spring Creek. Sandhill cranes are often seen courting and nesting along the Sweetwater River, Ord Creek, Seedskadee Refuge, and the Big Sandy River during spring.

Woodpeckers

Woodpeckers that inhabit the Rock Springs Field Office area include the northern flicker (*Colaptes auratus*), which is the most common, other less common woodpeckers include downy (*Picoides pubescens*), and hairy woodpeckers (*Picoides villosus*), and the red-naped sapsucker (*Sphyrapicus nuchalis*).

Grouse

Greater Sage-Grouse are found throughout the Rock Springs Field Office area wherever suitable habitat exists. Chukar partridge (*Alectoris chuckar*), blue grouse (*Dendragapus obscurus*), and ruffed grouse (*Bonasa umbellus*) are also present in the planning area.

Juniper Obligate Species

The south central portion of the Rock Springs Field Office area contains the northernmost extent of the pinyon/juniper biome. Many of the juniper trees in this area are several hundred years old and the large interior blocks support species not found anywhere else in Wyoming. The black-throated gray warbler (*Dendroica nigrescens*), Western scrub-jay (*Aphelocoma californica*), juniper titmouse (*Baeophus griseus*), ash-throated flycatcher (*Myiarchus cinerascens*), gray flycatcher (*Empidonax wrightii*), Bewick's wren (*Thryomanes bewickii*), blue-gray gnatcatcher (*Polioptila caerulea*), cliff chipmunk (*Tamias dorsalis*), pinyon mouse (*Peromyscus truei*), and canyon mouse (*Peromyscus crinitus*), Northern tree lizard (*Urosaurus ornatus wrighti*) bushtit (*Psaltriparus minimus*), and gray vireo (*Vireo vicinior*) occur in this habitat and are in the northernmost extent of their range.

Fisheries

There are approximately 465 miles of intermittent streams and 1,132 miles of perennial streams (including the Green River) in the field office. Under BLM-administered surface and mineral estate, there are 412 miles of perennial stream and 256 miles of intermittent (excluding the Green River). There are 109 miles of stream under split estate (excluding the Green River) on which BLM would have responsibility during a BLM-permitted action. Over half of the inventoried streams have the potential for significantly improved stream stability through various management practices.

A major limiting factor to game fisheries habitat is the low availability of spawning habitat. This is primarily due to stream sedimentation, which in turn relates to channel stability. Spawning habitat typically consists of gravelly, rocky stream bottoms with stable banks which prevent or reduce the sediment load entering the stream. Sedimentation destroys spawning habitat. Only 16.7% of the stream miles surveyed had good to fair spawning habitat. The remaining 83.3% falls into a poor, virtually none, or not significant category. Protection and improvement of spawning habitat throughout the area should therefore be one of the main aquatic program emphases.

There are 32 species of fish known to occur in the waters of the field office. Five species of trout, kokanee salmon, and whitefish provide recreation fishing on public lands. Flannelmouth suckers and carp provide a recreation resource for archers during spring and summer. Nongame fish, their eggs, and fry also provide a forage source for game fish and other wildlife.

Inventories and studies indicate that fish inhabit most streams in the field office. The mountain sucker is the most common and widespread species, with flannelmouth sucker, speckled dace, mottled sculpin, and fathead minnow also being common. Most sampling has concentrated on areas where cool water species, especially trout, may be found. Because of this, data on distribution and abundance of fish species may not be entirely accurate for standing waters and warm water streams.

Mottled sculpin and speckled and longnose dace are indicator fish species of good water quality and a more stable stream habitat. In many cases, these fish and trout species are more common near the headwaters of streams and creeks where sedimentation and/or siltation are not as significant as further downstream.

Based on electrofishing samples conducted by the WGFD, typical trout populations on the upper reaches of most streams range from 600 to 3,500 fish per mile. Typical trout populations in the lower reaches of these streams range from 0 to 500 per mile. Brook trout is the most prevalent of the species occurring in most streams near the mountains. Rainbow and brown trout species are most common in faster moving, lower reaches of many streams.

There are serious data gaps associated with aquatic wildlife and wetland/riparian resources within the field office. Although there have been quite a number of fish collection studies to determine species composition in many streams in the field office (particularly the Green River, both pre-and post-impoundment studies), a data gap exists for other parts of the field office. Population studies of the fishery resource throughout the field office are essentially nonexistent. Surveys of the population levels of fish, both game and nongame, in the network of streams are needed to help determine the significance of specific streams and to assist in making management decisions.

Aquatic macroinvertebrate information is an excellent and proven way to monitor the health and trends of a stream. A study has recently begun on Currant Creek as part of a management effort to restore the habitat for the Colorado River cutthroat trout, but no other macroinvertebrate data have been collected by the BLM in the field office, some data may exist with Wyoming Game and Fish Department or Bureau of Reclamation.

Fisheries Habitat Requirements

Fish and other aquatic animals have specific environmental requirements. General recommendations on water quality for the maintenance of life functions of a mixed fish fauna include dissolved oxygen (not less than 5 mg/l), pH (6.7 to 8.6), carbon dioxide (not over 3 mg/l), conductivity (at 25°C., 150-500 mhos, with a maximum of 1,000-2,000 mhos permissible in western alkaline areas), ammonia (not over 1.5 mg/l), temperature (varies by species), and stream flow.

Two constituents shown to cause widespread fishery impairments are total suspended solids and heavy metals. There is considerable uncertainty about the proper criteria for these constituents necessary to protect fisheries in the field office. Additional studies are needed to determine the magnitude at which fish are adversely affected. Any activity which increases total suspended solids, ammonia, heavy metals, or phosphates or reduces dissolved oxygen in the streams of the field office will adversely affect water quality and fish habitat.

3.21.2 Forest Service

General Planning Area Description

Wildlife habitat is best characterized by vegetation type and water resource; although air quality, geology and topography, and soils are also important contributors to habitat character. Such factors as fire management, forest management, ROWs, livestock grazing, energy developments (e.g., wind power and coal mining), OHV use and other recreation activities may also influence the quality of habitat. Wildlife species generally use vegetation on the basis of its physiognomy (e.g., structure [height and spacing] and growth form [gross morphology and growth aspect] of the predominant species and leaf characteristics of the dominant or component plants). This means that a given species may use a shrub of a particular height and growth form irrespective of its species. Therefore, the mapping of vegetation zones characterizes wildlife habitat in general terms. Important habitats within the planning area include mountain shrub (mountain big sagebrush and antelope bitterbrush); monotypic stands of bitterbrush and true mountain mahogany; and coniferous, rockland, aspen, riparian, and lowland sagebrush (primarily Wyoming big sagebrush on flatlands and basins below 7,000 feet) (Wichers 2002).

The State of Wyoming has jurisdiction over all wildlife in the state and species are managed by either WGFD or USFWS. The WGFD is responsible for oversight of big game species, nongame species, and small game species that are non-migratory. The USFWS has oversight of migratory bird species, whether they are hunted (e.g., waterfowl) or not (e.g., passerine species such as warblers and sparrows), and of all federal threatened, endangered, proposed, or candidate plant and animal species. The Forest Service is primarily responsible for management of wildlife habitat on lands for which it has administrative responsibility. In contrast, the State agencies are directly responsible for managing wildlife populations and have authority to carry out statutory policy to preserve, protect, perpetuate, and manage all fish and wildlife species.

Close cooperation between different state and federal agencies is necessary to endure proper management of the fish and wildlife resources. The Forest Service and state agencies work in partnership to achieve optimum balance between wildlife population goals and habitat management in the Forest. Effects to most species due to management activities on National Forest System lands are measured by changes in habitat and habitat trends.

Wildlife

A diverse array of wildlife habitats occur within the planning area due to the variety of ecoregions that occur in the area. Habitats include montane forests of lodgepole and ponderosa pines; aspen stands; mountain mahogany and juniper woodlands; sagebrush steppe communities; sand dunes; badlands; and extensive areas of grasslands (Knight 1994). Vertebrate wildlife species that occur within National Forest System lands represent all major vertebrate classes: reptiles, amphibians, fishes, birds, and mammals. Emphasis is primarily placed upon birds and mammals because of increased interest in them by the hunting, fishing, and the recreating public. Important species or groups include the following:

- Big game species such as pronghorn, mule deer, white-tailed deer, elk, moose, and bighorn sheep;
- Waterfowl such as duck and geese and other water birds such as rail, coot, and snipe;
- Upland game birds such as crane, pheasant, partridge, grouse, dove, and turkey;
- Small game mammals such as rabbit, hare, and squirrel;
- Furbearers such as badger, bobcat, marten, weasel, coyote, raccoon, red fox, skunk, beavers, mink, and muskrat; and
- Nongame species such as raptors and neotropical migratory birds.

Fisheries

Fisheries habitat includes perennial and intermittent streams, lakes, and reservoirs that support fish through at least a portion of the year. A number of major drainages occur within the planning area. National Forest System lands provide habitat for many species of fish. These species are adapted to a variety of stream habitats, from the cold, rapid waters of mountainous areas to the slow, turbid waters of the high desert.

Fishery habitat conditions are closely tied to stream riparian conditions. Riparian vegetation moderates water temperatures, adds structure to the banks to reduce erosion, provides in-stream habitat for fish, and provides organic material for aquatic insects. As riparian habitats degrade, erosion and sediment transport increases, temperature fluctuations increase, oxygen content can reach critically low levels, and streams widen and become shallower. As streams improve in condition, populations of some sensitive aquatic species could subsequently improve.

Bridger-Teton National Forest

Introduction

The BTNF is 3.4 million acres and includes five primary mountain ranges, including the Gros Ventre, Snake River, Salt River, Wyoming and Wind River mountain ranges. The Forest is sub-divided into six management units that include the Buffalo, Jackson, Greys River, Kemmerer, Big Piney, and Pinedale Ranger Districts. The BTNF provides a wide diversity of habitats that support over 395 vertebrate species, including six amphibians, six reptiles, 74 mammals, 208 birds, and 25 fish species that are indigenous to the BTNF. There are five mammals and 71 birds that are listed as rare or accidental visitors to the Forest.

As required by laws and regulations, the Forest Service works closely with other federal and state agencies (USFWS, WGFD, and Grand Teton National Park, and the National Elk Refuge) to manage habitat for wildlife and fish.

Wildlife

Generally, habitats are comprised of varying combinations of vegetation groups or cover types and varying degrees of the following vegetative components: (a) vertical structures, (b) size class, (c) density, (d) species composition, (e) snags, and (f) down woody debris. Some species of wildlife are sensitive to human activity in close proximity during the breeding, nesting, and wintering portions of their life cycles. Human activities, whether intentional or unintentional, can increase stress to some species and may reduce reproductive success.

Approximately 66% of the Forest is comprised of coniferous and deciduous (aspen) community types. The remaining 34% consists of grassland, willow, mountain shrub and sagebrush shrub community types along with rock and lakes. The primary coniferous types are subalpine fir/spruce and lodgepole pine. Of the 430,870 acres of sagebrush shrub community types on the Forest (about 12.4% of the total BTNF area), mountain big sagebrush is most common, comprising 88% of all sagebrush community types on the Forest.

Table 3-141. National Forest System Acreage and Mapped Greater Sage-Grouse Habitat Acres by Category in the Bridger-Teton National Forest

Unit	Core Habitat Acres* on the Bridger Teton National Forest**	General Habitat Acres* on the Bridger Teton National Forest**	Bridger Teton Occupied Habitat Acres* (Outside Core and General)	Total Acres of Mapped Sage-Grouse Habitat*	Sagebrush Community Type Acres* (Within General Habitat)	Sagebrush Community Type Acres* (Within Bridger Teton Habitat)
Buffalo Ranger District	220	33,070	0	33,290	-	-
Jackson Ranger District	2,700	144,230	5,590	152,510	-	-
Greys River Ranger District	0	1,860	2,920	4,780	-	-
Kemmerer Ranger District	0	7,720	0	7,720	-	-
Big Piney Ranger District	0	34,240	12,740	46,980	-	-
Pinedale Ranger District	3,080	40,900	39,340	83,310	-	-
Total Acres	**6,000**	**262,020**	**60,590**	**328,590**	**76,600 (29% of mapped habitat = sagebrush)**	**41,300 (68% of mapped habitat = sagebrush)**

*Excludes private lands within proclaimed Forest Service boundaries.
**(WY EO 2011-5)

Given the primacy of sage steppe habitats to the conservation of Greater Sage-Grouse, the following discussion will be directed toward the identification of current management practices and issues/concerns that may be directly or indirectly related to the conservation of sage steppe habitats that overlap with habitats of management indicator species. Management indicator species on the BTNF whose habitat requirement are fully or partially dependent on sagebrush habitat types (and thus, indicate a positive association with Greater Sage-Grouse habitat) are identified in Table 3-84 of Section 3.14 of this document. The species include Brewer's sparrow, elk, mule deer, moose, pronghorn antelope, boreal toad, boreal chorus frog, rainbow trout, and aspen.

The Brewer's sparrow is a sagebrush obligate and an ecological MIS for sagebrush dependent species. Elk, mule deer, pronghorn, and moose are all harvest management indicator species within the BTNF. They are habitat generalists, for the most part, selected for analysis to represent important harvest species. Two amphibians were identified as ecological MIS for wetland habitats; the boreal chorus frog and the boreal toad. The boreal toad was recently added to the Regional Forester's Sensitive Species list and was addressed in Section 3.14 of this document.

Brewer's Sparrow

There are five North American breeding bird survey (BBS) routes on the BTNF. Species occurrence data collected from 1968 to 2003 was analyzed at the route level to determine species trend per route. Four of the routes showed a positive trend during this period (+3.3, +18.1, +8.8, and +29.1 percent increase in the number on each route). The other route showed a negative trend of minus 16.2%/year (BBS GIS data). Transect data was not collected for every route during every year of the survey period and these surveys were not specifically targeting sagebrush habitat. Depending on the route, the number of years that survey data was collected ranges from eight to 21 years. Regionally in Wyoming, Brewer's sparrow population trends have been relatively stable with a -0.9% decrease in the occurrence of Brewer's sparrows on survey routes from 1968-2005 (USGS 2007).

The Rocky Mountain Bird Observatory (RMBO) recently completed breeding bird surveys from 2009 throughout the State of Wyoming. RMBO began 'Monitoring Wyoming's Birds' in 2002, in conjunction with the Forest Service, BLM, and WGFD. In 2009, RMBO implemented a new spatially balanced design based upon Bird Conservation Regions (BCR) and management boundaries in Wyoming. This new design allows for comparison of density estimates across public and private lands and to the results of other long-term monitoring projects throughout the country. This project is implemented throughout Wyoming and is designed for long-term monitoring of birds at large spatial scales. This is crucial to birds identified as MIS, particularly the Brewer's sparrow, to understand the trend of the species at the BCR level.

In the RMBO 2009 monitoring report (Rehm-Lorber et al. 2010), the BTNF, as well as a majority of the state of Wyoming, is mapped as BCR 10 in the Northern Rockies. Brewer's sparrows in this BCR were surveyed on BLM and Forest Service managed sagebrush vegetation types within the Green River drainage. Density surveys of Brewer's sparrows in this survey area recorded about 112 birds/ sq. km, the second highest density of birds recorded in the State. The Worland BLM Unit recorded the highest densities. Surveys of Brewer's sparrows on the Shoshone (the eastern neighbor of the BTNF) recorded about 23 birds/ sq. km. Since this was the first year data was collected using this survey method, no State or Regional density or population trend information is currently available.

As of 2009, only two transects were located on the BTNF. Of these two transects, one was on the Jackson Ranger District and one was on the Big Piney Ranger District in the Bondurant Basin (Rehm-Lorber et al. 2010). Two transects are not sufficient to understand Brewer's sparrow densities throughout the Forest. In 2010 the BTNF, in partnership with the RMBO and Region 2 of the Forest Service, added 15 transects to the forest survey plan that will provide necessary data to better estimate populations and long term trends. In the future, and depending on budget, additional transects may need to be added to fully understand the status of Brewer's sparrows and other migratory birds within the BTNF.

Elk, Mule Deer, Moose, and Pronghorn Antelope

The WGFD is responsible for managing wildlife populations within the state of Wyoming, including big game ungulates. The department manages and monitors these species in terms of geographic areas that are defined as 'herd management units.' The following discussion will address herd management units for elk, mule deer, pronghorn antelope, and moose within the Jackson and Sublette geographic areas where the majority of Greater Sage-Grouse habitat is located on the BTNF. Table 3-142 depicts big game herd population objectives and population estimates of elk, mule deer, moose, and pronghorn antelope in the Jackson GA of the BTNF.

Table 3-142. Big Game Herd Population Objectives and Trends for the Jackson Geographic Area in the Bridger-Teton National Forest

Elk—Jackson Herd Unit		Mule Deer—Targhee Herd Unit	
Population Objective	11,000	Population Objective	850
Population 2007	12,582	Current Population	Unknown
Population 2008	12,552	Trend	Unknown
Population 2009	11,691		
Population 2010	11,978		
Moose—Jackson Herd Unit		**Pronghorn Antelope—Jackson Herd Unit**	
Population Objective	3,700	No objectives or population info available.	
Population 2007	1,705		
Population 2008	970		
Population 2009	934		
Population 2010	919		

WGFD 2010a

Elk population trends in the Jackson Herd Unit have remained stable over the past few years, and population estimates have slightly exceeded objectives since 2007. This herd winters primarily on Elk Winter Feed Grounds on the National Elk Refuge and within the Gros Ventre drainage. Elk use of mapped Greater Sage-Grouse habitats in the Jackson Hole Valley and Gros Ventre occurs yearlong, but primarily during winter and spring (parturition habitat).

Due to the "Interstate" nature of the mule deer herd in the Jackson GA (referred to by Wyoming Fish and Game as the Targhee herd), population management is problematic. Mule deer in this population spend summer and early fall in Wyoming and migrate to lower elevations in Idaho to spend the winter in the foothills of the Teton Range or along the Teton River. Because of minimal numbers of wintering deer in Wyoming, there have been no classification counts since 1998. Field observations, public comments and harvest statistics indicate that this population has declined from the levels observed in the 1970s and 1980s. The State of Idaho initiated liberal seasons prior to 1998 to address deer numbers on winter ranges on the Teton River and damage concerns along the state line. Conservative hunting seasons were in place in Wyoming from 1998 to 2001 due to low numbers of deer observed on winter ranges along the Wyoming/Idaho state line. Since 2001, hunting seasons have been set that are consistent with deer areas east of Jackson.

Moose populations in the Jackson Herd Unit have declined significantly since approximately 2000, and current populations are well below objectives. Several studies have been initiated to determine the reasons for population decline. Moose use of sagebrush vegetation types within the Jackson Hole Valley and Gros Ventre occur yearlong, and primarily within the sagebrush and willow ecotone.

Pronghorn antelope summer in the Jackson Hole Valley and Gros Ventre within sagebrush flats and Greater Sage-Grouse summer and winter habitat, but migrate south to winter ranges in Sublette County south of Pinedale. Because population estimates are based on count surveys conducted during winter months, the Wyoming Fish and Game does not provide population estimates for pronghorn that summer in the Jackson area.

Table 3-143. Big Game Herd Population Objectives and Trends for the Hoback Geographic Area in the Bridger-Teton National Forest

Elk—Hoback Herd Unit		Mule Deer—Sublette Herd Unit
Population Objective	1,100	See Piney Geographic Area Table
Population 2007	995	
Population 2008	1,064	
Population 2009	1,076	
Population 2010	850	
Moose—Sublette Herd Unit		**Pronghorn Antelope—Sublette Herd Unit**
See Piney Geographic Area Table		See Piney Geographic Area Table

Elk populations in the Hoback Herd Unit have been slightly below population objectives since 2005 (Table 3-143). Elk in this unit winter primarily on Elk Winter Feed Grounds, but some natural winter and parturition ranges also exist along HWY 191 within sagebrush vegetation types and Greater Sage-Grouse summer habitats.

Table 3-144. Big Game Herd Population Objectives and Trends in the Piney Geographic Area in the Bridger-Teton National Forest

Elk—Piney Herd Unit		Mule Deer—Sublette Herd Unit	
Population Objective	2,400	Population Objective	32,000
Population 2007	3,763	Population 2007	31,207
Population 2008	3,616	Population 2008	28,700
Population 2009	3,485	Population 2009	26,057
Population 2010	3,280	Population 2010	26,162
Moose—Sublette Herd Unit		**Pronghorn Antelope—Sublette Herd Unit**	
Population Objective	5,500	Population Objective	48,000
Population 2007	4,481	Population 2007	62,200
Population 2008	4,768	Population 2008	59,200
Population 2009	4,701	Population 2009	57,000
Population 2010	4,908	Population 2010	59,000

The Piney Elk Herd has remained well above objective since 2005 (Table 3-144). These elk rely heavily on five Winter Elk Feed Grounds located west of Big Piney along the East Wyoming Range Front and within large sagebrush flats. Use of Greater Sage-Grouse habitats are primarily restricted to winter and spring time periods (winter and parturition range).

The Sublette Mule Deer Herd Unit covers a very large area and includes the majority of Sublette County. The estimated total population has remained below objective since 2005. Deer in this herd winter almost exclusively within sagebrush flats in the valley and within Greater Sage-Grouse summer and winter habitat.

The Sublette Moose Herd Unit covers a very large area and includes the majority of Sublette County. The estimated total population has remained below objective since 2005, but has shown a slow but steady climb to a population estimate of 4,908 in 2010. Moose winter primarily in willow complexes within sagebrush flats and Greater Sage-Grouse summer and winter habitats. During less severe winters with lower snow depths, moose also winter within the sagebrush and conifer ecotone.

The Sublette Pronghorn Herd populations have remained fairly steady and over objective since 2005. The herd occupies most of the Green River drainage north of Interstate Highway 80 in addition to portions of the Gros Ventre, Hoback, and Sweetwater River drainages. Within the Sublette herd, pronghorn migrate farther between seasonal ranges than any other known herd in North America. Pronghorn that summer along the Gros Ventre River and within Grand Teton National Park winter as far south as Rock Springs, a distance of over 150 air miles. The Sublette herd covers 10,546 square miles of total surface area, which is approximately 11% of the state of Wyoming. Pronghorn occupy 7,938 square miles of habitat within the herd unit boundaries. This herd utilizes sagebrush vegetation and Greater Sage-Grouse habitat year long.

Table 3-145. Big Game Herd Population Objectives and Trends in the Upper Green Geographic Area in the Bridger-Teton National Forest

Elk—Upper Green River Herd Unit		Mule Deer—Sublette Herd Unit
Population Objective	2,500	See Piney Geographic Area Table
Population 2007	2,452	
Population 2008	2,600	
Population 2009	2,639	
Population 2010	2,550	
Moose—Sublette Herd Unit		**Pronghorn Antelope—Sublette Herd Unit**
See Piney Geographic Area Table		See Piney Geographic Area Table

The Upper Green Elk Herd Unit has remained at objective since 2005, with only slight total population variations (Table 3-145). Elk winter on two Winter Feed Grounds, but some use also occurs on natural winter ranges on and adjacent to sagebrush vegetation types and summer Greater Sage-Grouse habitat along the Upper Green River.

Table 3-146. Big Game Herd Population Objectives and Trends in the Pinedale Geographic Area in the Bridger-Teton National Forest

Elk—Pinedale Herd Unit		Mule Deer—Sublette Herd Unit
Population Objective	1,900	See Piney Geographic Area Table
Population 2007	1,741	
Population 2008	2,006	
Population 2009	1,980	
Population 2010	2,000	
Moose—Sublette Herd Unit		**Pronghorn Antelope—Sublette Herd Unit**
See Piney Geographic Area Table		See Piney Geographic Area Table

The Pinedale Elk Herd Unit has remained at and slightly above objective since 2005 (Table 3-146). These elk winter almost exclusively on Winter Elk Feed grounds which occur within sagebrush vegetation types and Greater Sage-Grouse habitat along the Wind River Range front near Pinedale.

Boreal Chorus Frog

Chorus frogs breed in shallow, ephemeral pools, marshes, and sometimes more permanent waters. During summer months, they may move up to one-third of a mile from breeding ponds into wet meadows. Some breeding sites on the BTNF are known to occur adjacent to sagebrush flats that also provide habitat for Greater Sage-Grouse. Monitoring sites for ten boreal chorus frog breeding sites were established on the Forest in 2010 and an additional ten monitoring sites will be established in 2012. No population trend data is available at this time.

Fisheries

The BTNF supports a variety of native and non-native fisheries in lotic (flowing) and lentic (still water) ecosystems. Cutthroat trout were historically present and native to each of the four river basins on the BTNF (Bear, Green, Snake and Yellowstone). Only the Sweetwater River drainage was not historically occupied by trout on the BTNF. Beginning in the mid-1800's western trout, particularly subspecies of interior cutthroat trout, experienced severe declines in distribution and abundance as a result of non-native fish introductions, habitat degradation, over harvest, and habitat fragmentation. The introduction of non-native fishes has been identified as posing the greatest present-day danger to native cutthroat trout conservation, due mainly to hybridization and introgression. Native cutthroat trout populations on the BTNF (Bonneville, Colorado River and Yellowstone/Snake River fine-spotted cutthroat trout) have declined due to hybridization and introgression, population fragmentation from manmade barriers, and competition from introduced trout species that include rainbow trout. In addition, the ability of many cutthroat trout populations to persist has declined due to reduced watershed function and habitat degradation from dam operations, water diversions, road networks, timber harvest, permitted livestock grazing, private and public developments on floodplains, developed and dispersed recreation in riparian areas, and recreational angling.

Fish populations on the BTNF are managed by the WGFD, while the Forest manages much of the habitat. Management of fisheries and aquatics resources is largely driven by balancing the needs of native species with the desire to maintain a sport fishery. Management goals are largely dependent on the geographic area of consideration, the native species present and their relative population status, as well as habitat availability.

Fish-bearing streams within Greater Sage-Grouse core areas consist of an extremely small percentage of the overall amount of fish-bearing habitats on the Forest. The construction of in-channel reservoirs or off-site watering facilities for livestock may have altered fish distributions where they occur, and may have altered habitats that create competitive advantages for non-native species to flourish. Primary threats to aquatic habitats in or near identified core Greater Sage-Grouse habitats include sedimentation, habitat fragmentation, hybridization, riparian degradation, dewatering, and exotic fish introductions. Current Greater Sage-Grouse management is not believed to have significantly impacted fish resources at a localized or broad geographic scale.

Although aspen stands themselves do not provide habitat for sage-grouse, aspen stands do occur within or immediately adjacent to mapped core and general sage-grouse habitats on the BTNF. Because the maintenance and persistence of aspen community types over the long term are dependent on natural and artificial disturbance processes such as wildfire and prescribed fire, implementation of sage-grouse conservation measures that suppress such disturbance actions could potentially have a negative impact on aspen communities that occur within or immediately adjacent to sage-grouse habitats.

Medicine Bow National Forest

Introduction

The Medicine Bow National Forest provides a wide diversity of habitats that support over 300 vertebrate species, including 75 mammals, 227 birds, 19 reptiles, and six amphibians (Von Ahlefeldt and Speas 1996). The MBNF provides important seasonal (breeding as well as year-long) habitats for many bird species such as songbirds, raptors, shorebirds, woodpecker and others (Von Ahlefeldt and Speas 1996). The Wyoming Wildlife Action Plan identifies 279 species of greatest conservation need. Many of these that occur on the Forest are federally threatened, candidate, Region 2 Sensitive species, or Forest Species of Local Concern.

The MBNF includes four units in three distinct mountain ranges. The Medicine Bow portion of the Central Rockies includes the northern extension of the Colorado Front Range, which divides to include the Laramie Range on the east (the southern extension is known as the Sherman Mountains) and the Snowy Range of the Medicine Bow Mountains on the west. The Sierra Madre Mountains, which are the northern part of the Parks Range, occupy the westernmost portion of the Forest. The Continental Divide bisects the Sierra Madres. The major river drainages flow from the Continental Divide: the Green River Basin flows west into the Colorado River system, and the western Dakota sub-Basin and Platte River Basin flow east. All of the Medicine Bow National Forest is mountainous. Elevations range from 5,050 feet above sea level in the Laramie Range to 12,013 feet at Medicine Bow Peak in the Snowy Range of the Medicine Bow Mountains.

Wildlife

Approximately 88% of the MBNF is forested. Forests are comprised primarily of lodgepole pine (*Pinus contorta*); other forest types include spruce-fir, aspen (*Populus tremuloides*), and Ponderosa pine (*Pinus ponderosa*). There are 28 geographic areas within the four units that have been established on the MBNF. The physical and ecological characteristics of these geographic areas are described in the MBNF Land and Resource Management Plan (2003). Of the four larger units on the Forest, only three contain sage or sage steppe habitats designated as 'core' habitats (WY EO 2011-5) for the Greater Sage-Grouse.

No core habitat for Greater Sage-Grouse occurs within the Sherman Mountains unit (Pole Mountain) of the MBNF. Within the Laramie Range unit, 2,640 acres have been designated as core Greater Sage-Grouse habitat within the Boxelder Geographic Area. Within the Sierra Madre unit, 1,290 acres of core Greater Sage-Grouse habitat occur within the Northeast Sierra Madre Geographic Area (765 acres); South Savery Geographic Area (100 acres); Beaver Creek Geographic Area (130 acres); and the North Savery Geographic Area (300 acres). Within the Snowy Range, designated core Greater Sage-Grouse habitat occurs within the Pennock Mountain Geographic Area (280 acres) and the Platte River Geographic Area (350 acres). In general, these habitats occur in areas of ecological transition. Core habitat consists of areas of sage steppe interspersed by rock or outcrops as they transition to primarily lodgepole pine forest types. No leks of the Greater Sage-Grouse are known to occur on the MBNF.

Table 3-147 below depicts National Forest System acreage within the four primary geographic units on the MBNF and the designated Greater Sage-Grouse core habitat acres within each of the respective units. Of the 1.26 million acres of National Forest System lands within the four units, 4,560 acres (<0.4%) are designated as core habitat for the Greater Sage-Grouse.

Table 3-147. National Forest System Acreage and Greater Sage-Grouse Core and General Habitat for the Medicine Bow National Forest

Unit	Unit Acres	Core Acres	General Habitat Acres
Laramie Peak	437,780	2,640	5,520
Sherman Mountains	55,580	0	0

Unit	Unit Acres	Core Acres	General Habitat Acres
Sierra Madre	362,220	1,290	15,630
Snowy Range	406,740	630	2,030
Total	**1,262,320**	**4,560**	**23,175**

The following discussion will be restricted to the Laramie Peak, Snowy Range, and Sierra Madre units of the MBNF as the Sherman Mountains unit (Pole Mountain) lacks any designated core Greater Sage-Grouse habitat.

Issues of relevance to the conservation of the Greater Sage-Grouse that are related to the distribution or management of other wildlife species may include the conservation of sensitive species such as passerines associated with sage or sage steppe habitats, the conservation of raptors such as the Northern harrier (a regional forester's sensitive species), and the management of large ungulates such as the mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), and the Rocky Mountain elk (*Cervus elaphus*). Consequently, the following discussion will focus on the implications of big game management on the conservation of sagebrush habitat.

The WGFD, as the trust steward of game species such as large ungulates, manages and monitors these species in terms of geographic areas that are defined as 'herd management units.' The following discussion will address herd management units for bighorn sheep, mule deer, pronghorn antelope, and Rocky Mountain elk within the Laramie Peak, Snowy Range, and Sierra Madre geographic areas of the MBNF.

Laramie Peak Geographic Area

Within the Laramie Peak Geographic Area (GA), the herd population estimate for Rocky Mountain elk far exceeds the respective herd management objective (Table 3-148). This is an area of dissected landownerships with substantial acreage held in private ranches. In this case, the availability of access to private land confounds the management of regulated elk harvest. Table 3-148 depicts big game herd population objectives and current population estimates of Bighorn sheep, mule deer, pronghorn antelope, and Rocky Mountain elk in the Laramie Peak GA of the MBNF. Where population estimates exceed herd unit objectives, data is highlighted in boldface.

Table 3-148. Big Game Herd Population Objectives for the Laramie Peak Geographic Area in the Medicine Bow National Forest

Bighorn Sheep		Mule Deer	
Laramie Peak Unit		**Bates Hole/Hat Six Units**	
Current Population	250	Current Population	5,940
Population Objective	500	Population Objective	12,000
Rocky Mountain Elk		**Pronghorn Antelope**	
Laramie Peak Herd Unit		**Medicine Bow National Forest Herd Unit**	
Current Population	**9,323**	Current Population	56,358
Population Objective	5,000	Population Objective	60,000

WGFD 2010a

Snowy Range Geographic Area

Within the Snowy Range GA, the herd population estimate for pronghorn antelope far exceeds the respective herd management objective (Table 3-149). This too is an area of dissected landownerships with substantial acreage held in private ranches. In this case, the availability of access to private land confounds the management of regulated pronghorn harvest. Table 3-149 depicts the big game herd population objectives and current population estimates of Bighorn sheep, mule deer, pronghorn antelope, and Rocky Mountain elk in the Snowy Range GA of the MBNF. Where population estimates exceed herd unit objectives, data is highlighted in boldface.

Table 3-149. Big Game Herd Population Objectives for the Snowy Range Geographic Area in the Medicine Bow National Forest

Bighorn Sheep		Mule Deer	
Douglas Creek Herd Unit		**Sheep Mountain Herd Unit**	
Current Population	95	Current Population	12,282
Population Objective	350	Population Objective	15,000
Rocky Mountain Elk		**Pronghorn Antelope**	
Snowy Range Herd Unit		**Elk Mountain Herd Unit**	
Current Population	5,885	Current Population	**10,093**
Population Objective	6,000	Population Objective	5,000

WGFD 2010a

Sierra Madre Geographic Area

Within the Sierra Madre GA, the herd population estimates for pronghorn antelope and Rocky Mountain elk far exceed their respective herd management objectives (Table 3-150). This too is an area of dissected land ownerships with substantial acreage held in private ranches. In this case, the availability of access to private land confounds the management of regulated pronghorn harvest. In the case of elk harvest on public lands, accessibility may be limited due to the hazards associated with substantial tree mortality as a result of a pine beetle epidemic. Table 3-150 depicts big game herd population objectives and current population estimates of bighorn sheep, mule deer, pronghorn antelope, and Rocky Mountain elk in the Sierra Madre GA of the MBNF. Where population estimates exceed herd unit objectives, data is highlighted in boldface.

Table 3-150. Big Game Herd Population Objectives for the Sierra Madre Geographic Area in the Medicine Bow National Forest

Bighorn Sheep		Mule Deer	
Encampment River Unit		**Platte Valley Herd Unit**	
Current Population	50	Current Population	13,000
Population Objective	200	Population Objective	20,000
		Baggs Herd Unit	
		Current Population	17,000
		Population Objective	19,000
Rocky Mountain Elk		**Pronghorn Antelope**	
Sierra Madre Herd Unit		**Iron Springs Herd Unit**	
Current Population	**7,700**	Current Population	10,940
Population Objective	4,200	Population Objective	12,000

Bighorn Sheep	Mule Deer	
	Big Creek Herd Unit	
	Current Population	**1,462**
	Population Objective	600
	Baggs Herd Unit	
	Current Population	6,700
	Population Objective	9,000

WGFD 2010a

Based on monitoring of range quality within the Sierra Madre GA of the MBNF, it is apparent that big game species, all of which may utilize sage or sagebrush shrublands seasonally, may influence the quality or composition of sagebrush habitats on the Forest.

Fisheries

The MBNF supports a variety of native and non-native fisheries in lotic (flowing) and lentic (still water) ecosystems. The Forest is situated across three major drainages including the Colorado, North Platte, and South Platte River Basins, all of which have native and introduced fish species. In many cases, introduced fish have reduced the abundance and distribution of native species through competition, displacement, predation, and in some cases, hybridization.

Fish populations on the MBNF are managed by the WGFD, while the Forest manages much of the habitat. Management of fisheries and aquatics resources is largely driven by balancing the needs of native species with the desire to maintain a sport fishery. Management goals are largely dependent on the geographic area of consideration, the native species present and their relative population status, as well as habitat availability.

Fishbearing streams within Greater Sage-Grouse core areas consist of an extremely small percentage of the overall amount of fishbearing habitat on the Forest. The construction of in-channel reservoirs or off-site watering facilities for livestock may have altered fish distributions where they occur, and may have altered habitats that create competitive advantages for non-native species to flourish. Primary threats to aquatic habitats in or near identified core habitats include sedimentation, habitat fragmentation, hybridization, riparian degradation, dewatering, and exotic fish introductions. Current Greater Sage-Grouse management is not believed to have significantly impacted fish resources at a localized or broad geographic scale.

Thunder Basin National Grassland

Introduction

The TBNG provides a wide diversity of habitats that support over 314 vertebrate species that are indigenous to the area, including at least six amphibians, eight reptiles, 50 mammals, 229 birds, and 24 fish species (14 of which are considered native to the TBNG).

Wildlife

There are at least 66 TBNG wildlife species on the Wyoming Wildlife Action Plan's Wyoming's Species of Greatest Conservation Need list. In addition, there are eight major mammalian predators on TBNG: the mountain lion, coyote, red fox, swift fox, badger, bobcat, least weasel, and long-tailed weasel. Table 3-151 shows the Species of Greatest Conservation Need on the TBNG.

Table 3-151 Wyoming Species of Greatest Conservation Need for the Thunder Basin National Grassland

Common Name	Scientific Name
Big Brown Bat *	*Eptesicus fuscus*
Black-tailed Prairie Dog *	*Cynomys ludovicianus*
Fringed Myotis *	*Myotis thysanodes*
Hispid Pocket Mouse	*Chaetodipus hispidus*
Least Weasel *	*Mustela nivalis*
Little Brown Myotis *	*Myotis lucifugus*
Long-eared Myotis	*Myotis evotis*
Long-legged Myotis	*Myotis volans*
Olive-backed Pocket Mouse	*Perognathus fasciatus*
Plains Harvest Mouse *	*Reithrodontomys montanus*
Plains Pocket Gopher *	*Geomys bursarius*
Prairie Vole *	*Microtus ochrogaster*
Silky Pocket Mouse	*Perognathus flavus*
Swift Fox *	*Vulpes velox*
Townsend's Big-eared Bat *	*Corynorhinus townsendii*
Eastern Red Bat	*Lasiurus borealis*
Western Small-footed Myotis	*Myotis ciliolabrum*
American Bittern	*Botaurus lentiginosus*
American White Pelican	*Pelecanus erythrorhynchos*
Bald Eagle Haliaeetus	*leucocephalus*
Barrow's Goldeneye *	*Bucephala islandica*
Black Rosy-Finch *	*Leucosticte atrata*
Black-backed Woodpecker *	*Picoides arcticus*
Black-crowned Night-Heron	*Nycticorax*
Brewer's Sparrow	*Spizella breweri*
Burrowing Owl	*Athene cunicularia*
Canvasback	*Aythya valisineria*
Chestnut-collared Longspur	*Calcarius ornatus*
Ferruginous Hawk *	*Buteo regalis*
Forster's Tern	*Sterna forsteri*
Franklin's Gull	*Larus pipixcan*
Grasshopper Sparrow	*Ammodramus savannarum*
Great Blue Heron	*Ardea herodias*
Greater Sage-Grouse	*Centrocercus urophasianus*
Greater Sandhill Crane	*Grus canadensis*

Common Name	Scientific Name
Lark Bunting	*Calamospiza melanocorys*
Lesser Scaup	*Aythya affinis*
Lewis' Woodpecker *	*Melanerpes lewis*
Long-billed Curlew *	*Numenius americanus*
McCown's Longspur	*Calcarius mccownii*
Merlin *	*Falco columbarius*
Mountain Plover *	*Charadrius montanus*
Northern Pintail	*Anas acuta*
Northern Pygmy-Owl *	*Glaucidium gnoma*
Sage Sparrow	*Amphispiza belli*
Sage Thrasher	*Oreoscoptes montanus*
Short-eared Owl	*Asio flammeus*
Swainson's Hawk	*Buteo swainsoni*
Upland Sandpiper	*Bartramia longicauda*
Western Grebe	*Aechmophorus occidentalis*
Willow Flycatcher	*Empidonax traillii*
Black Hills Redbelly Snake *	*Storeria occipitomaculata pahasapae*
Bullsnake *	*Pituophis catenifer sayi*
Common Garter Snake *	*Thamnophis sirtalis*
Great Plains Earless Lizard *	*Holbrookia maculata*
Greater Short-horned Lizard *	*Phrynosoma hernandesi*
Northern Sagebrush Lizard *	*Sceloporus graciosus graciosus*
Ornate Box Turtle *	*Terrapene ornata ornata*
Pale Milksnake *	*Lampropeltis triangulum multistriata*
Plains Hog-nosed Snake *	*Heterodon nasicus nasicus*
Prairie Rattlesnake *	*Crotalus viridis viridis*
Boreal Chorus Frog *	*Pseudacris maculata*
Great Basin Spadefoot *	*Spea intermontana*
Great Plains Toad *	*Bufo cognatus*
Northern Leopard Frog *	*Rana pipiens*
Tiger Salamander *	*Ambystoma tigrinum*
Black Bullhead *	*Ameiurus melas*
Plains Topminnow *	*Fundulus sciadicus*

*Species listed wholly or in part due to absence of data at the state level.

General Raptor Information

In 2001, nesting raptors (bald eagles, golden eagles, red-tailed hawks, Swainson's hawks, and ferruginous hawks) were inventoried on 3,500 acres of the TBNG to provide resource information for land management decisions, and to assist other ongoing raptor projects. A total of 89 raptor nests were located, 16% (14 nests) were active. This, however, does not represent a totally accurate percent of active nests. Each year specific areas are targeted for survey, leaving other areas with an undetermined status for many nests. Depending on the habitat available, the raptor species using it will vary. The percent active category only represents the minimum percent of active nests found in one year. It is suspected that the low activity level was due to a lack of prey caused by a crash in the local rabbit population. Table 3-152 and Figure 3-55 show raptor nest monitoring data from 2003 to 2011 for the TBNG.

Table 3-152. Raptor Nest Monitoring for the Thunder Basin National Grassland

Year	Total Inventoried	Number Active	Percent Active
2003	208	37	18
2004	155	62	40
2005	104	64	61
2006	337	166	49
2007	151	76	50
2008	190	92	48
2009	123	11	09
2010	126	23	18
2011	88	14	16

Thunder Basin Elk Herds - Rochelle Hills Elk Herd

The following big game information has been summarized from the WGFD Job Completion Reports from 2002 through 2010 from the Casper and Sheridan Regions (Table 3-153 and Figure 3-56).

The entire analysis area falls into one elk herd unit, the Rochelle Hills Elk Herd Unit. The current population is approximately 728 animals which above the desired objective of 400 animals. This population has fluctuated between 600 and 800 animals over the last ten years, but has consistently remained above the WGFD objective.

Elk habitats found within this herd unit include yearlong, winter yearlong, and crucial winter range. Elk within this herd unit do not concentrate primarily in the existing ponderosa pine stands found within the herd unit. Instead, they are found throughout the herd unit and most of the analysis area. These elk will use the cottonwood/willow riparian galleries, broken topography, sagebrush grassland, and have even been recorded on black-tailed prairie dog towns. A unique aspect of their habitat is as a result of coal mine reclamation, portions of the herd have increased their use within the Jacobs Ranch Mine to the point that the Wyoming Game and Fish Department has classified a portion of the reclamation as Crucial Winter Range.

Table 3-153. Elk Population for the Thunder Basin National Grassland

	2010 Data
Current population	728
Population objective	400

	2010 Data
Percent above or below objective	82%
Number of years above or below objective	12 years
Harvest	81 animals
Hunter success	70%

Thunder Basin Pronghorn Antelope Herds

Pronghorn antelope will use all habitat types found within the analysis area, excluding the ponderosa pine habitat, and the more dense portions of the cottonwood willow riparian. Generally, pronghorn prefer habitats with vegetation 15 inches or less in height (WGFD 2002). Pronghorn feed somewhat opportunistically, focusing on grasses in the spring and summer, forbs during mid-summer and browsing on shrubs (primarily sagebrush) through the fall and winter. The availability of water is critical to antelope habitat; pronghorn generally require habitat within five miles of a water source (WGFD 2002). Within TBNG there is habitat that provides conditions that support pronghorn yearlong (Figure 3-57).

Hilight Herd Unit

This herd unit involves only pronghorn hunt area 24 and is located just north of Wyoming highway 450 near the current coal mining activity. The current population is approximately 13,108 animals and has been above the WGFD objective of 11,000 animals for the last six years. National Grassland surface makes up less than 25% of this herd unit (Table 3-154 and Figure 3-58).

Table 3-154. Hilight Herd Population for the Thunder Basin National Grassland

	2010 Data
Current population	13,108
Population objective	11,000
Percent above or below objective	19% above
Number of years above or below objective	6 years
Harvest	1,319 animals
Hunter success	97%

North Black Hills Herd Unit

This herd unit involves five hunt areas, but only antelope hunt area 18 includes the TBNG. It is located just east of Wyoming highway 59, north of Gillette near the old Weston Town site. The current population is approximately 12,832 animals and has been at, or below the WGFD objective of 14,000 animals for the last two years. National Grassland Surface makes up less than 25% of this herd unit (Table 3-155 and Figure 3-59).

Table 3-155. North Black Hills Population for the Thunder Basin National Grassland

	2010 Data
Current population	12,832
Population objective	14,000
Percent above or below objective	8.3% below
Number of years above or below objective	2 years at or below

	2010 Data
Harvest	1,311 animals
Hunter success	86%

Gillette Herd Unit

This herd unit involves only antelope hunt area 17. It is located just west of Wyoming highway 450, north of Gillette near the old Weston Town site. The current population is approximately 12,038 animals and has been above the WGFD objective of 11,000 animals for the last seven years. National Grassland surface makes up less than 10% of this herd unit (Table 3-156 and Figure 3-60).

Table 3-156. Gillette Herd Population for the Thunder Basin National Grassland

	2010 Data
Current Population	12,038
Population Objective	11,000
Percent above or below objective	9% above
Number of years above or below objective	7 years above
Harvest	1,208 animals
Hunter success	85%

Cheyenne River Herd Unit

This herd unit involves eight hunt areas, seven of which involve TBNG. This herd unit is located just east of Wyoming Highway 59, and South of I-90 between Bill and Newcastle, Wyoming. The current population is approximately 13,108 animals and has been above the WGFD objective of 11,000 animals for the last six years. National Grassland Surface makes up less than 25% of this herd unit (Table 3-157 and Figure 3-61).

Table 3-157. Cheyenne River Population for the Thunder Basin National Grassland

	2010 Data
Current population	38,795
Population objective	38,000
Percent above or below objective	2% above
Number of years above or below objective	8 years
Harvest	6,725 animals
Hunter success	93%

North Converse Herd Unit

This herd unit involves only antelope hunt areas 25 and 26. It is located just west of Wyoming highway 59, south of Wright down to I-25, and west to Casper. The current population is approximately 34,808 animals and has been above the WGFD objective of 28,000 animals for the last seven years. National Grassland Surface makes up less than 10% of this herd unit.

Table 3-158. North Converse Population for the Thunder Basin National Grassland

	2010 Data
Current population	34,808
Population objective	28,000
Percent above or below objective	27% above
Number of years above or below objective	7 years above
Harvest	3,184 animals
Hunter success	96%

Thunder Basin Mule Deer Herds

Mule deer will use all habitat types found within the analysis area. Generally, mule deer concentrate on shrubland habitats in winter and use all habitat types available in the analysis area during the remainder of the year. Diet is primarily sagebrush and deciduous shrubs during winter and includes more herbaceous material during the remainder of the year. The TBNG contains habitat to support mule deer throughout the year (Figure 3-63).

Powder River Herd Unit

This herd unit involves hunt areas 17, 18, 23, and 26 but only hunt area 18 is located on the TBNG. The herd unit is defined by the area around Weston, Gillette, and Sheridan, near the current coal mining activity. The 2010 population is approximately 40,196 animals and has been below the WGFD objective of 52,000 animals for the last three years (Table 3-159 and Figure 3-64). National Grassland Surface makes up less than 10% of this herd unit.

Table 3-159. Powder River Mule Deer Herd Population for the Thunder Basin National Grassland

	2010 Data
Current population	40,196
Population objective	52,000
Percent above or below objective	22% below
Number of years above or below objective	4 years
Harvest	2,925 animals
Hunter success	65%

Cheyenne River Herd Unit

This herd unit involves nine hunt areas, but only hunt areas 7, 8, 9, 10, 11, and 21 include the TBNG. It is located southeast of Gillette. The current population is approximately 23,963 animals and has been below the WGFD objective of 38,000 animals for the last ten years (Table 3-160 and Figure 3-65). National Grassland Surface makes up less than 25% of this herd unit.

Table 3-160. Cheyenne River Mule Deer Herd Population for the Thunder Basin National Grassland

	2010 Data
Current population	23,963

	2010 Data
Population objective	38,000
Percent above or below objective	37% below
Number of years above or below objective	10 years
Harvest	1,817 animals
Hunter success	58%

Black Hills Herd Unit

This herd unit involves hunt areas 1 through 6. Only hunt areas 5 and 6 occur on TBNG. The herd unit surrounds the Black Hills in northeast Wyoming. The current population is approximately 16,092 animals and has been below the WGFD objective of 20,000 animals for the last two years (Table 3-161 and Figure 3-66). National Grassland Surface makes up less than 10% of this herd unit.

Table 3-161. Black Hills Mule Deer Herd Population for the Thunder Basin National Grassland

	2010 Data
Current population	16,092
Population objective	20,000
Percent above or below objective	19% below
Number of years above or below objective	2 years below
Harvest	1,723 animals
Hunter success	38%

North Converse Herd Unit

This herd unit includes hunt area 8. This herd unit is located just south of Highway 387, west of Highway 59, and north of Interstate 25. The current population is approximately 8,546 animals and has been below the WGFD objective of 9,100 animals for the last two years (Table 3-162 and Figure 3-67). National Grassland Surface makes up less than 10% of this herd unit.

Table 3-162. North Converse Mule Deer Herd Population for the Thunder Basin National Grassland

	2010 Data
Current population	8,546
Population objective	9,100
Percent above or below objective	6% below
Number of years above or below objective	2 years
Harvest	820 animals
Hunter success	85%

Fisheries

Many of the perennial and intermittent streams and waterbodies on the TBNG support diverse fish populations, most of which are dominated by nongame, warmwater species. Fish population data on the TBNG are limited and data regarding their distribution are sparse; however, recent surveys conducted on and downstream of the TBNG indicate the TBNG likely contains at least 24 fish species, 14 of which are endemic to the TBNG, and five are Region 2 Sensitive (Table 3-163 and Table 3-164). Recreational fishing opportunities are limited to a few reservoirs and ponds that are periodically stocked by WGFD. These recreational fisheries are typically managed as a put-and-take fishery and are frequently stocked with coldwater species, such as rainbow trout. Largemouth bass, brown trout, green sunfish, black bullhead and bluegill are also present in some reservoirs and occasionally these species can be found in tributary streams. Other recreational fishing opportunities are limited on the grasslands, mostly due to the paucity of water and ephemeral nature of most streams which prevent the establishment and maintenance of sportfish populations.

Table 3-163. Native Fish Documented or Believed Present on the Thunder Basin National Grassland, Based on Survey Data Collected on or Adjacent to the Thunder Basin National Grassland

Common Name	Scientific Name
Brassy Minnow	*Hybognathus hankinsoni*
Creek Chub	*Semotilus atromaculatus*
Emerald Shiner	*Notropis atherinoides*
Fathead Minnow	*Pimephales promelas*
Flathead Chub (R2S)	*Platygobio gracilis*
Lake Chub (R2S)	*Couesius plumbeus*
Longnose Dace	*Rhinichthys cataractae*
Mountain Sucker (R2S)	*Catostomus platyrhynchus*
Plains Minnow (R2S)	*Hybognathus placitus*
Sand Shiner	*Notropis stramineus*
Stonecat	*Noturus flavus*
Sturgeon Chub (R2S)	*Macrhybopsis gelida*
White Sucker	*Catostomus commersoni*
Western Silvery Minnow	*Hybognathus argyritis*

Table 3-164. Non-Native Species Documented or Believed Present on the Thunder Basin National Grassland, Based on Survey Data Collected on or Adjacent to the Thunder Basin National Grassland

Common Name	Scientific Name
Black Bullhead	*Ameiurus melas*
Bluegill	*Lepomis macrochirus*
Brook Stickleback	*Culaea inconstans*
Brown Trout	*Salmo trutta*

Common Name	Scientific Name
Common Carp	*Cyprinus carpio*
Green Sunfish	*Lepomis cyanellus*
Largemouth Bass	*Micropterus calmoides*
Plains Killifish	*Fundulus zebrinus*
Rainbow Trout	*Oncorhynchus mykiss*
Yellow Perch	*Perca flavescens*

Most unaltered stream systems on the TBNG exhibit high hydrologic fluctuations in response to precipitation events. As a result, stream systems can exhibit high variance in the hydrograph which may include periods of high flows followed by extended periods of low flows or even no flow, especially during the late summer and fall months. Many warmwater fish species are adapted to survive in these harsh environmental conditions, which may include periods of intermittency, high suspended solids, extreme temperatures (low and high), low dissolved oxygen levels, and silty substrates. Impoundments, reservoirs, and ponds have altered the hydrography in many stream systems and have resulted in habitat changes that favor both desirable and undesirable non-native fish species. Habitat fragmentation, water development, and drought have altered important aquatic habitats favored by native warmwater fish species and have likely altered species compositions (Barrineau et al. 2007).

Diverse aquatic habitats exist on the TBNG, which include pools, runs, and riffle-type habitats. Beaver activity on the TBNG is relatively rare, but where present, their dams contribute to channel complexity and deep pool habitats favored by a number of native and non-native fish species. Substrates in most stream systems range from silty-sand dominated stream bottoms to cobble substrates, with coarse material such as boulder or bedrock substrates being relatively rare due to the geology of the area. Typical upland vegetation communities on the TBNG include sagebrush, greasewood, and mixed grass communities. Riparian areas are typically comprised of mixed grass, sedge, and forb communities, while some riparian corridors also contain coyote willow and plains cottonwood.

Recent droughts have likely altered flow regimes on the TBNG and may have influenced abundance and distribution of native fish species. The Cheyenne, Little Missouri, and Little Powder drainages have been affected by recent drought conditions in Wyoming. Drought conditions may have altered habitat connectivity, predation, and may have provided conditions favorable for non-native fish species (Barrineau et al. 2007). Most streams on the TBNG have been manipulated to store water during dry periods for a variety of beneficial uses, including livestock grazing, wildlife habitat, and agriculture. Mineral development has altered aquatic habitats and produced water from CBNG development may favor habitat connectivity for non-native species such as green sunfish, while reducing intermittent pools tolerated by native fish such as flathead chub and plains minnow.

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CHAPTER 3 FIGURES

Figure 3-1. BLM Casper Field Office, Medicine Bow National Forest and Thunder Basin National Grassland

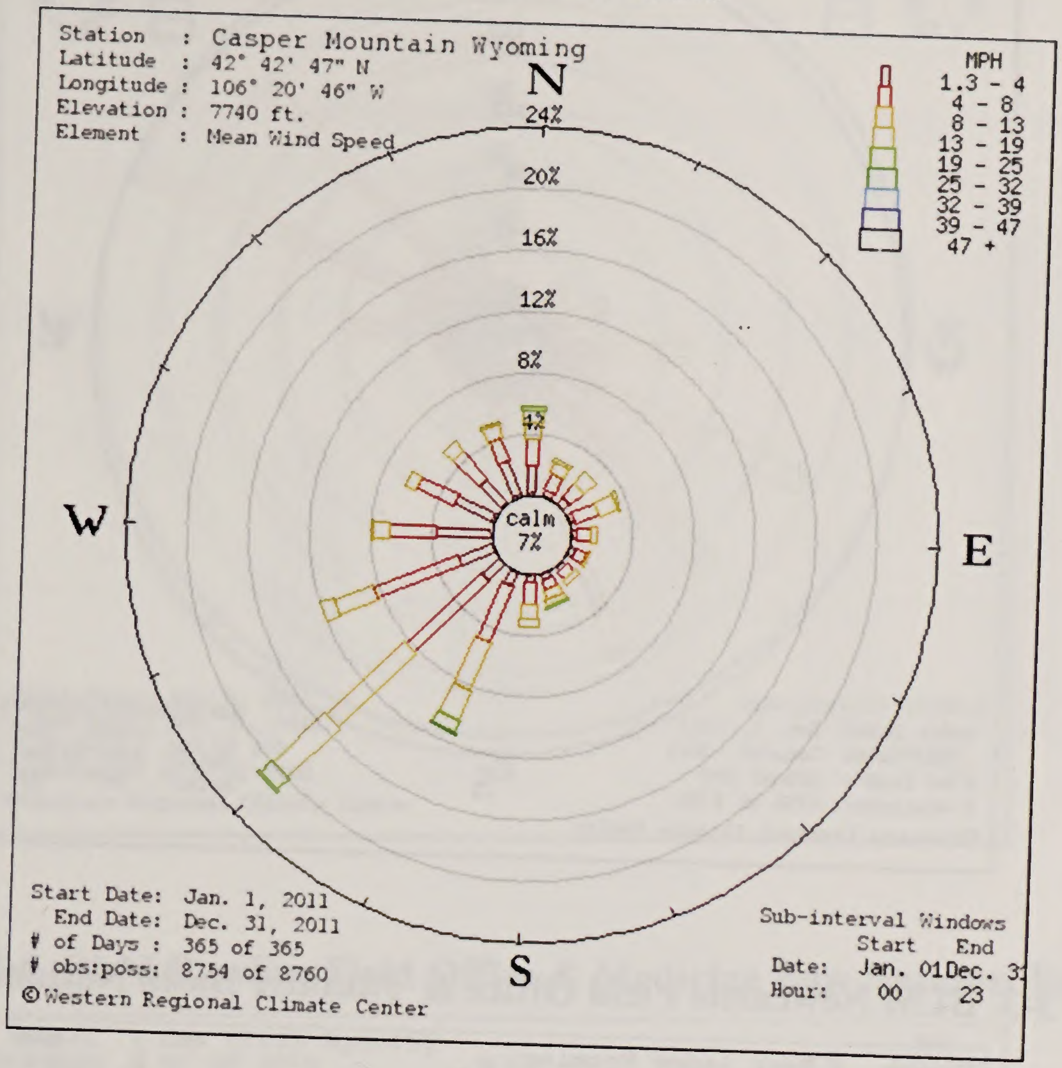


Figure 3-2. BLM Kemmerer Field Office and Bridger-Teton National Forest

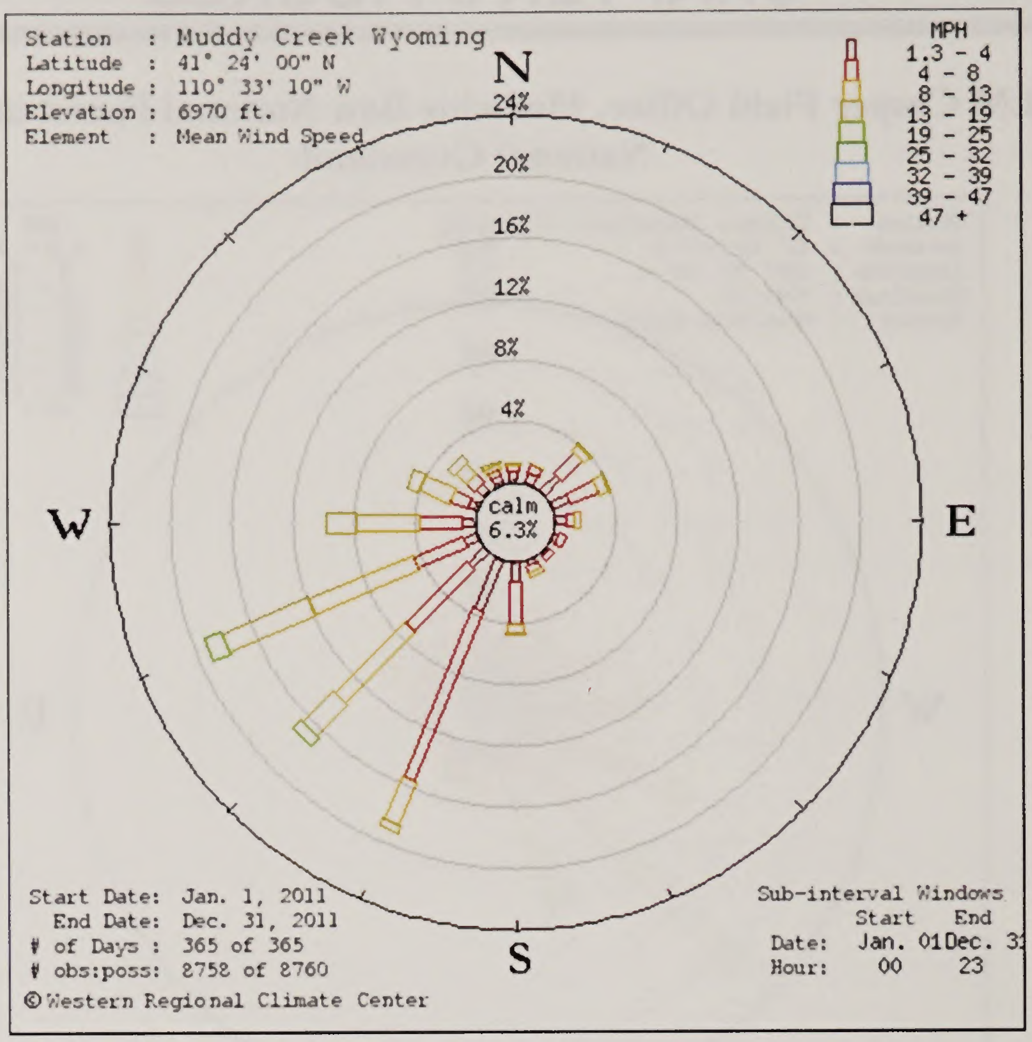


Figure 3-3. BLM Newcastle Field Office & Thunder Basin National Grassland

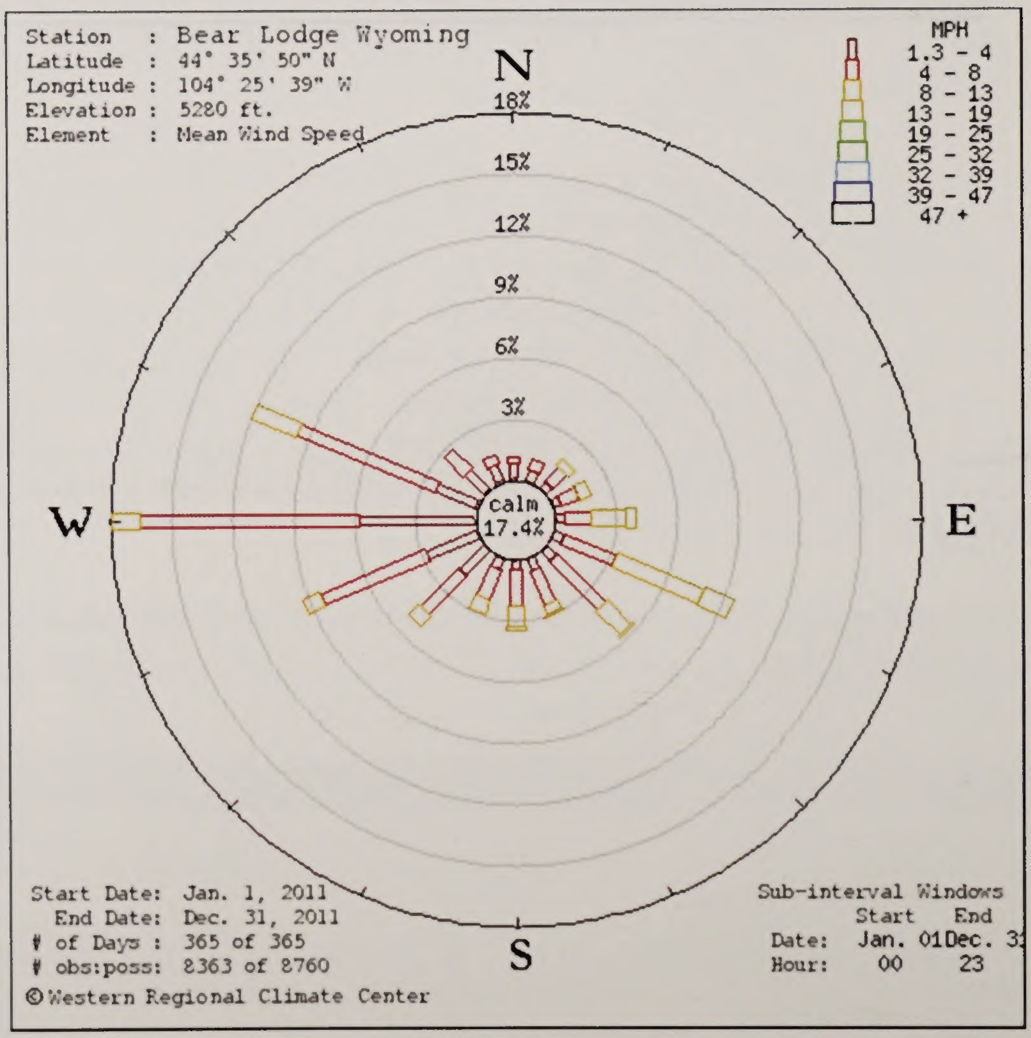


Figure 3-4. BLM Pinedale Field Office & Bridger-Teton National Forest

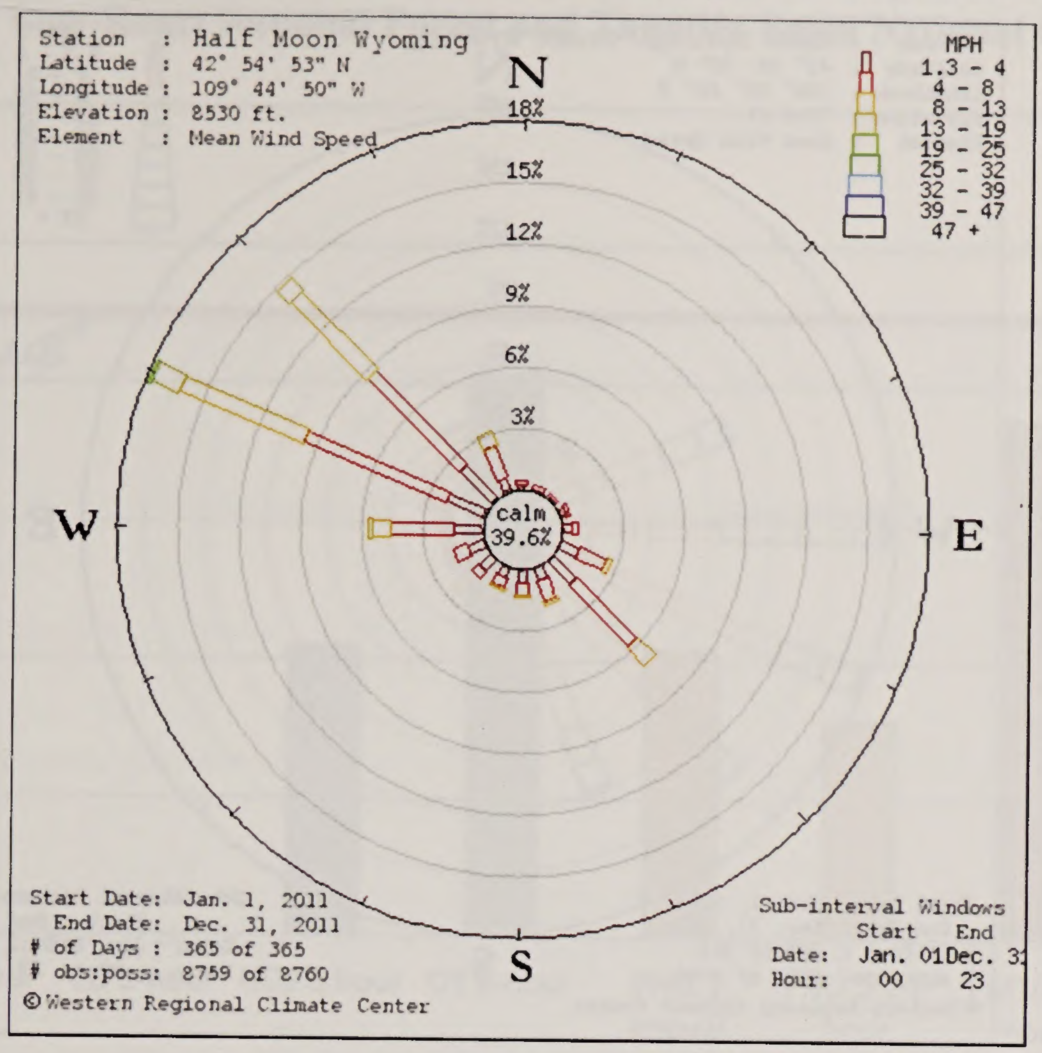


Figure 3-5. BLM Rawlins Field Office & Medicine Bow National Forest

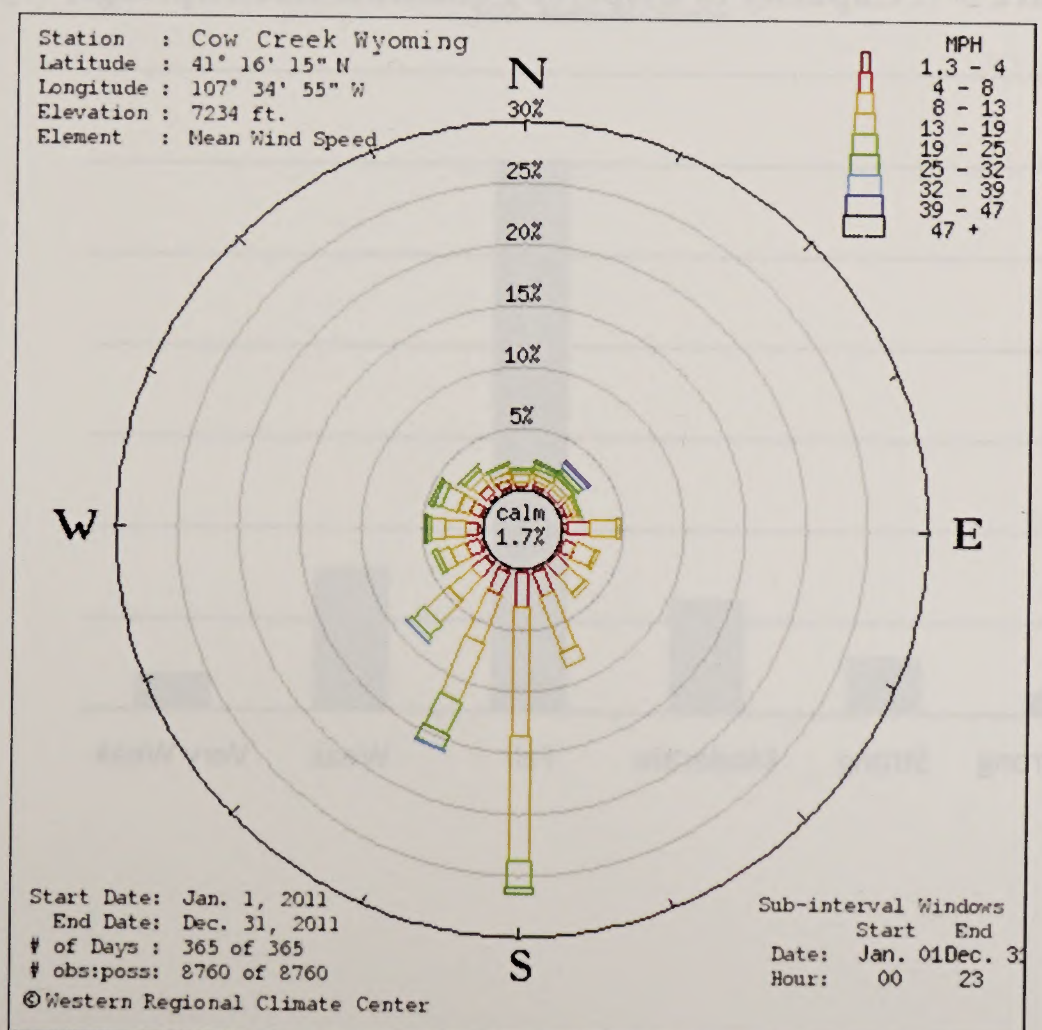


Figure 3-6. BLM Rock Springs Field Office & Bridger-Teton National Forest

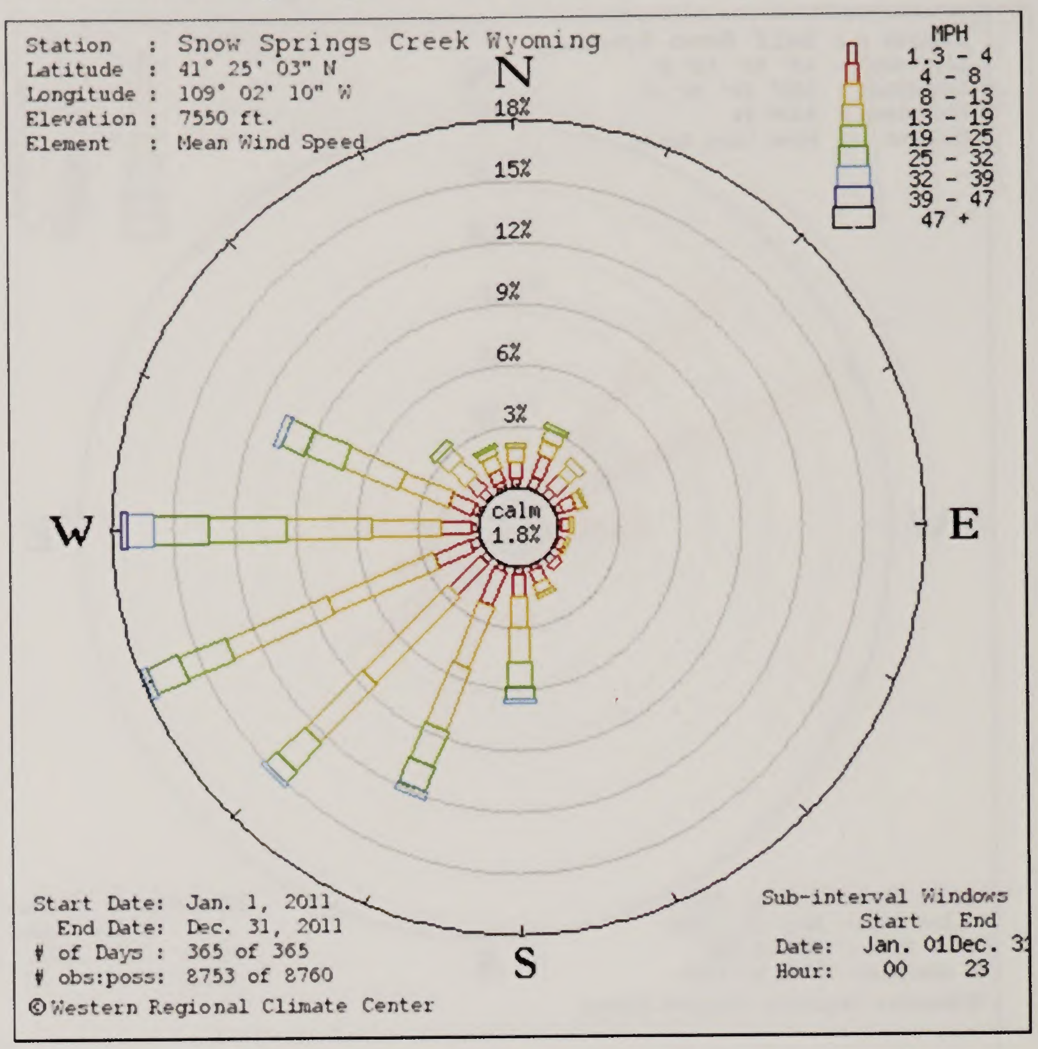


Figure 3-7. Capacity to Disperse Pollutants Rock Springs, Wyoming

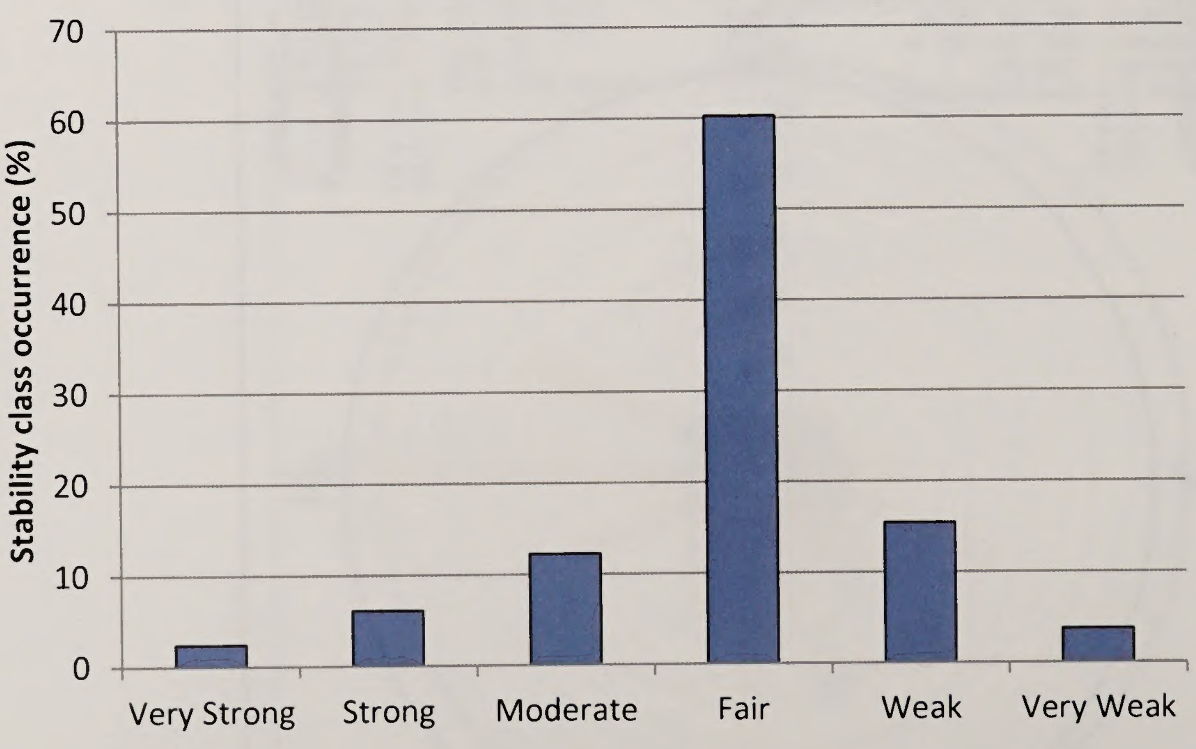


Figure 3-8. Criteria Pollutant Concentrations in the BLM Casper Field Office Area, Medicine Bow-Routt National Forest and Thunder Basin National Grassland

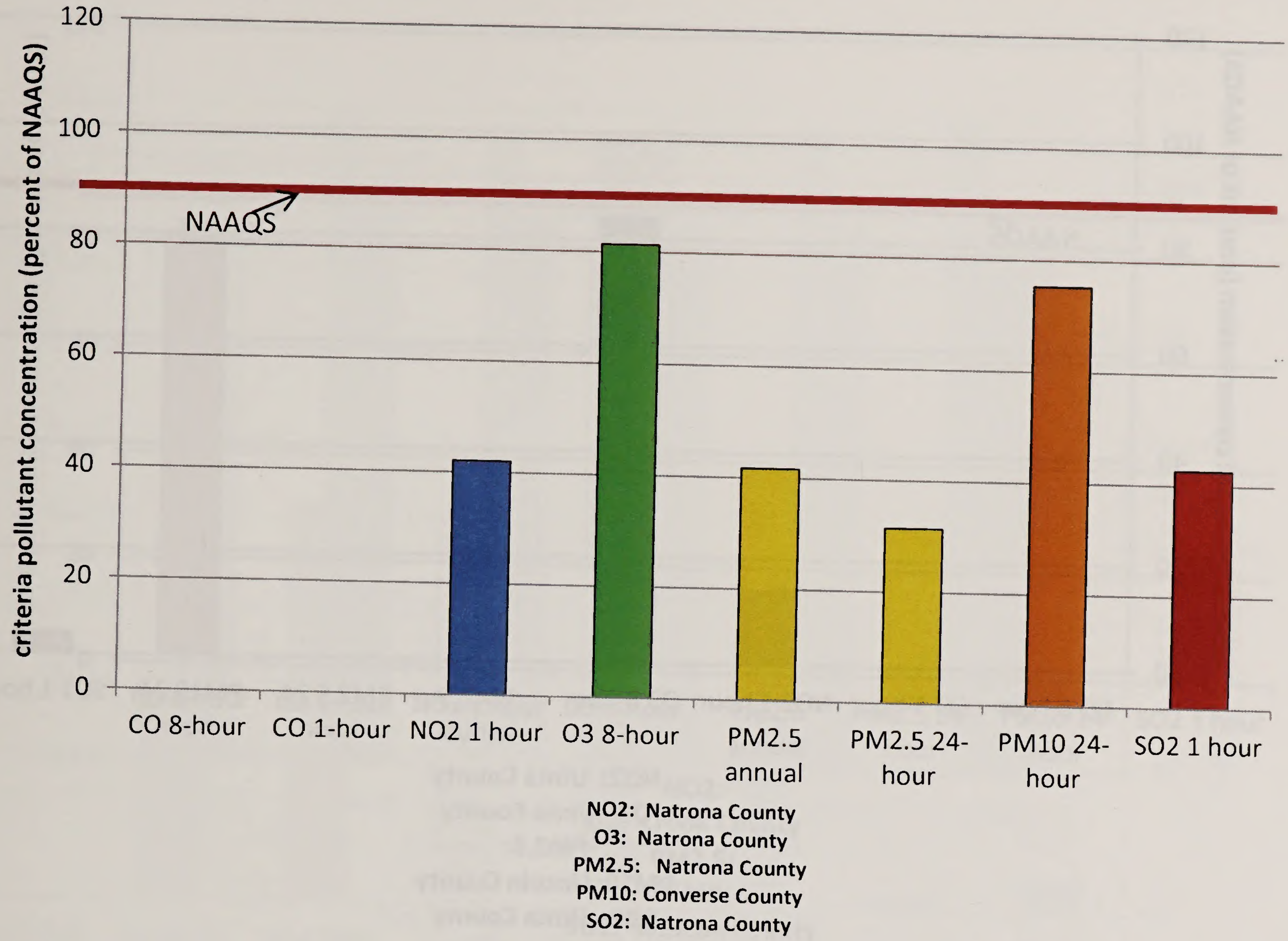
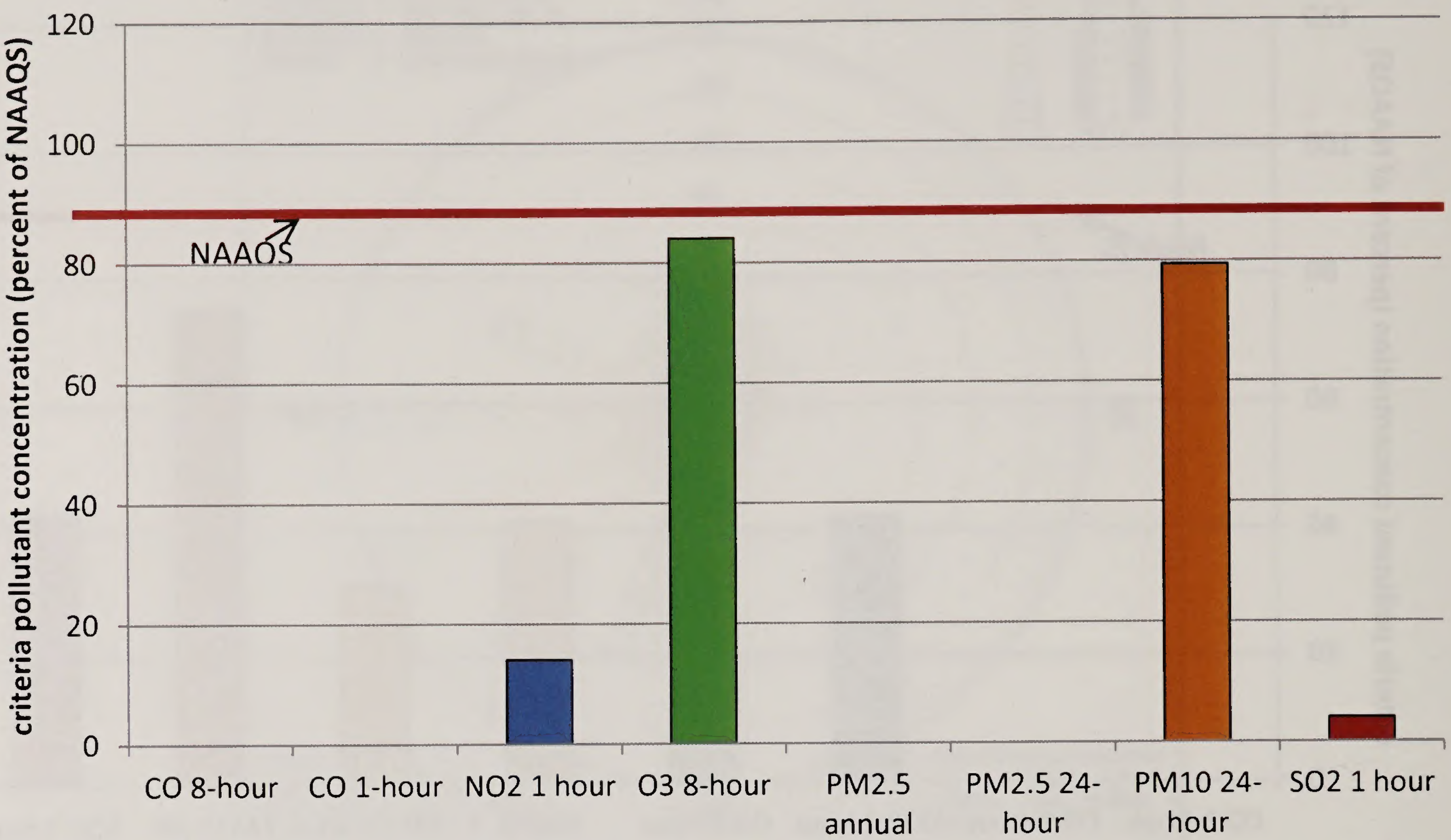


Figure 3-9. Criteria Pollutant Concentrations in the BLM Kemmerer Field Office Area and Bridger-Teton National Forest



NO2: Uinta County
O3: Uinta County
PM2.5:
PM10: Lincoln County
SO2: Uinta County

Figure 3-10. Criteria Pollutant Concentrations in the BLM Newcastle Field Office Area and Thunder Basin National Grassland

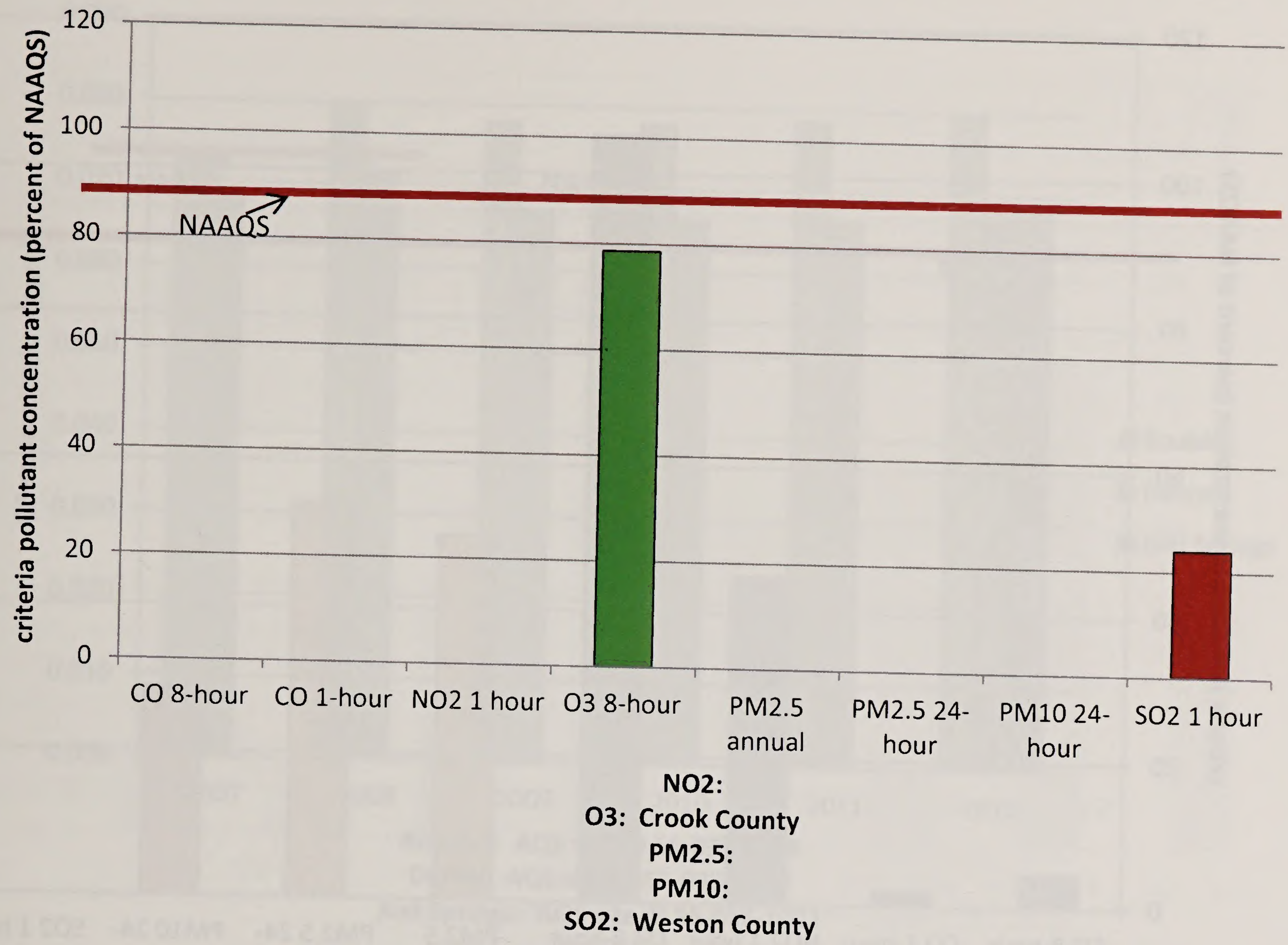
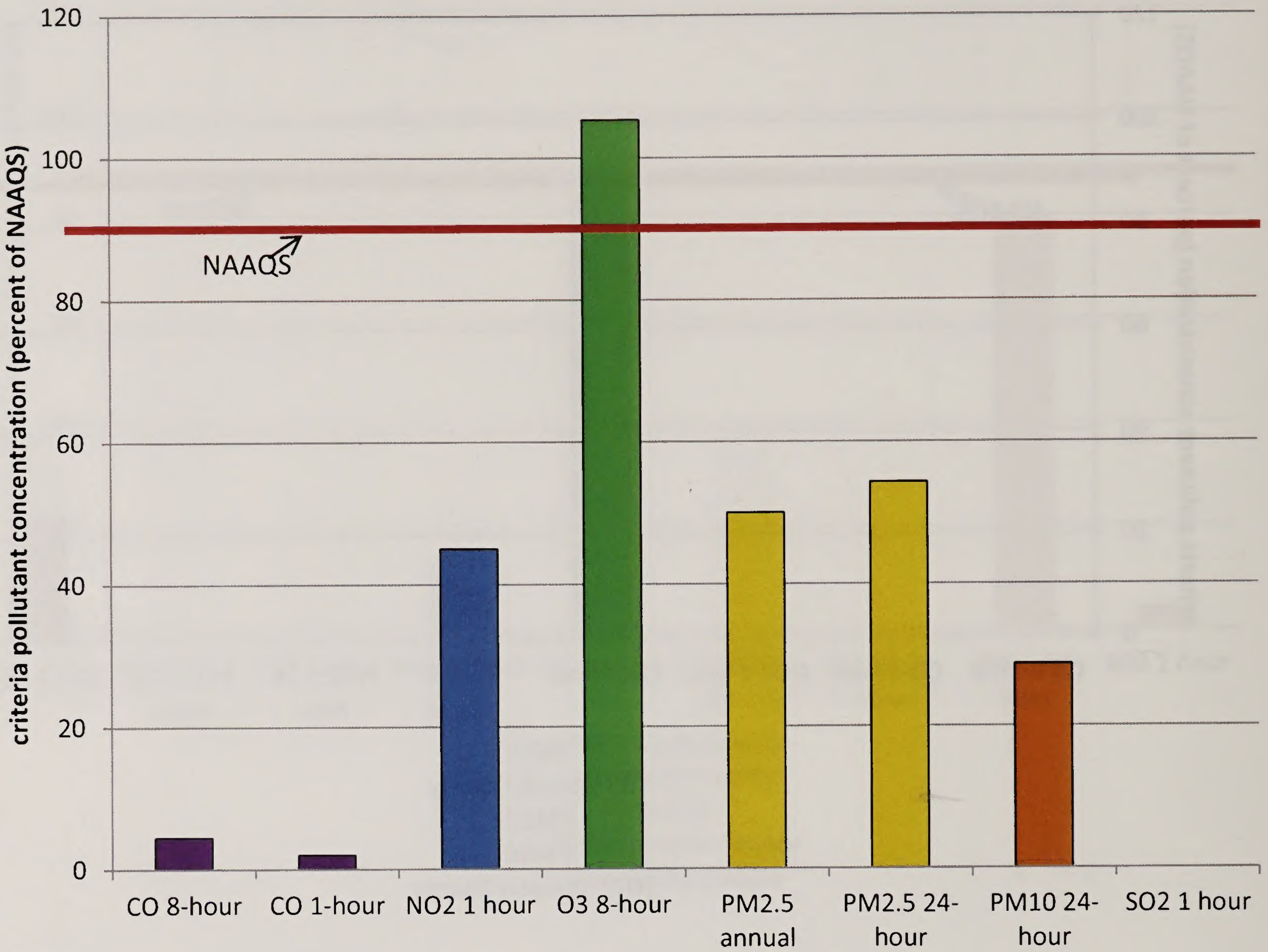
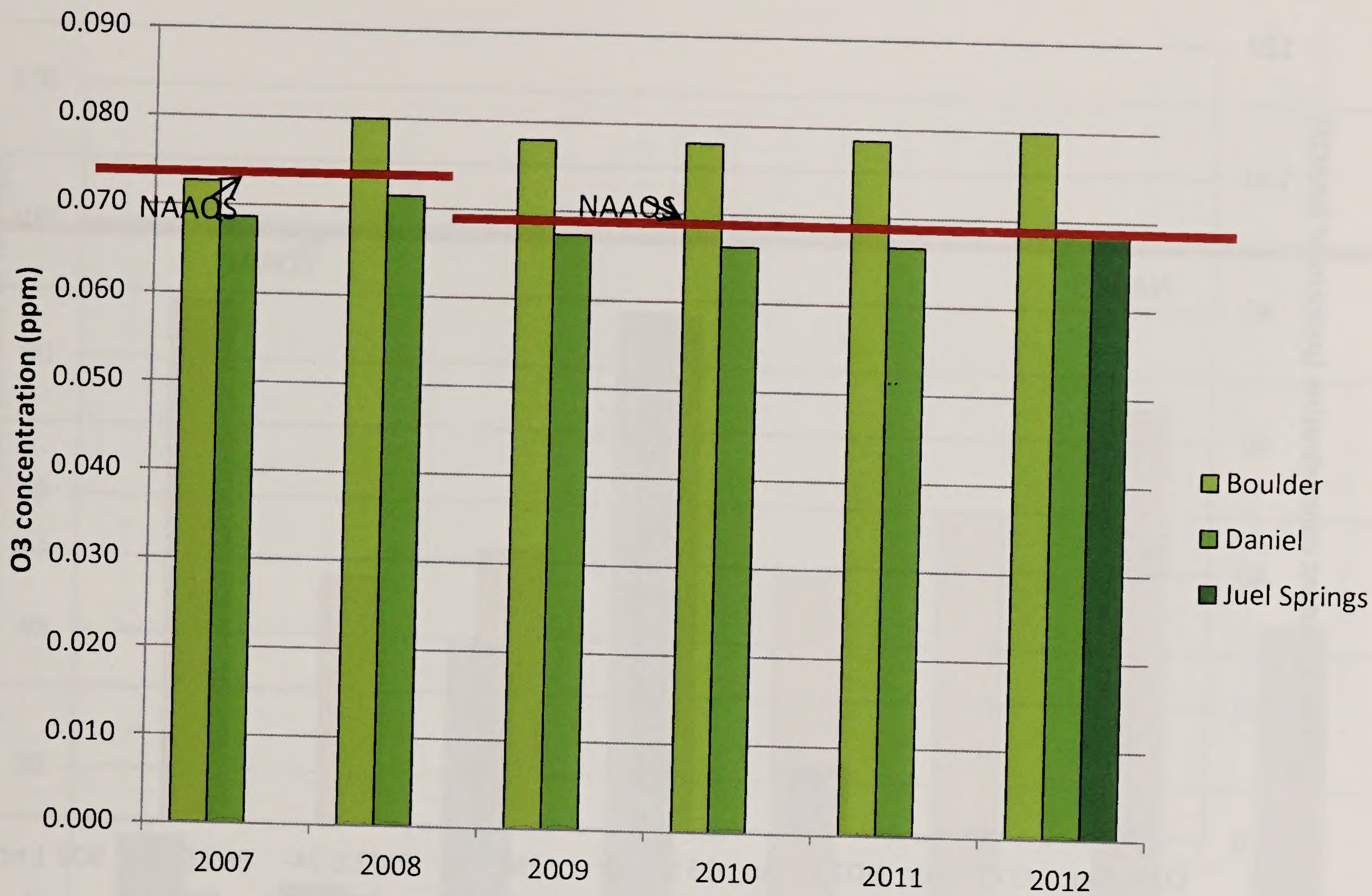


Figure 3-11. Criteria Pollutant Concentrations in the BLM Pinedale Field Office Area and Bridger-Teton National Forest



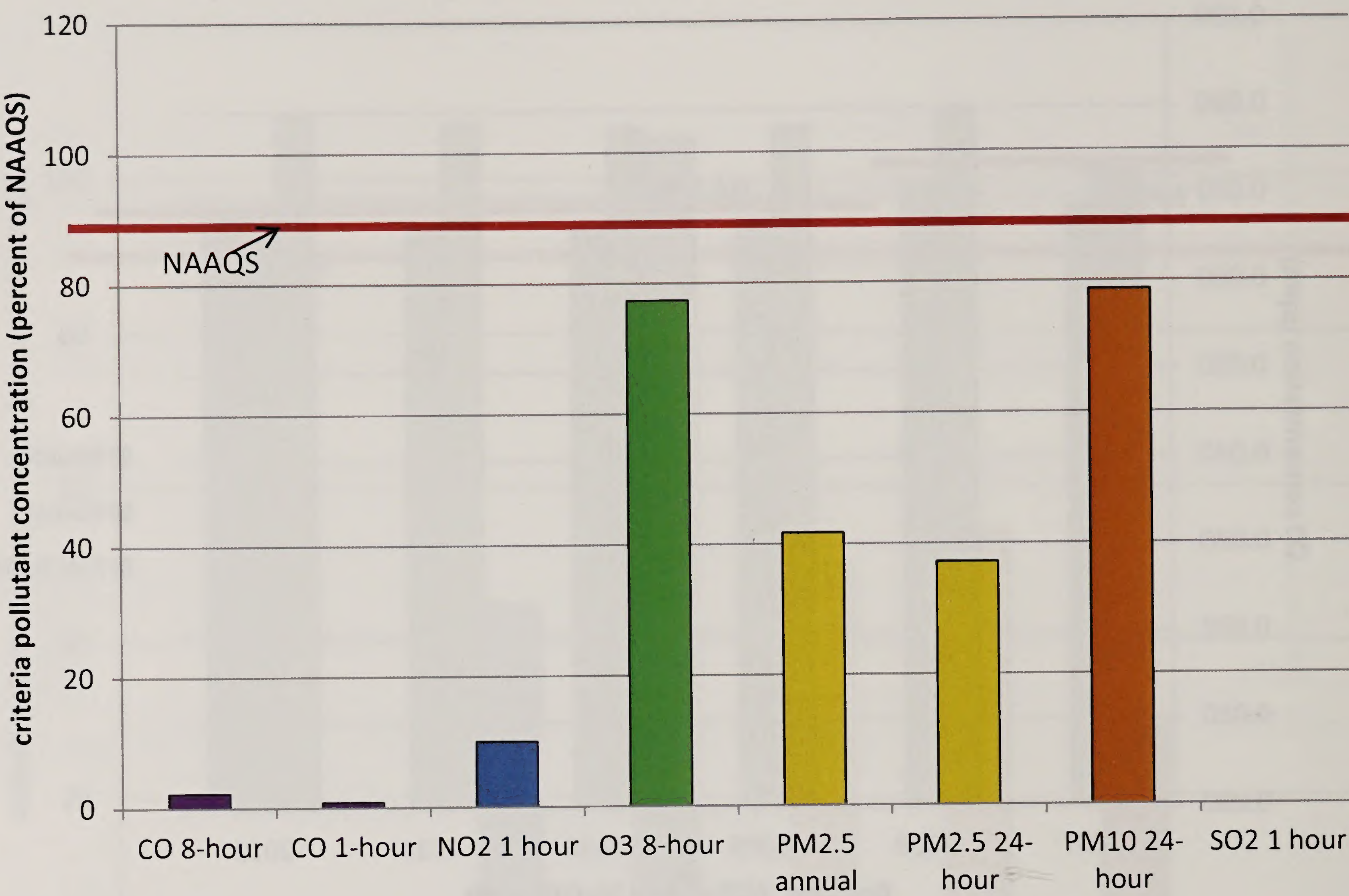
CO: Teton County
NO2: Sublette County
O3: Sublette County
PM2.5: Sublette County
PM10: Sublette County

Figure 3-12. Ozone Concentrations in the Pinedale Field Office Area and Bridger-Teton National Forest



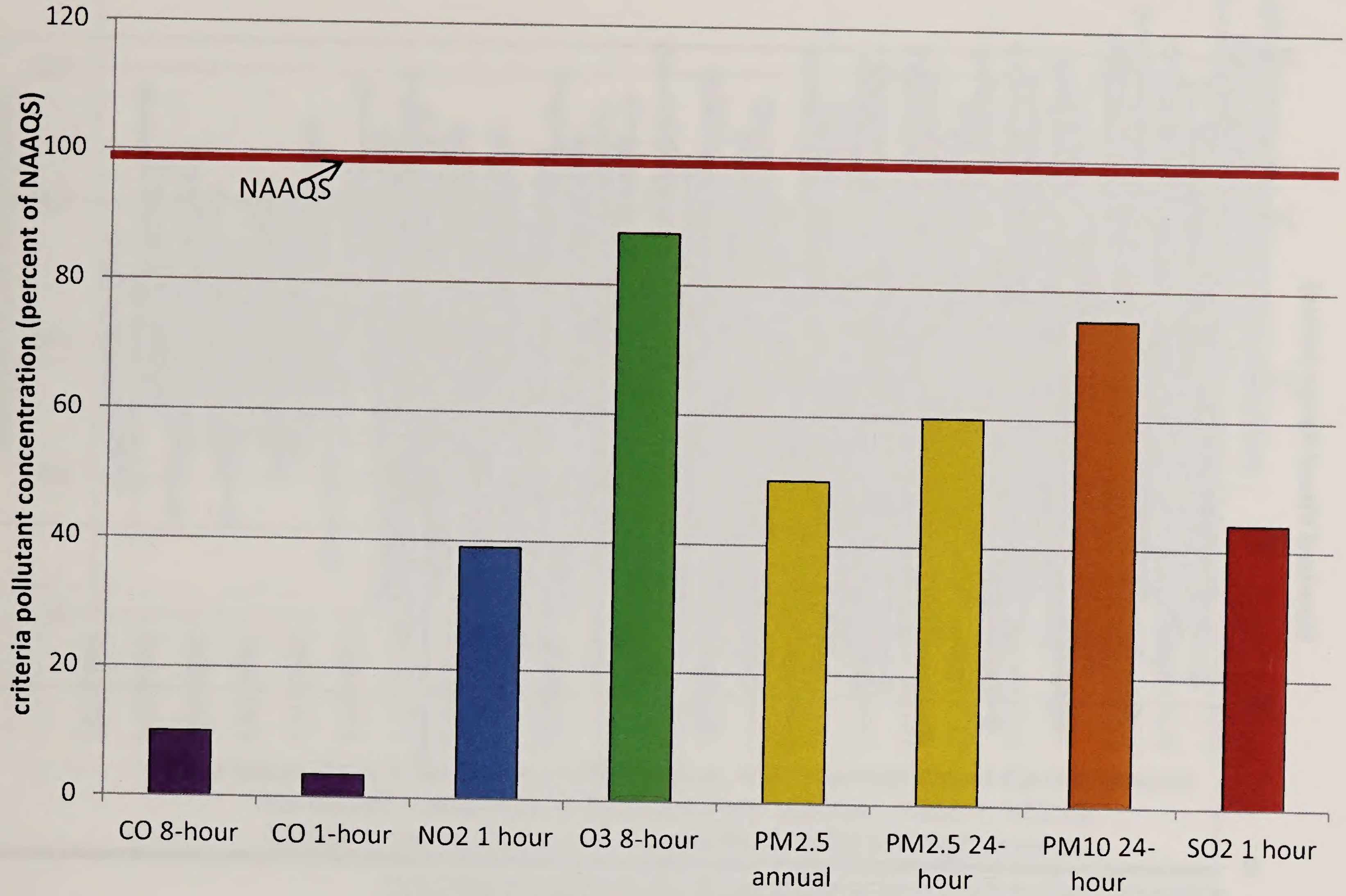
Boulder: AQS site ID 56-035-0099
Daniel: AQS site ID 56-035-0100
Juel Springs: AQS site ID 56-035-1002

Figure 3-13. Criteria Pollutant Concentrations in the BLM Rawlins Field Office Area and Medicine Bow National Forest



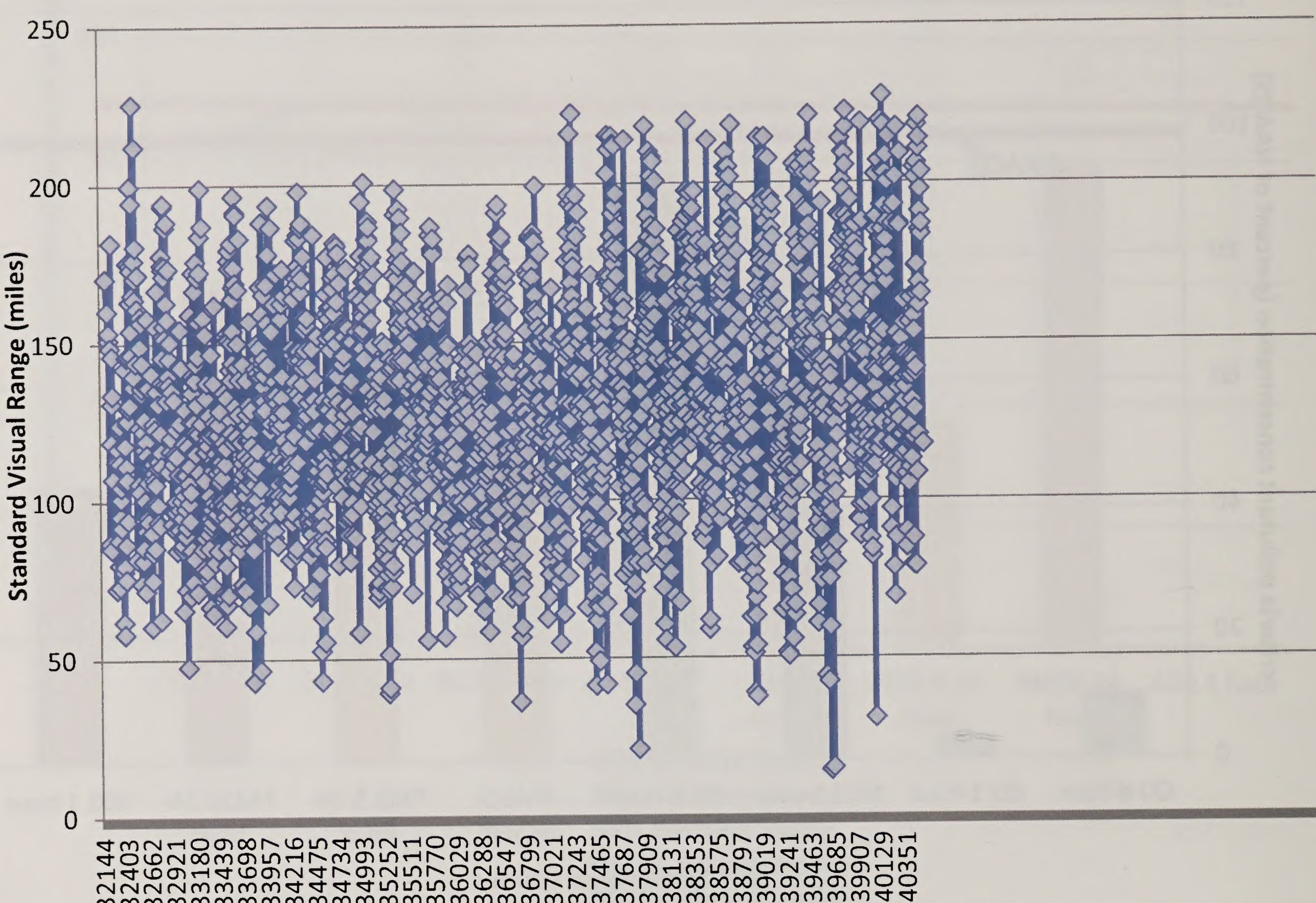
CO: Laramie County
NO2: Carbon County
O3: Carbon County
PM2.5: Albany County
PM10: Albany County
SO2: Carbon County

Figure 3-14. Criteria Pollutant Concentrations in the BLM Rock Springs Field Office Area and Bridger-Teton National Forest



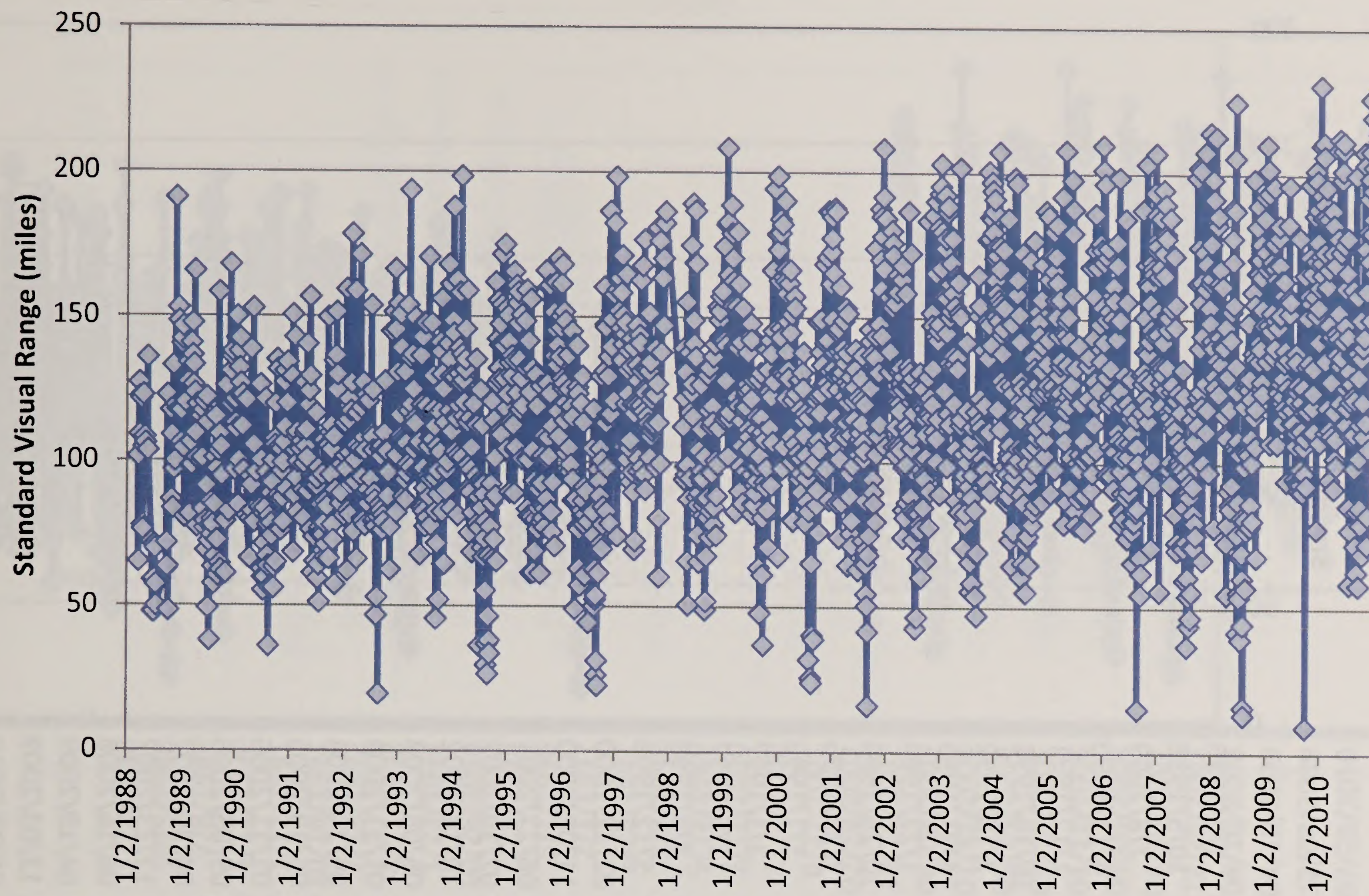
CO: Sweetwater County
NO2: Sweetwater County
O3: Sweetwater County
PM2.5: Sweetwater County
PM10: Sweetwater County
SO2: Sweetwater County

Figure 3-15. Daily Visibility near Sage-grouse Planning Area Bridger Wilderness



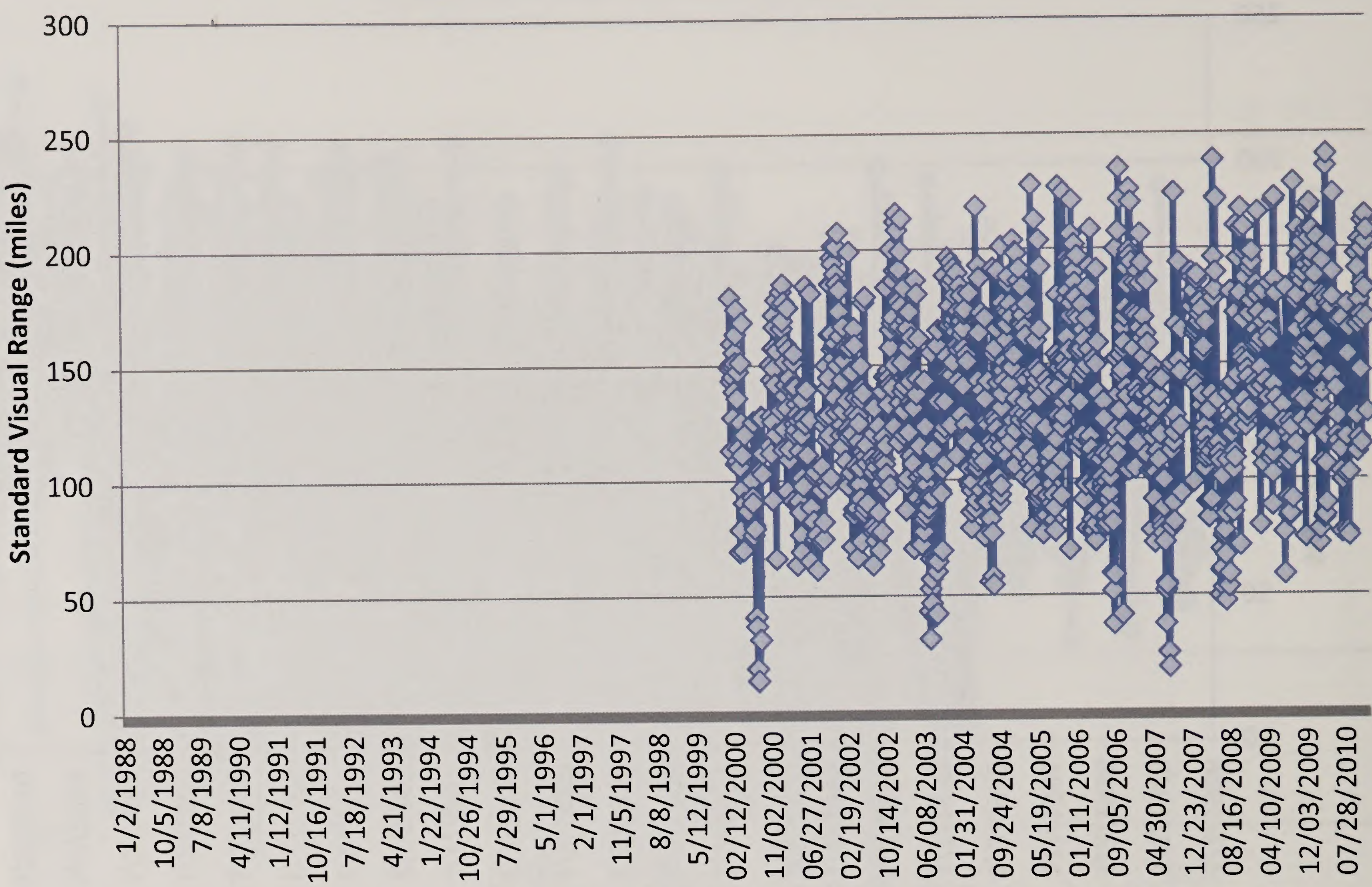
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Bridger station: BRID1
Visibility measured every 3 days from 1988 through present

Figure 3-16. Daily Visibility near Sage-grouse Planning Area Yellowstone National Park



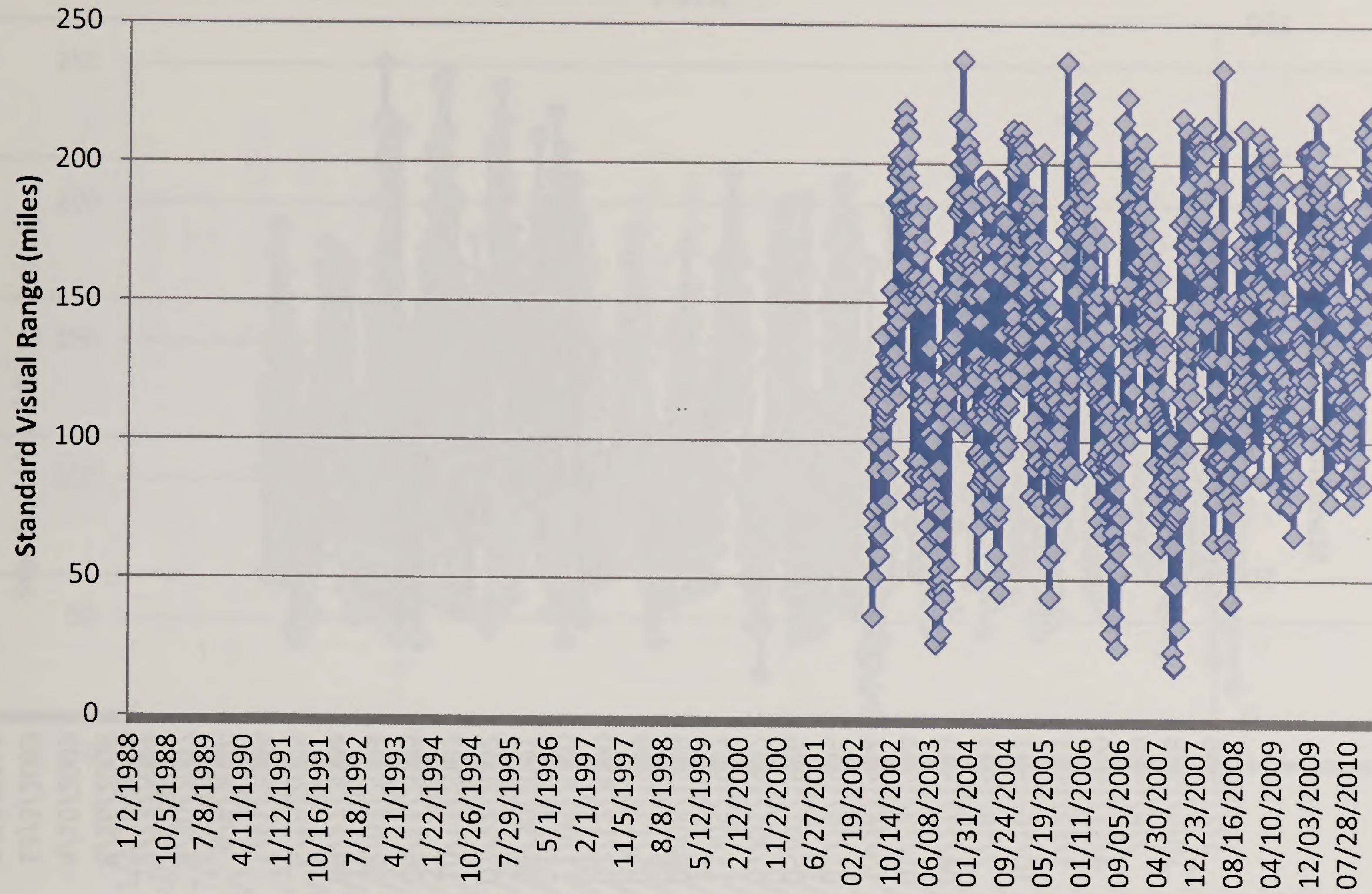
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Yellowstone National Park station: YELL1, YELL2
Visibility measured every 3 days from 1988 through present

Figure 3-17. Daily Visibility near Sage-grouse Planning Area North Absaroka Wilderness



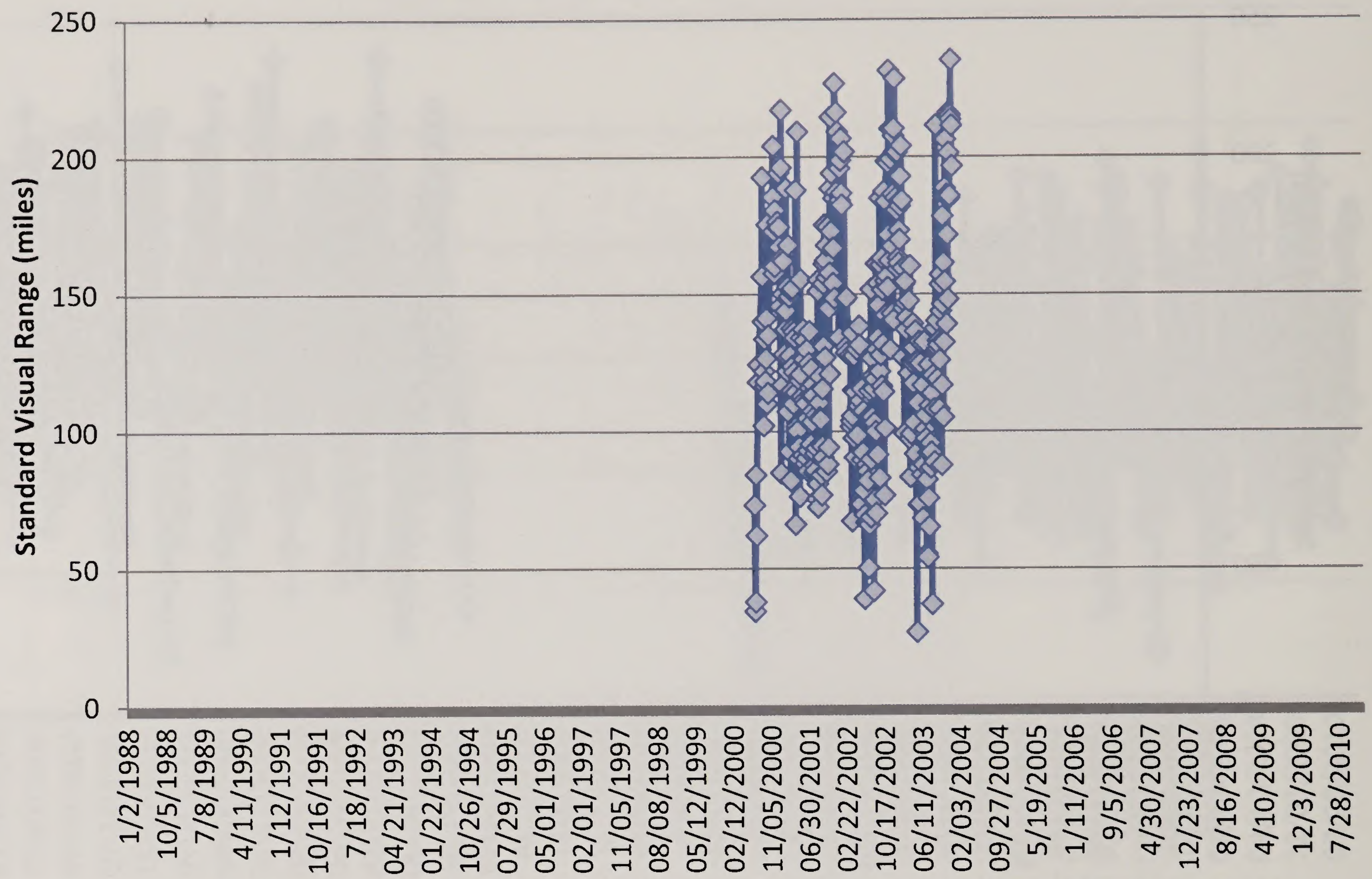
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE North Absaroka station: NOAB1
Visibility measured every 3 days from 2000 through present

Figure 3-18. Daily Visibility near Sage-grouse Planning Area Cloud Peak Wilderness



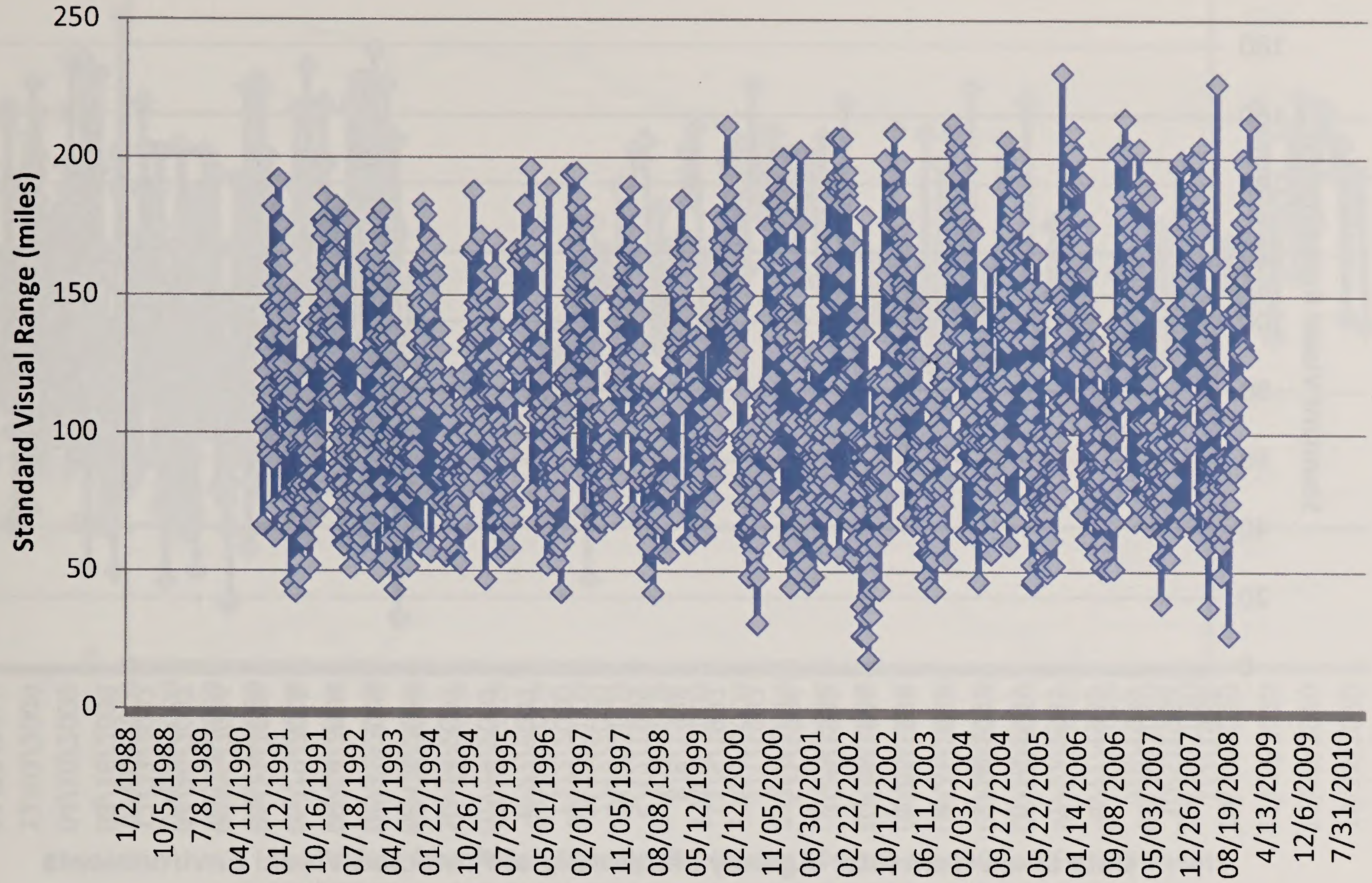
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Cloud Peak station:CLPE
Visibility measured every 3 days from 2002 through present

Figure 3-19. Daily Visibility near Sage-grouse Planning Area Brooklyn Lake



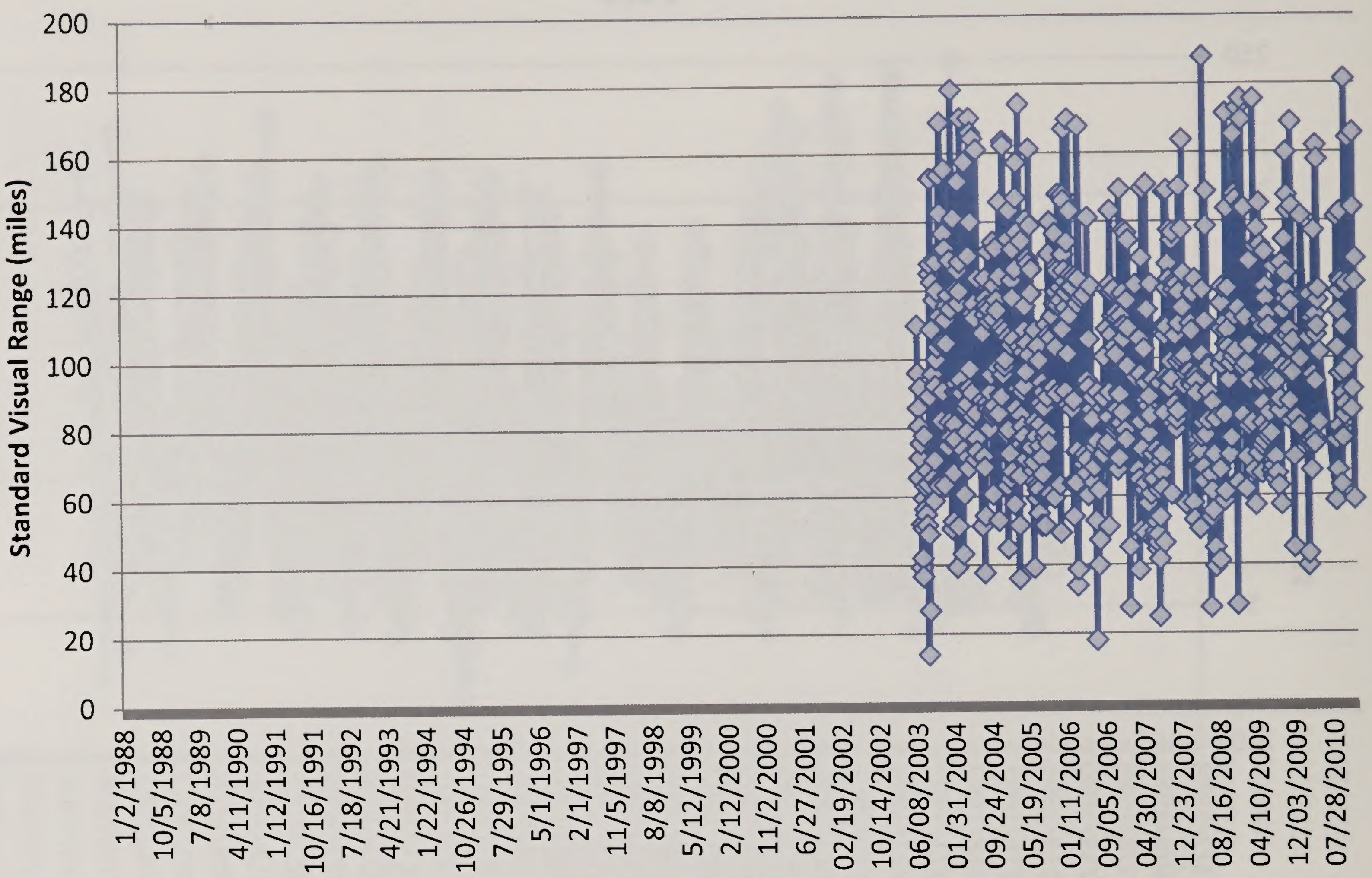
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Brooklyn Lake station: BRLA1
Visibility measured every 3 days from 1993 through 2003

Figure 3-20. Daily Visibility near Sage-grouse Planning Area Rocky Mountain National Park



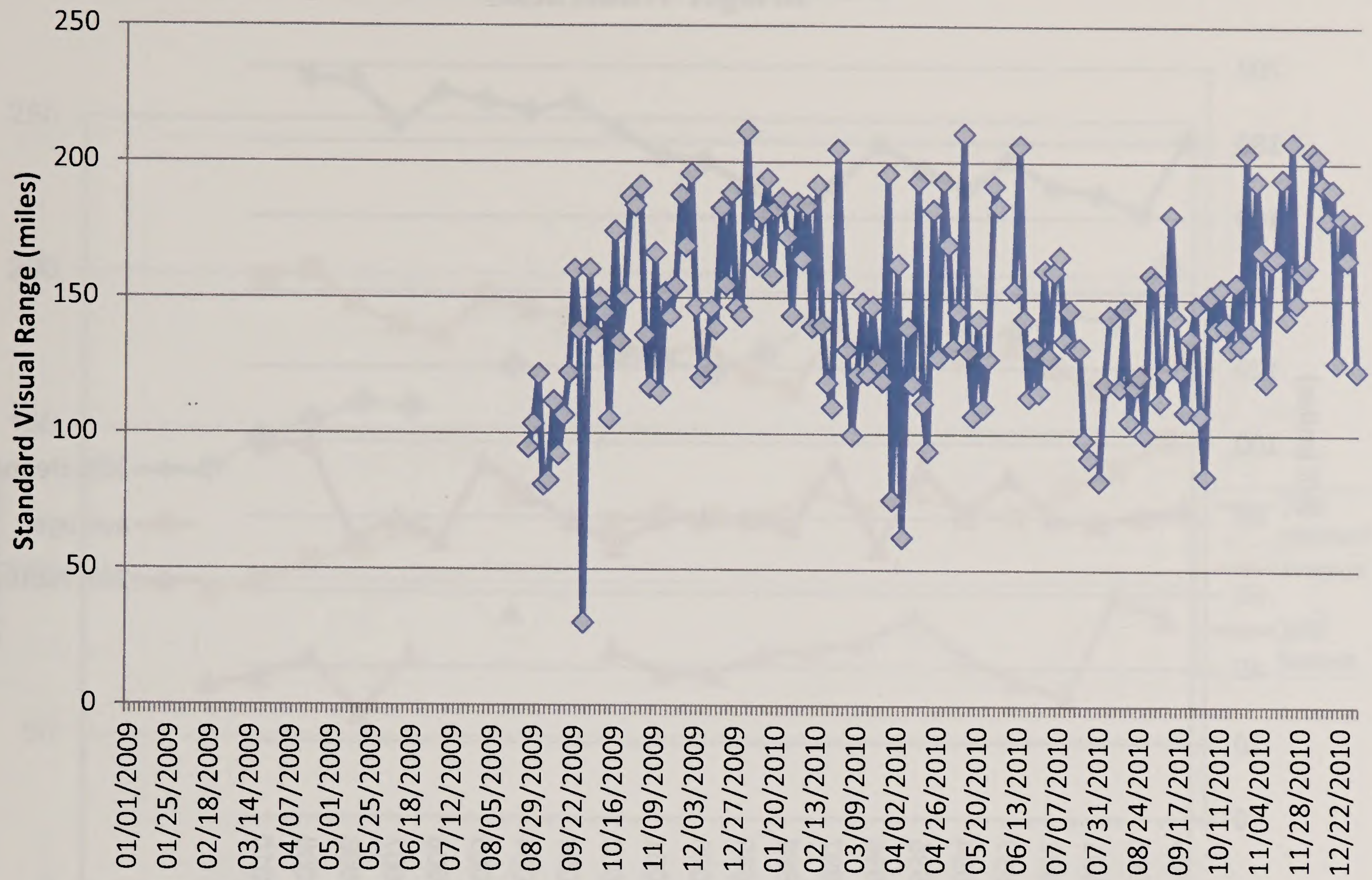
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Rocky Mountain National Park station: ROMO1
Visibility measured every 3 days from 1990 through present

Figure 3-21. Daily Visibility near Sage-grouse Planning Area Thunder Basin



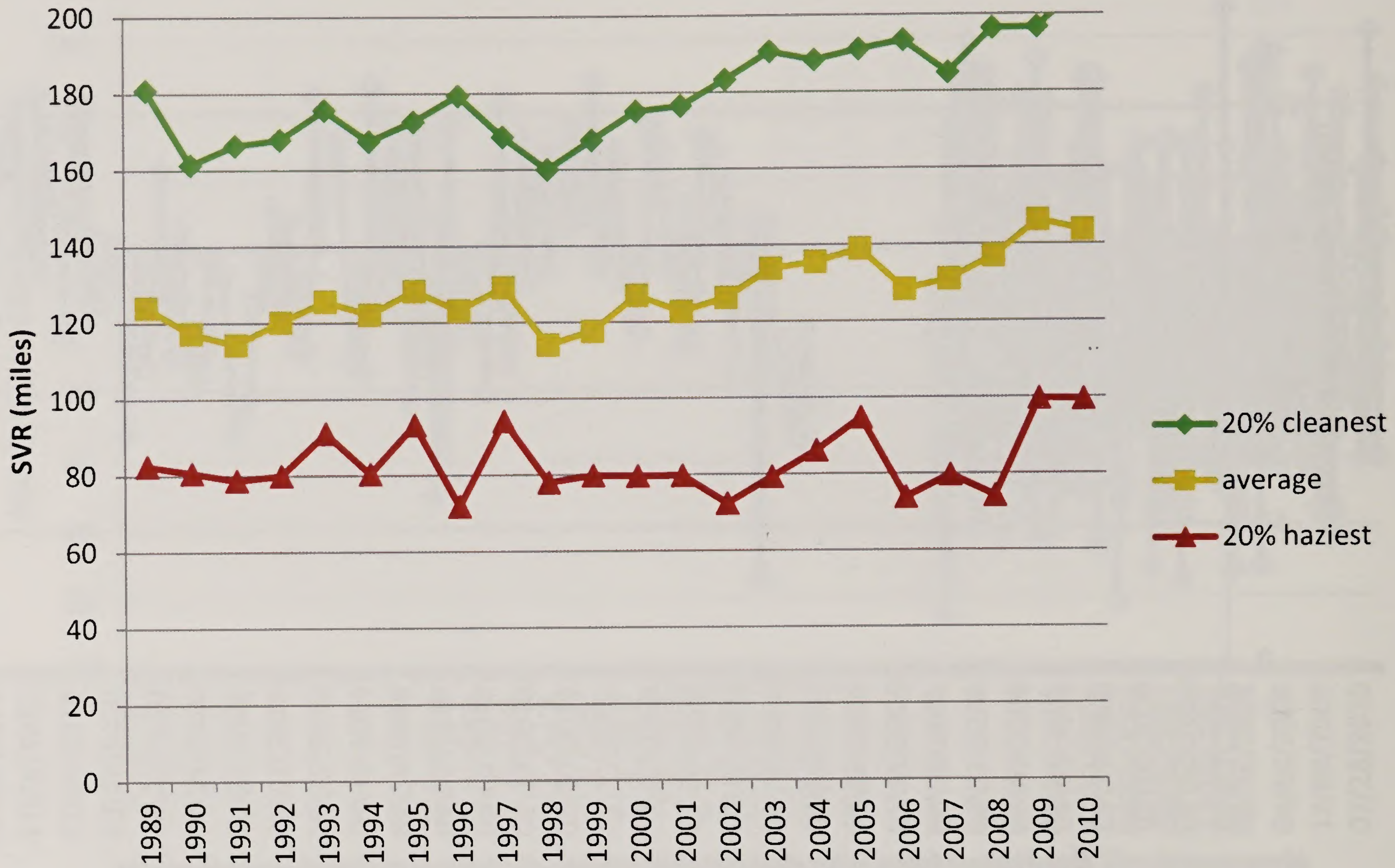
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Thunder Basin station: THBA1
Visibility measured every 3 days from 2002 through present

Figure 3-22. Daily Visibility near Sage-grouse Planning Area Boulder Lake



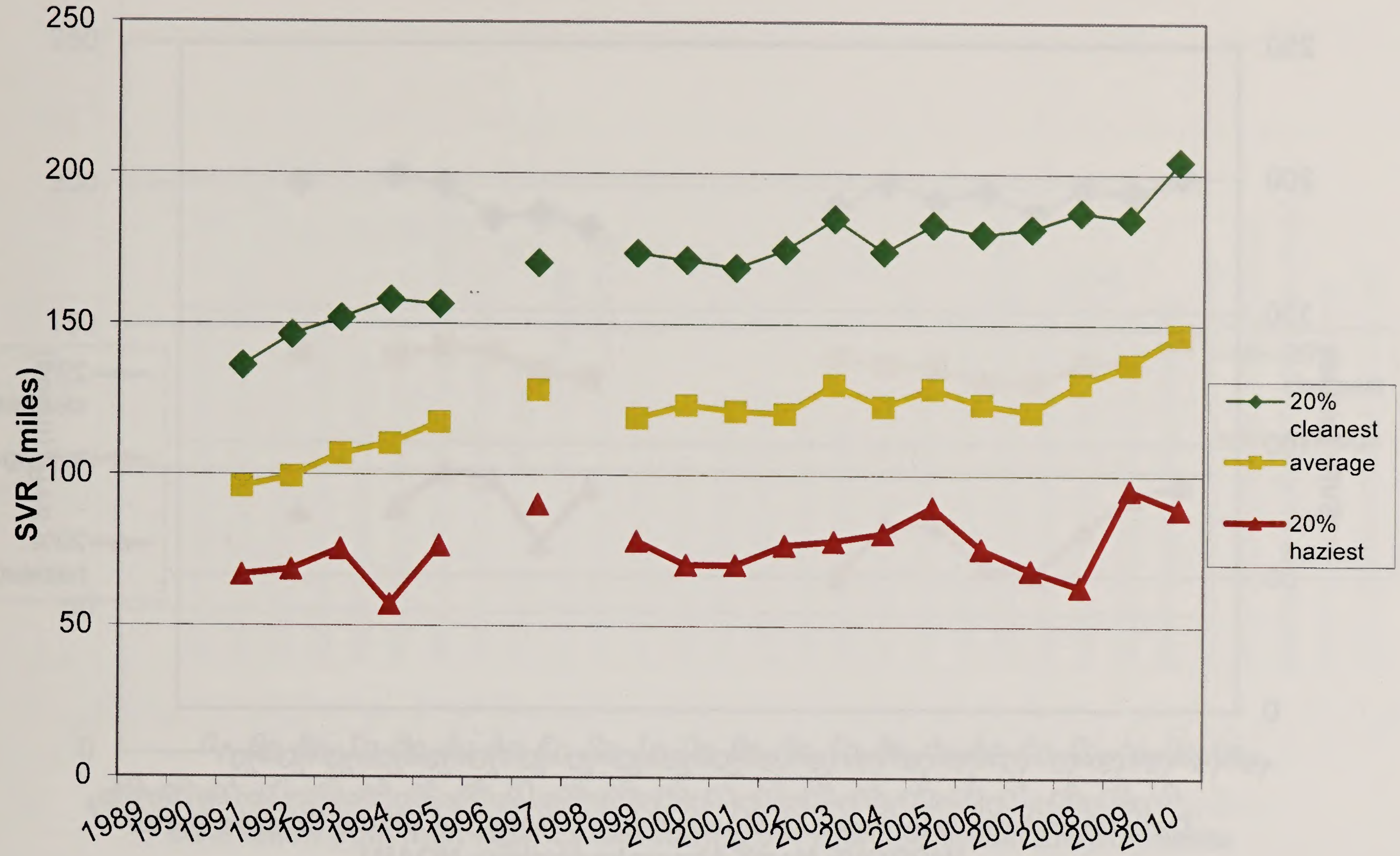
Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Boulder Lake IMPROVE station: BOLA1
Visibility measured every 3 days from 2010 through present

Figure 3-23. Annual Visibility (Standard Visual Range) near Sage-grouse Planning Area Bridger Wilderness



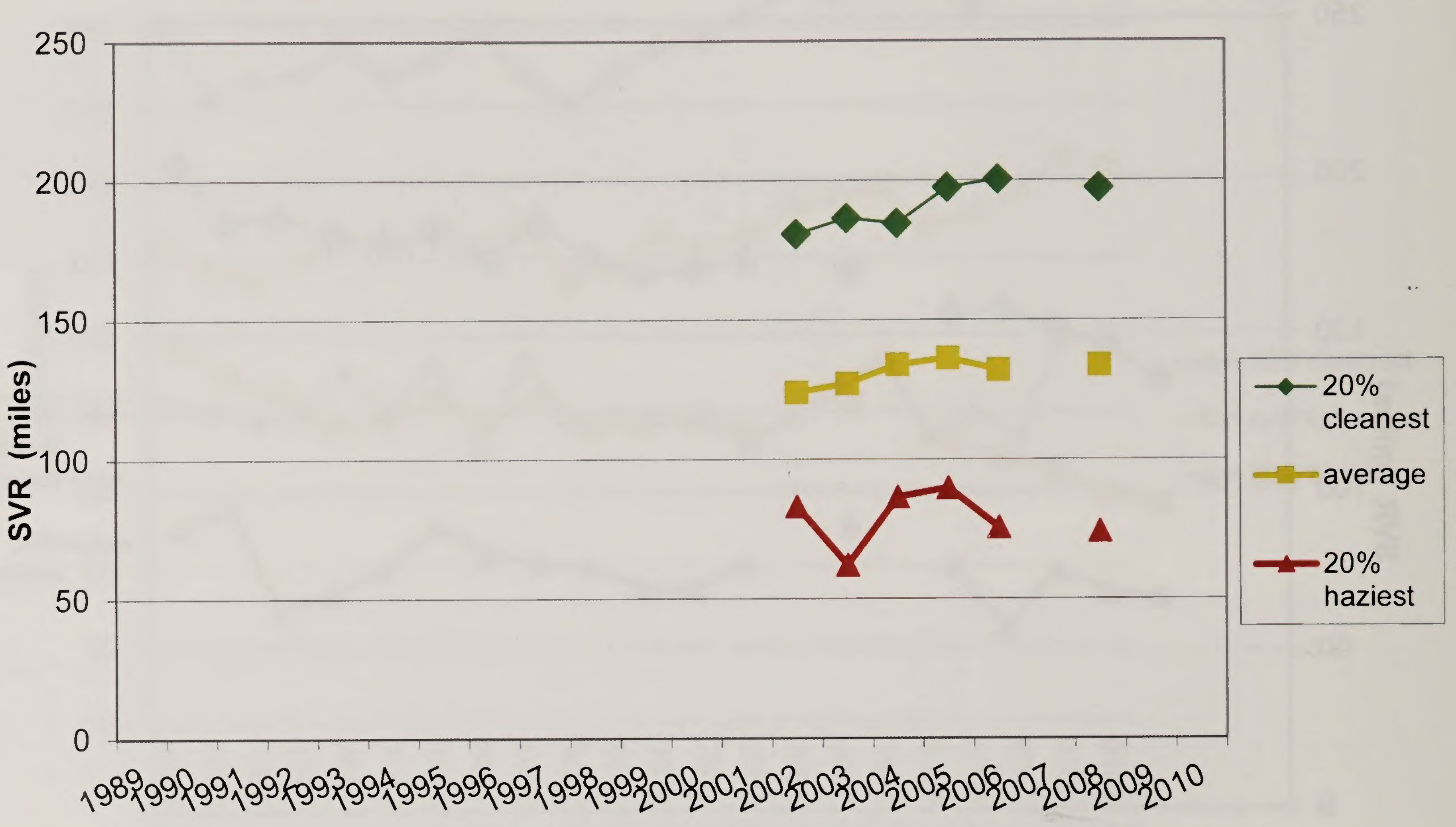
Data takem from Inter-Agency Monitoring of Protected Visual Environments IMPROVE Bridger station BRID1

Figure 3-24. Annual Visibility (Standard Visual Range) near Sage-grouse Planning Area Yellowstone National Park



Data taken from Inter-Agency Monitoring of Protected Visual Environments
IMPROVE Yellowstone National Park station YELL1, YELL2

Figure 3-25. Annual Visibility (Standard Visual Range) near Sage-grouse Planning Area North Absaroka



Data taken from Inter-Agency Monitoring of Protected Visual Environments IMPROVE North Absaroka station: NOAB1

Figure 3-26. Annual Visibility (Standard Visual Range) near Sage-grouse Planning Area Cloud Peak

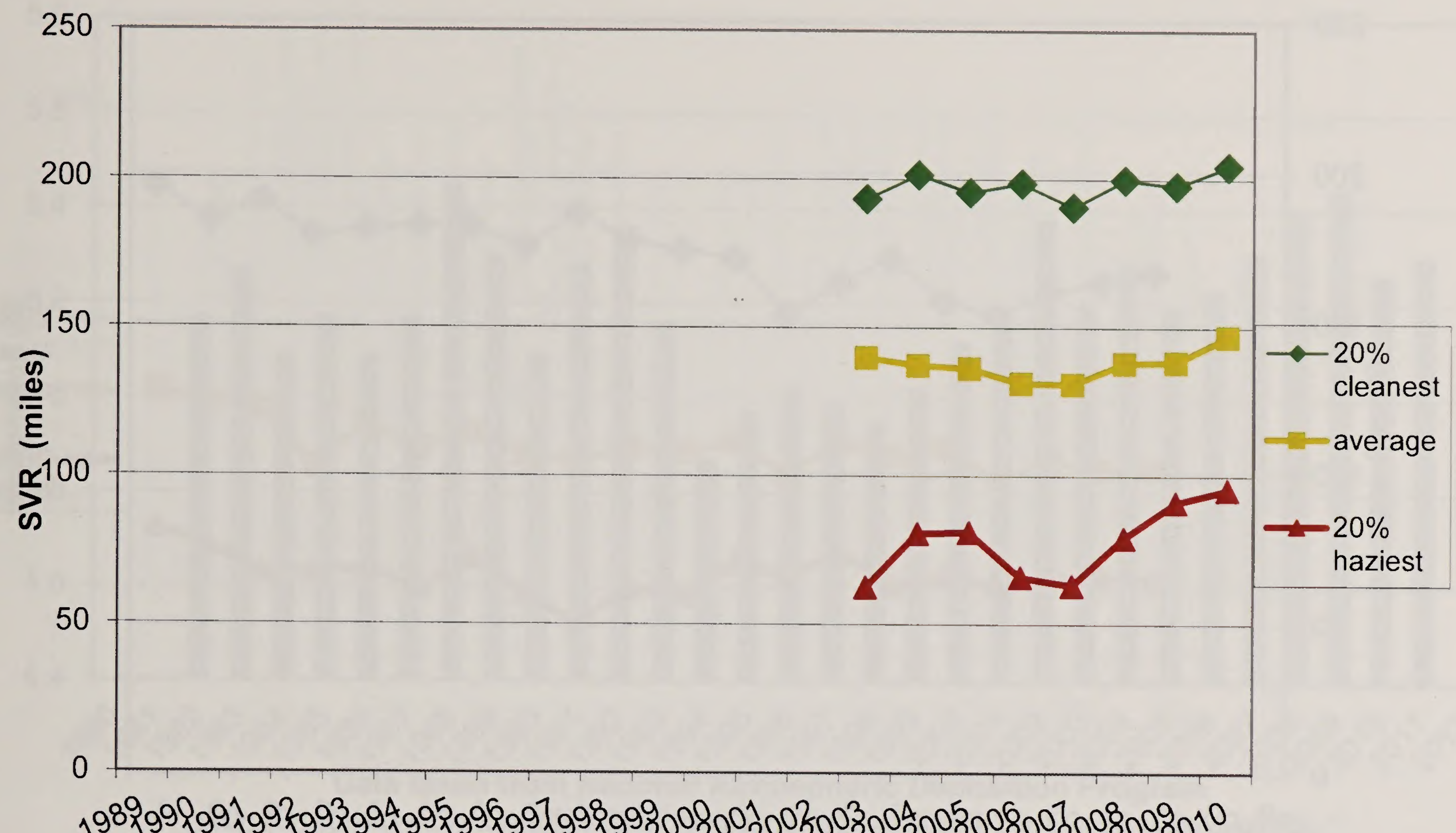
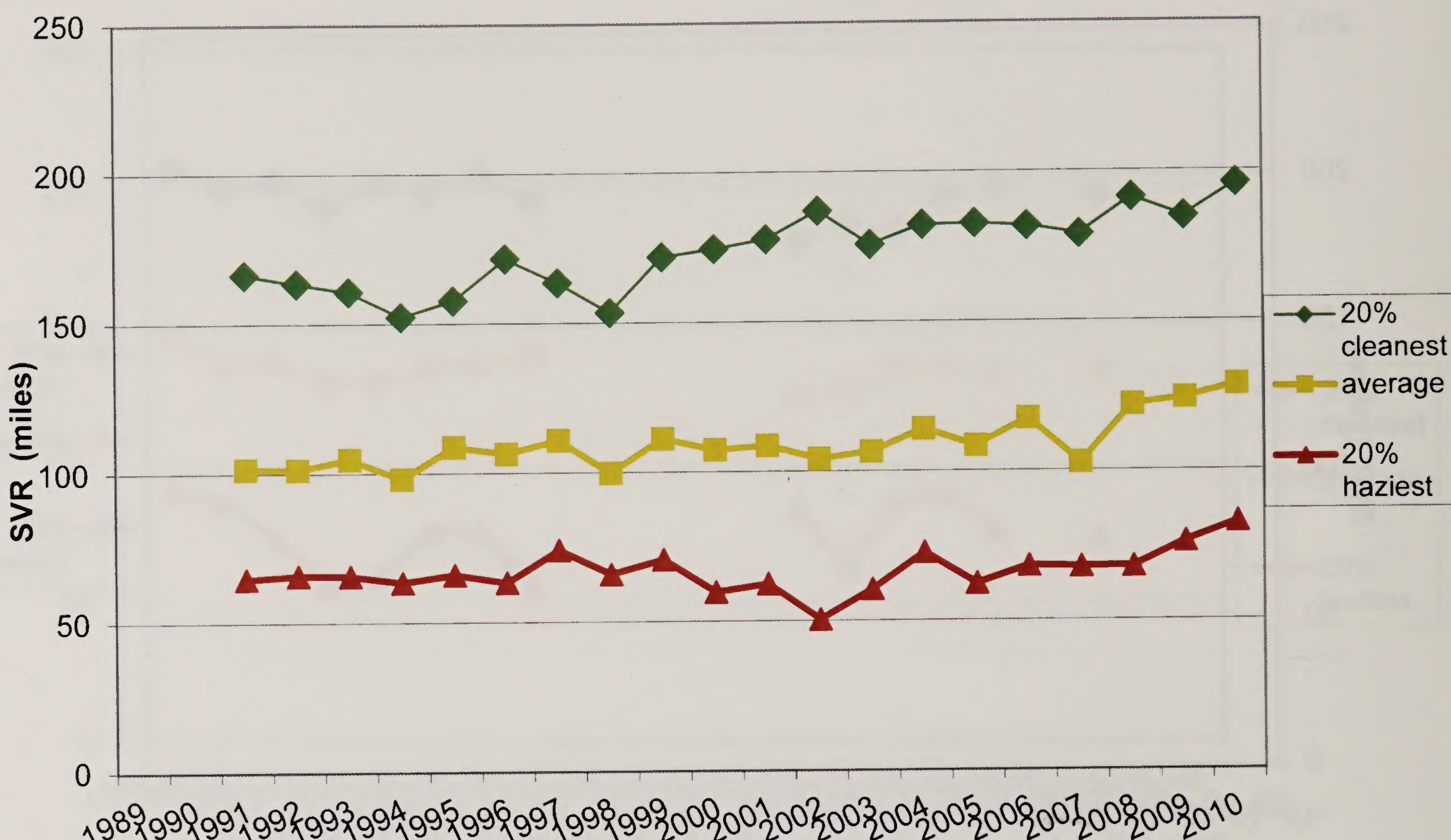
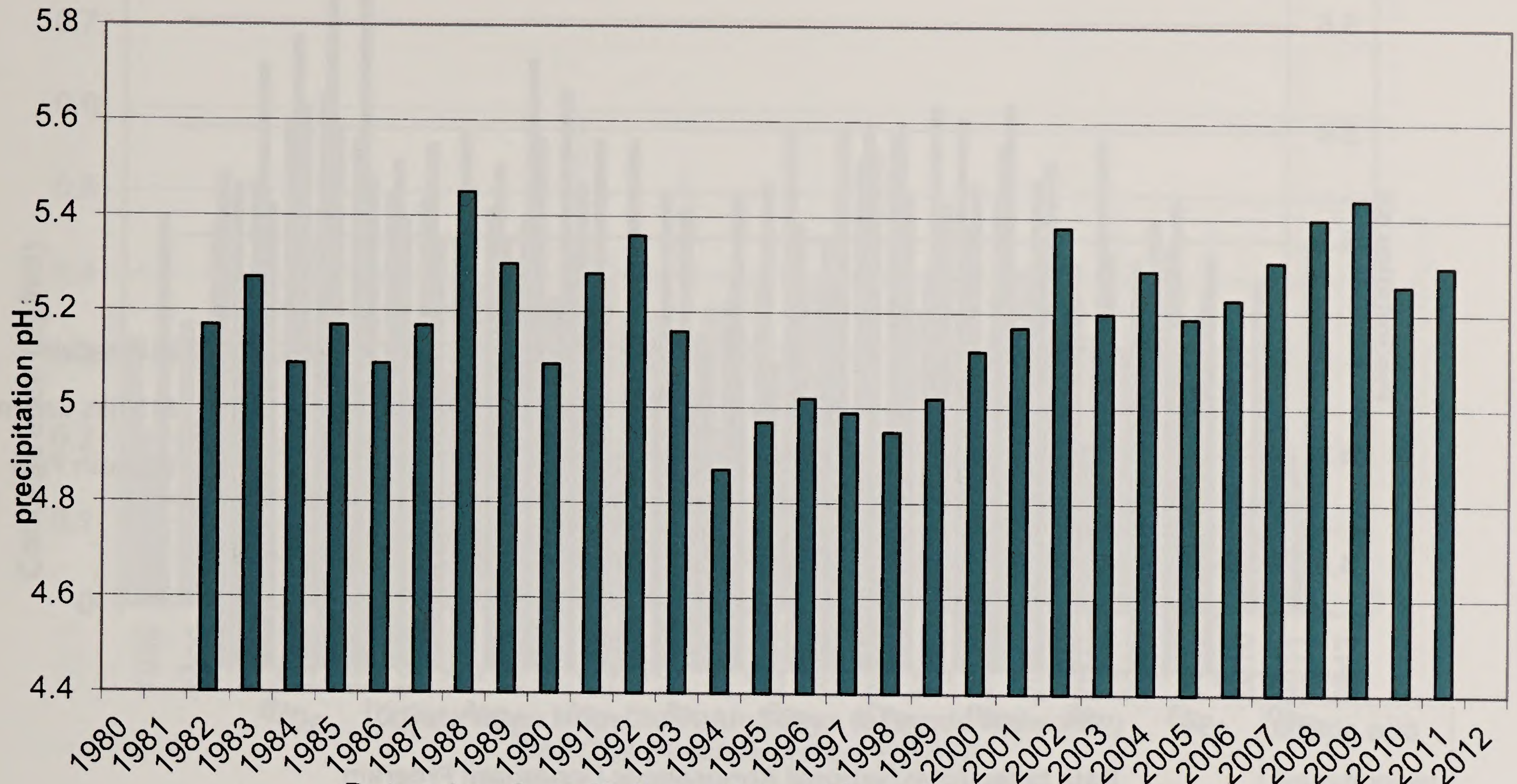


Figure 3-27. Annual Visibility (Standard Visual Range) near Sage-grouse Planning Area Rocky Mountain National Park



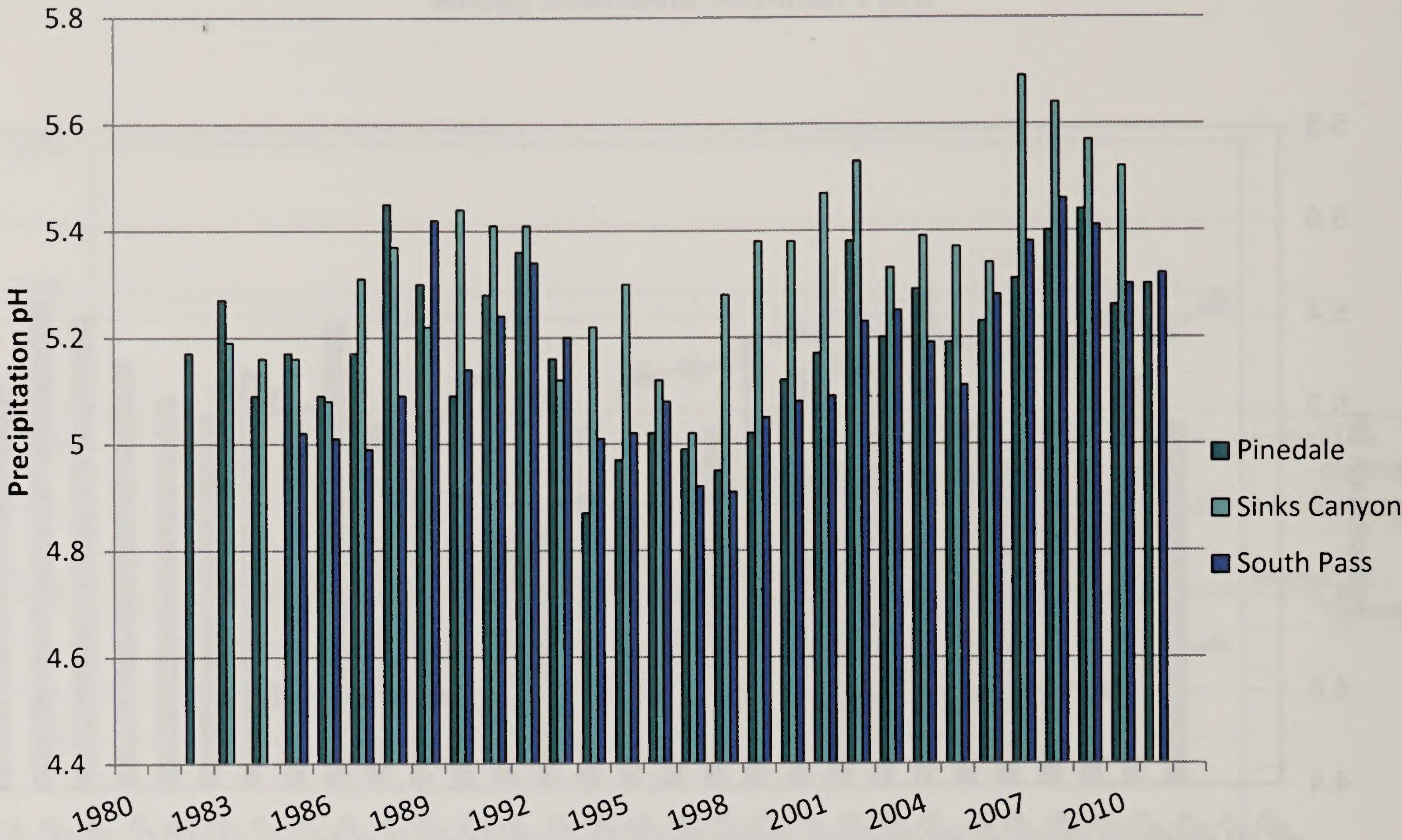
Data taken from Inter-Agency Monitoring of Protected Visual Environments IMPROVE Rocky Mountain National Park station: ROMO1

Figure 3-28. Mean Annual Precipitation pH in the Sage-grouse Planning Area Pinedale, Wyoming



Data taken from National Atmospheric Deposition Program
NADP Pinedale station WY06
Normal range of precipitation pH:
5.0 - 5.6 (Seinfeld, 1986)

Figure 3-29. Mean Annual Precipitation pH in the Sage-grouse Planning Area



Data taken from National Atmospheric Deposition Program
NADP Pinedale station WY06
NADP Sinks Canyon station WY02
NADP South Pass station WY97

Figure 3-30. Mean Annual Concentrations of Nitrogen Compounds near Sage-grouse Planning Area Pinedale, Wyoming

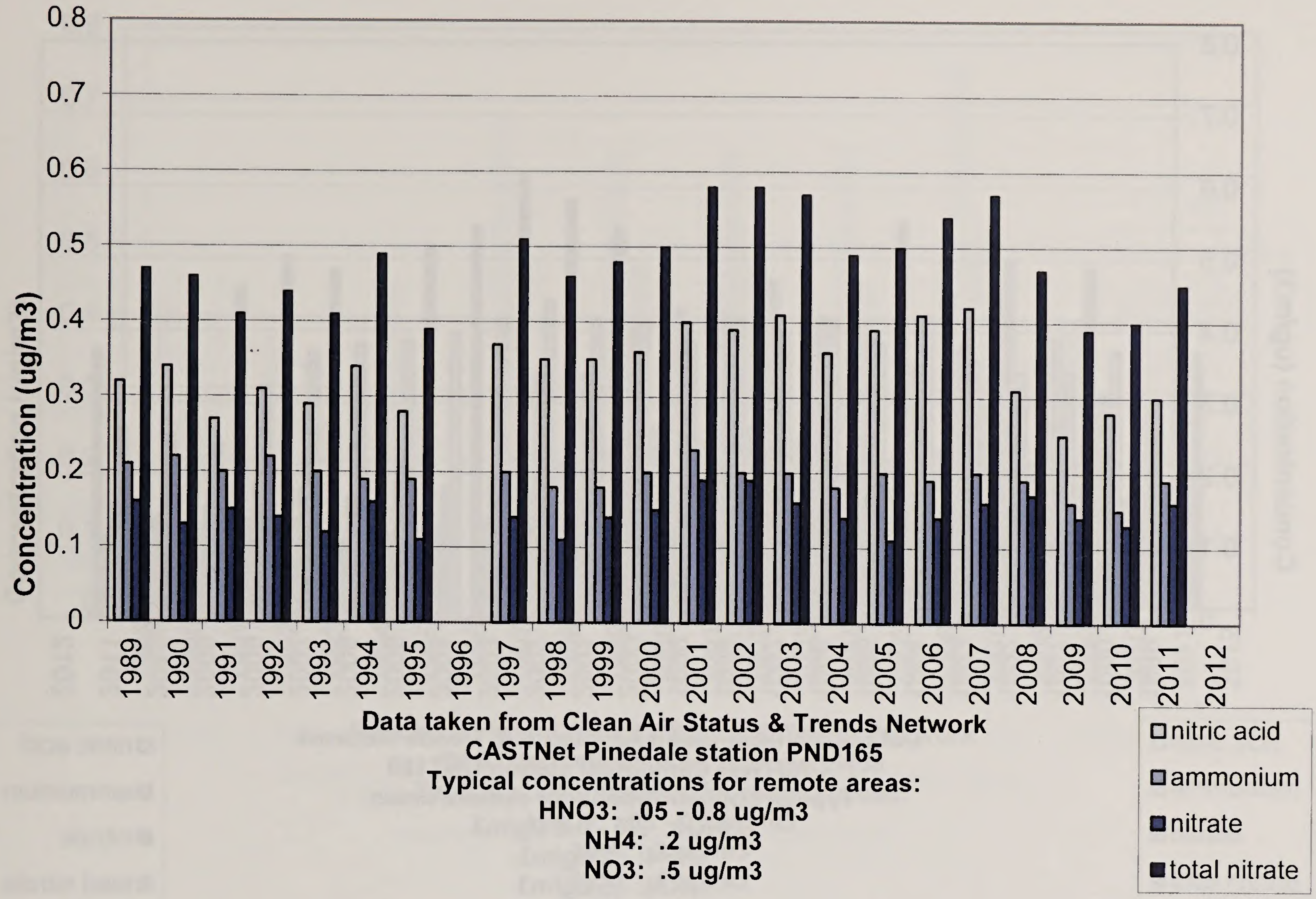


Figure 3-31. Mean Annual Concentrations of Nitrogen Compounds near Sage-grouse Planning Area Centennial, Wyoming

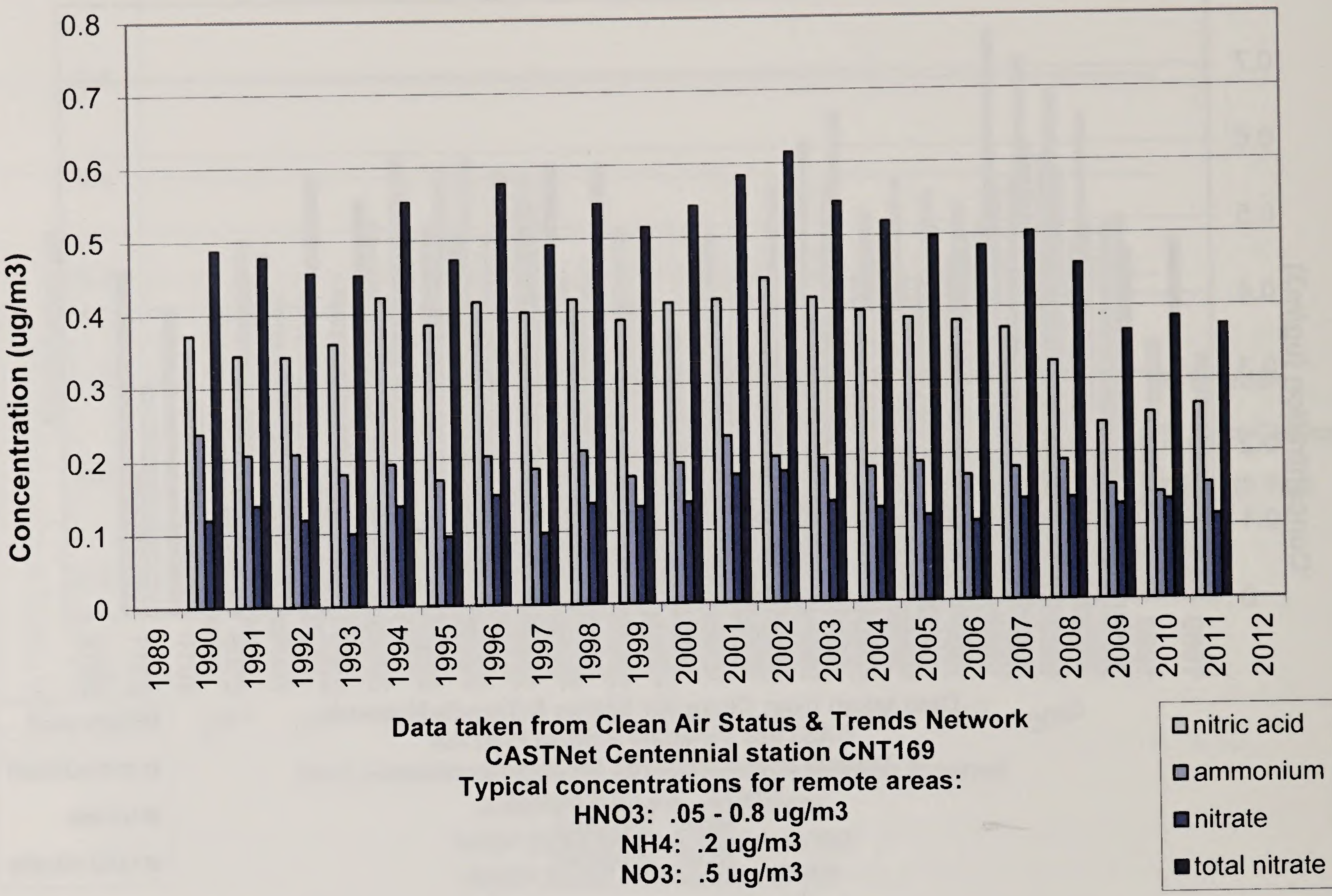
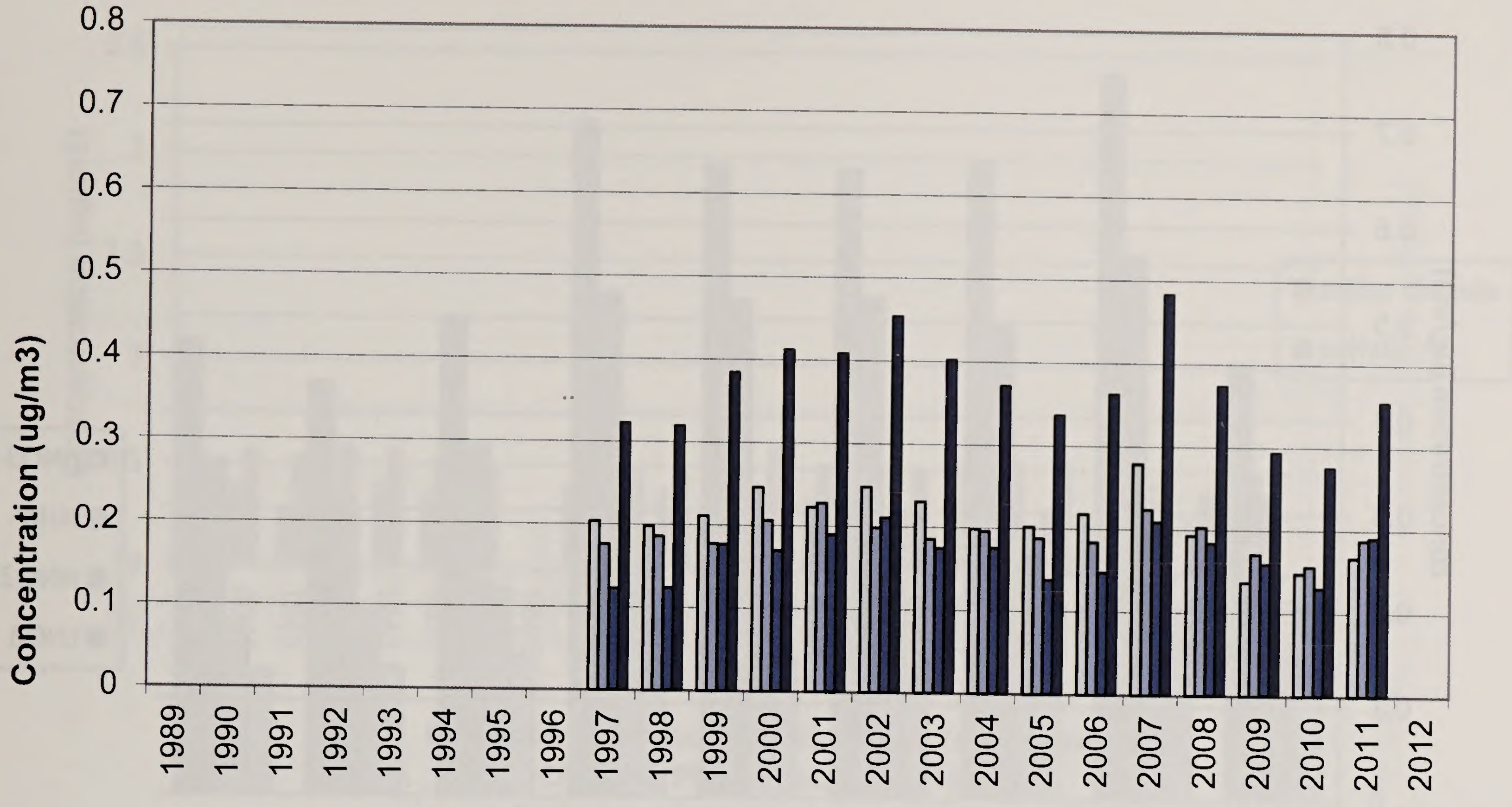
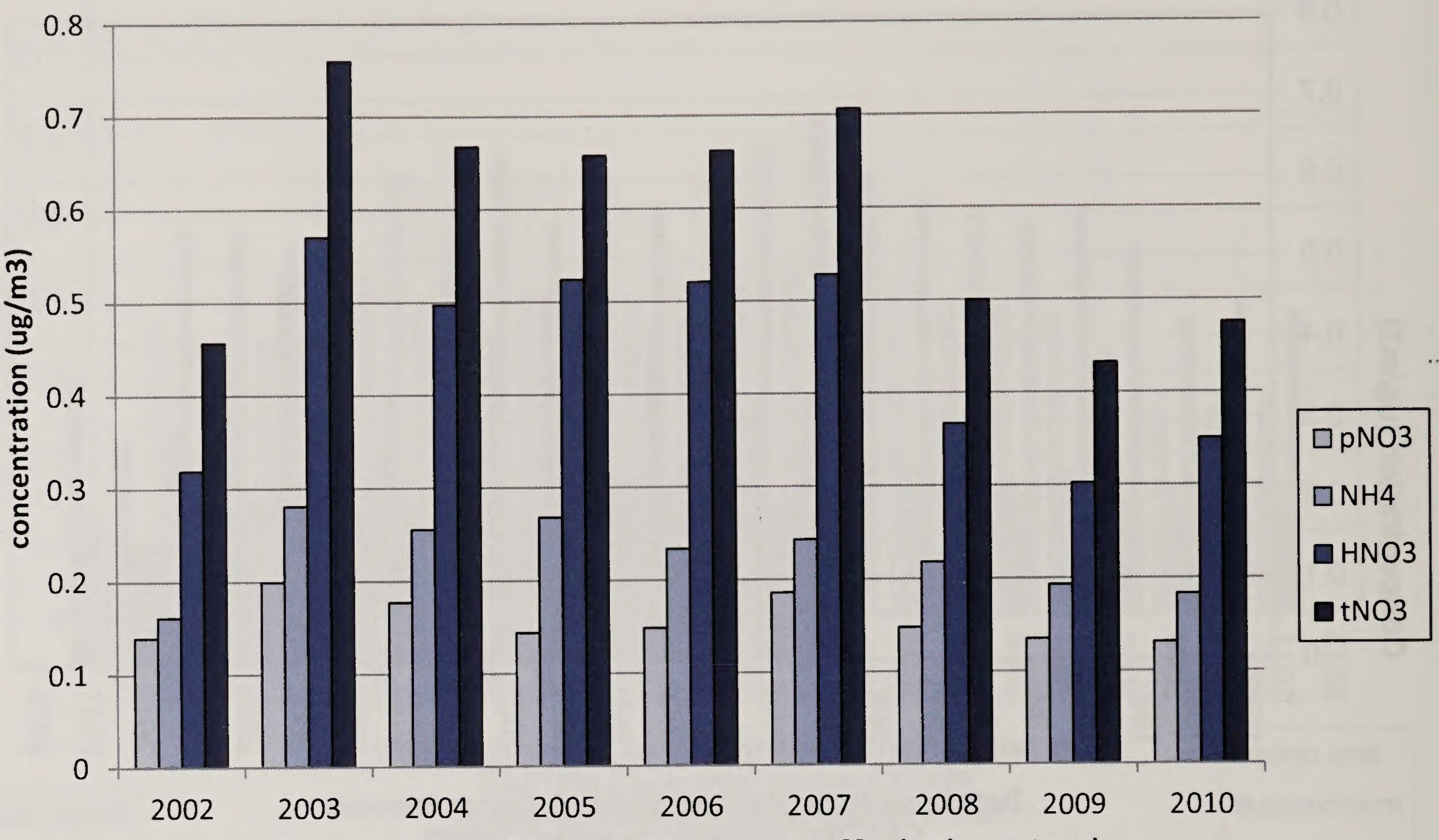


Figure 3-32. Mean Annual Concentrations of Nitrogen Compounds near Sage-grouse Planning Area Yellowstone National Park



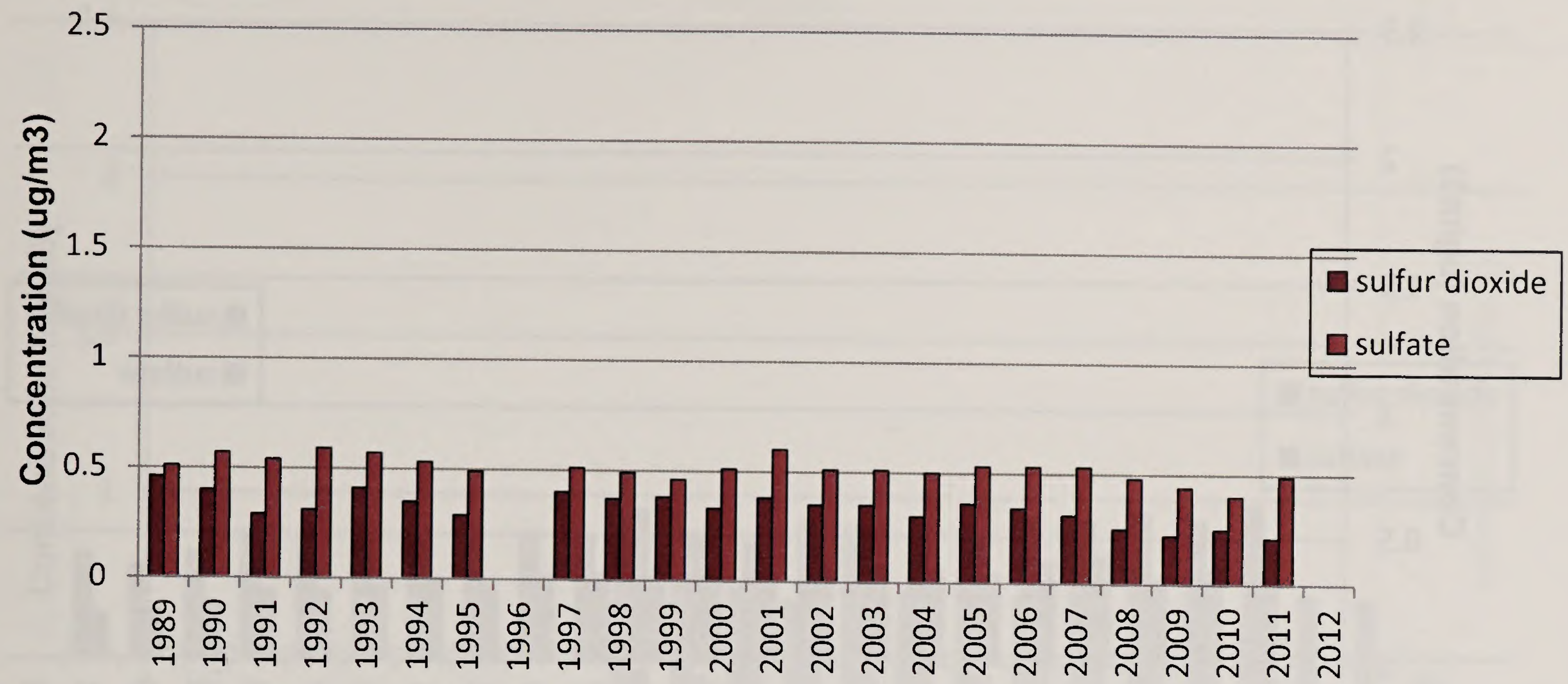
Data taken from Clean Air Status & Trends Network
CASTNet Yellowstone station Yel408
Typical concentrations for remote areas:
HNO3: .05 - 0.8 ug/m3
NH4: .2 ug/m3
NO3: .5 ug/m3

Figure 3-33. Mean Annual Concentrations of Nitrogen Compounds in the Sage-grouse Planning Area Pinedale



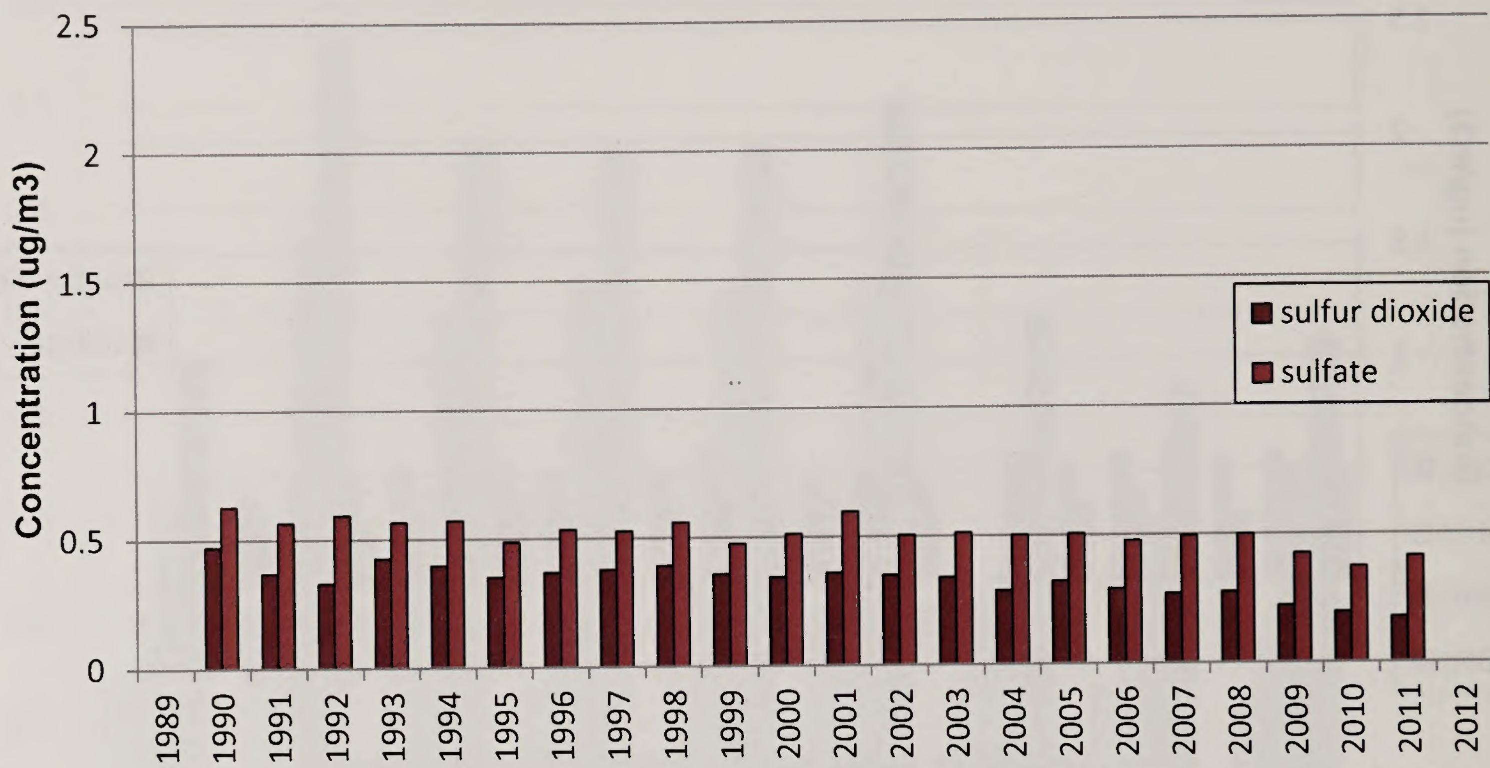
Data taken from Wyoming Air Resources Monitoring network
WARMS Pinedale station
Typical concentrations for remote areas:
HNO3: .05 - 0.8 ug/m3
NH4: .2 ug/m3
NO3: .5 ug/m3

Figure 3-34. Mean Annual Concentrations of Sulfur Compounds near Sage-grouse Planning Area Pinedale, Wyoming



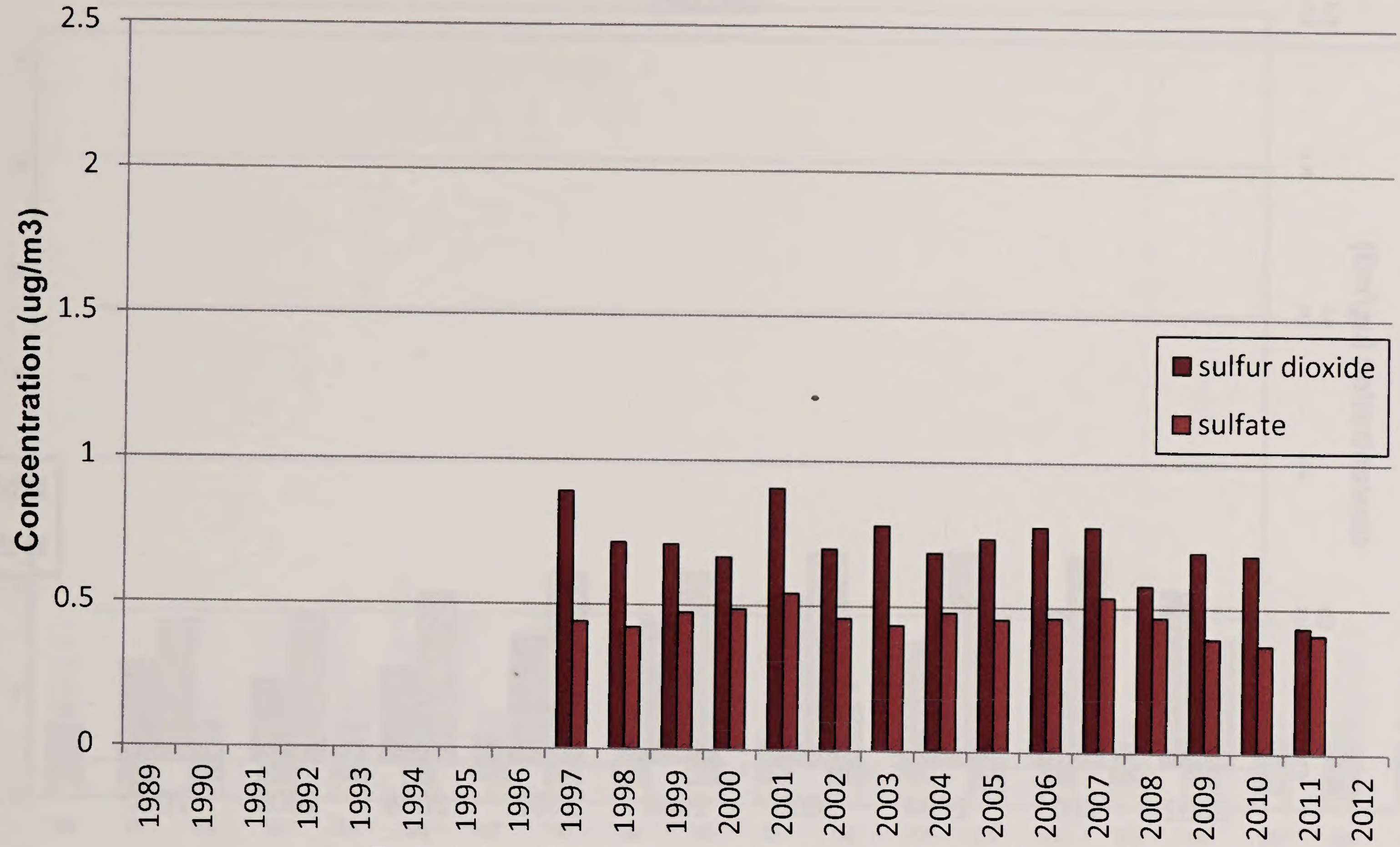
Data taken from Clean Air Status and Trend Network
CASTNet Pinedale station: PND165
Typical concentrations for remote areas
SO2: 2.6 - 26 ug/m3
SO4: 2.5 ug/m3

Figure 3-35. Mean Annual Concentrations of Sulfur Compounds near Sage-grouse Planning Area Centennial, Wyoming



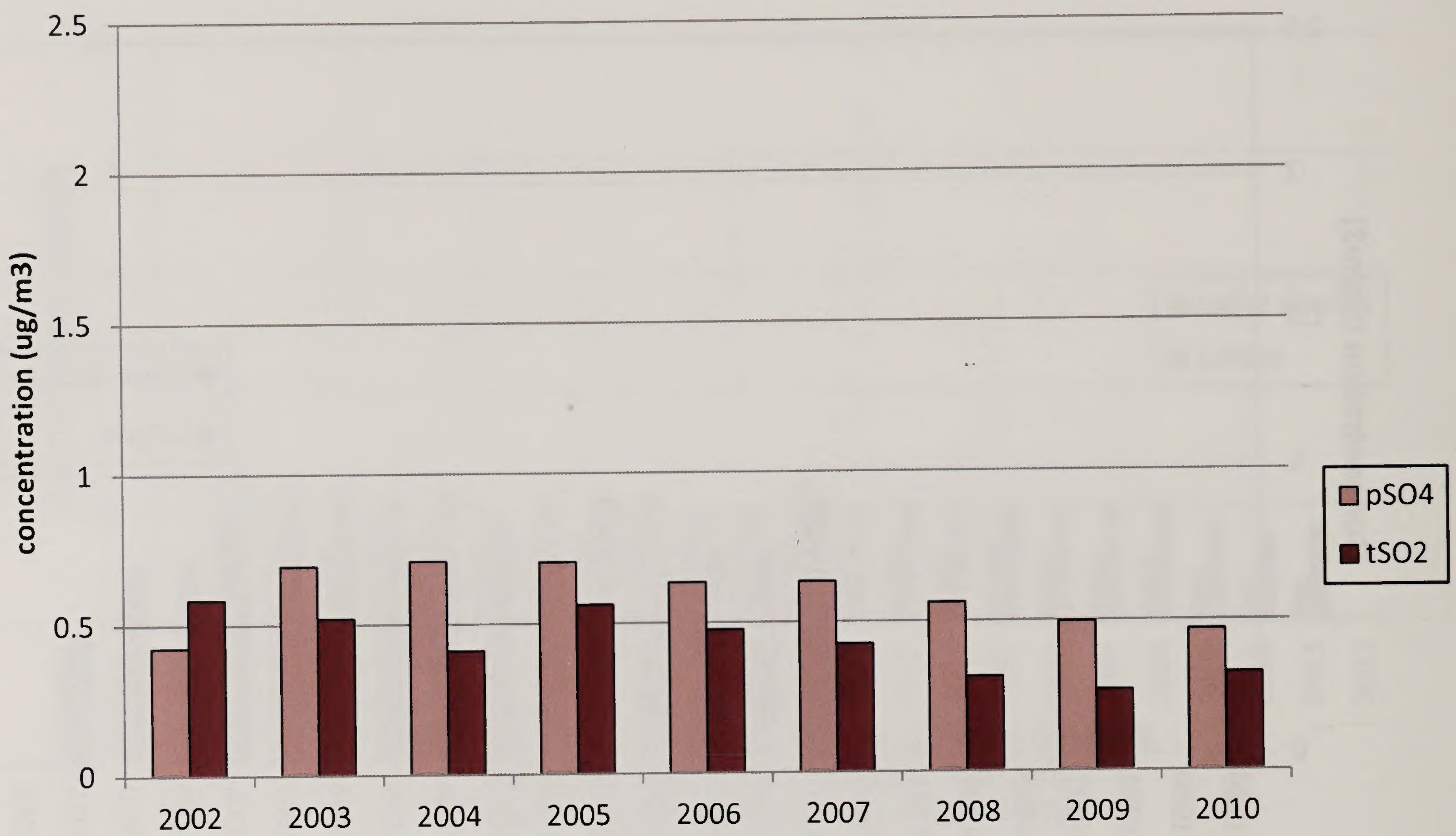
Data taken from Clean Air Status & Trend Network
CASTNet Centennial station: CNT169
Typical concentrations for remote areas
SO_2: 2.6 - 26 ug/m3
SO_4: 2.5 ug/m3

Figure 3-36. Mean Annual Concentrations of Sulfur Compounds near Sage-grouse Planning Area Yellowstone National Park



Data taken from Clean Air Status & Trend Network
CASTNet Yellowstone station: YEL408
Typical concentrations for remote areas
SO2: 2.6 - 26 ug/m3
SO4: 2.5 ug/m3

Figure 3-37. Mean Annual Concentrations of Sulphur Compounds in the Sage-grouse Planning Area Pinedale



Data taken from Wyoming Air Resources Monitoring System
WARMS Pinedale station
Typical concentrations for remote areas
SO2: 2.6 - 26 ug/m3
SO4: 2.5 ug/m3

Figure 3-38. Total Nitrogen Deposition in Pinedale

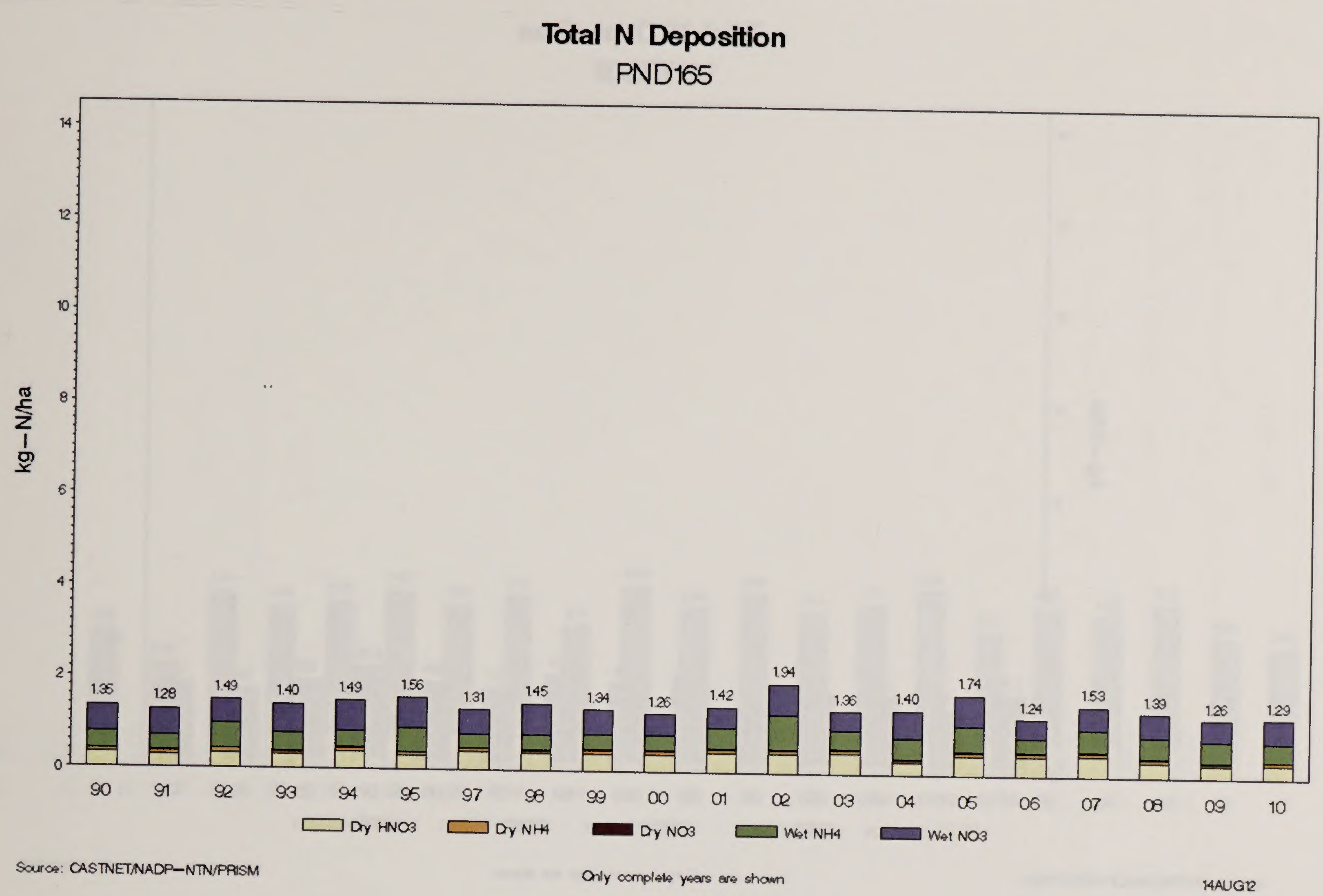


Figure 3-39. Total Nitrogen Deposition in Yellowstone National Park

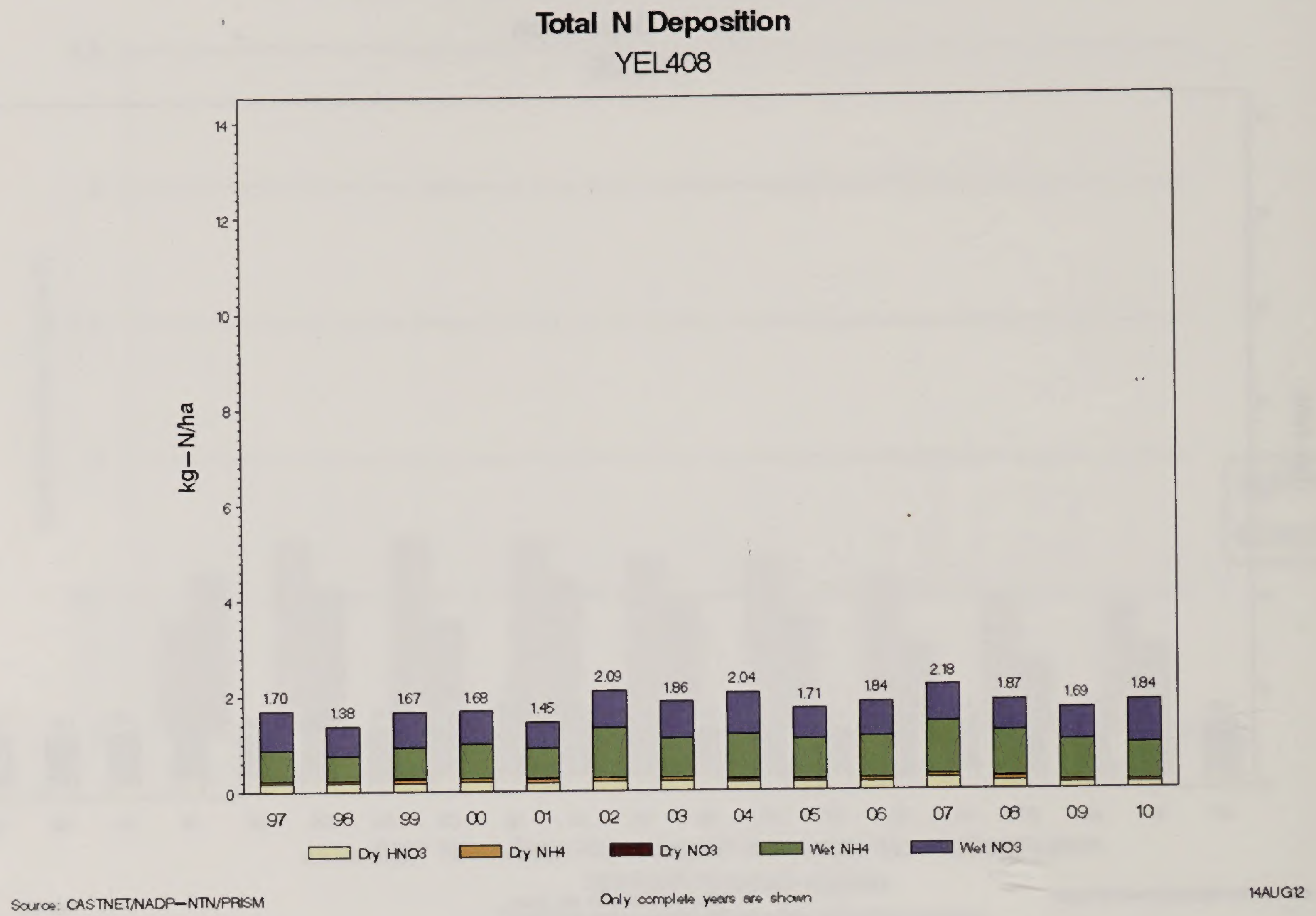


Figure 3-40. Total Nitrogen Deposition in Centennial

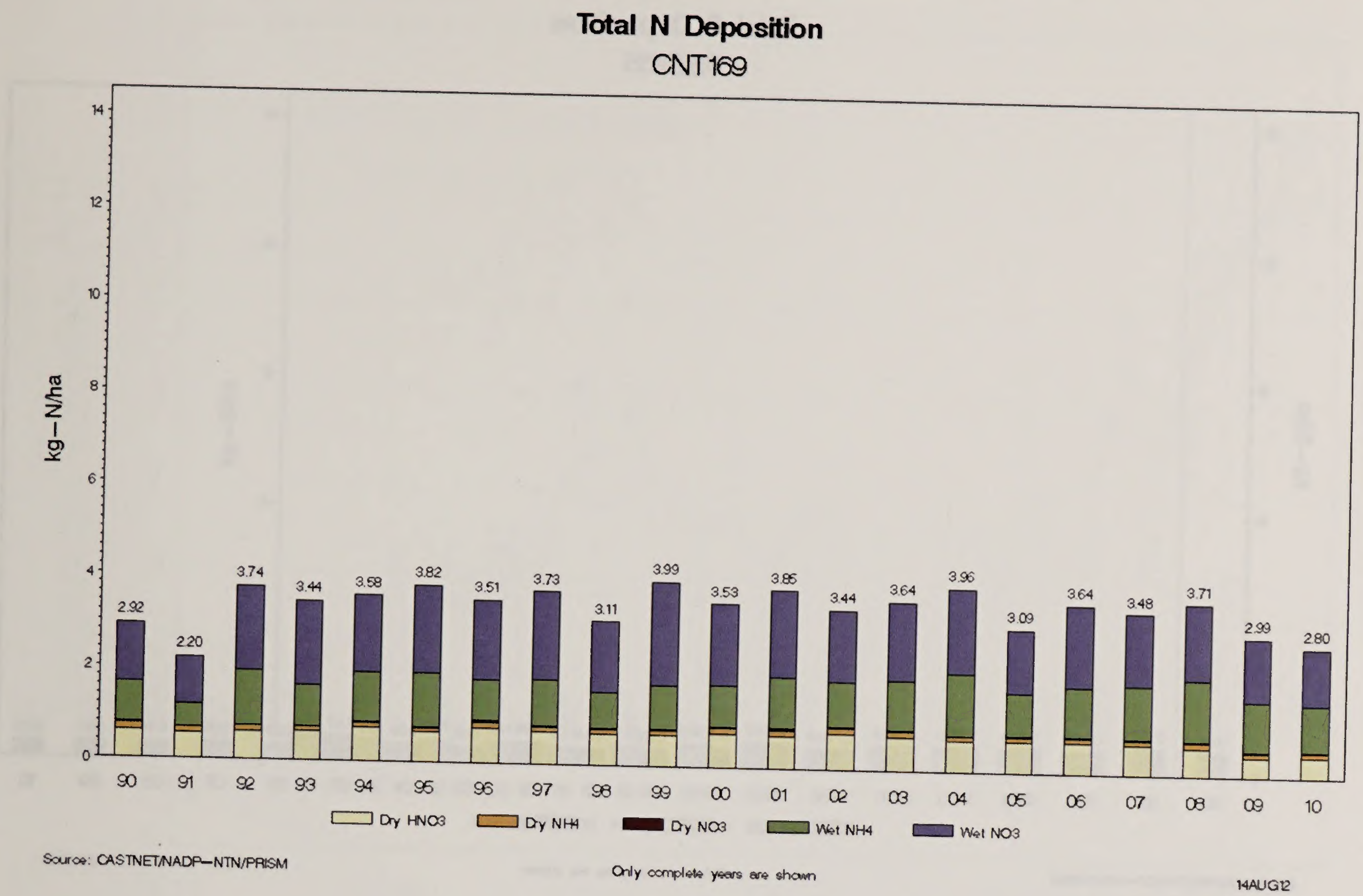


Figure 3-41. Total Sulphur Deposition in Pinedale

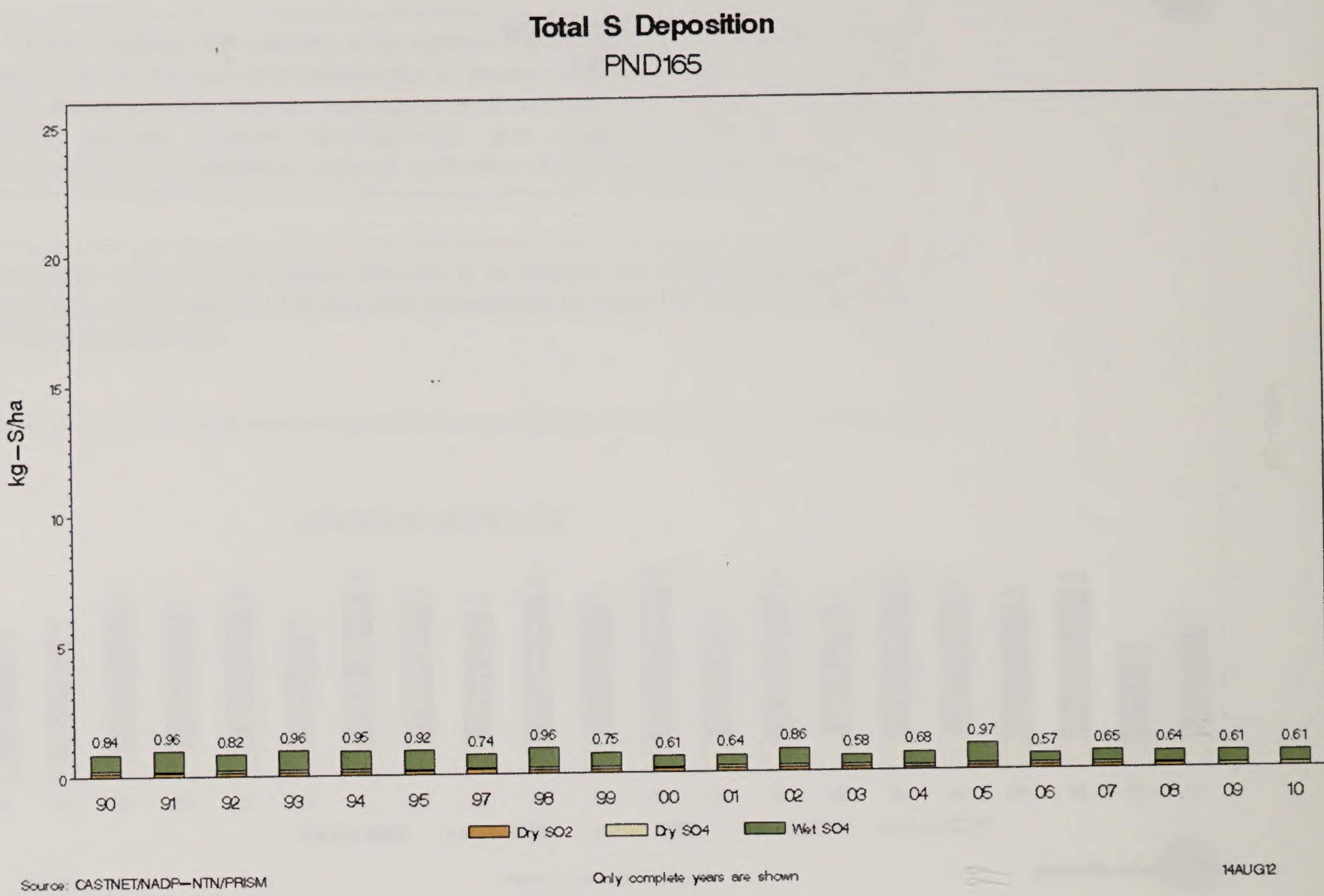


Figure 3-42. Total Sulphur Deposition in Yellowstone National Park

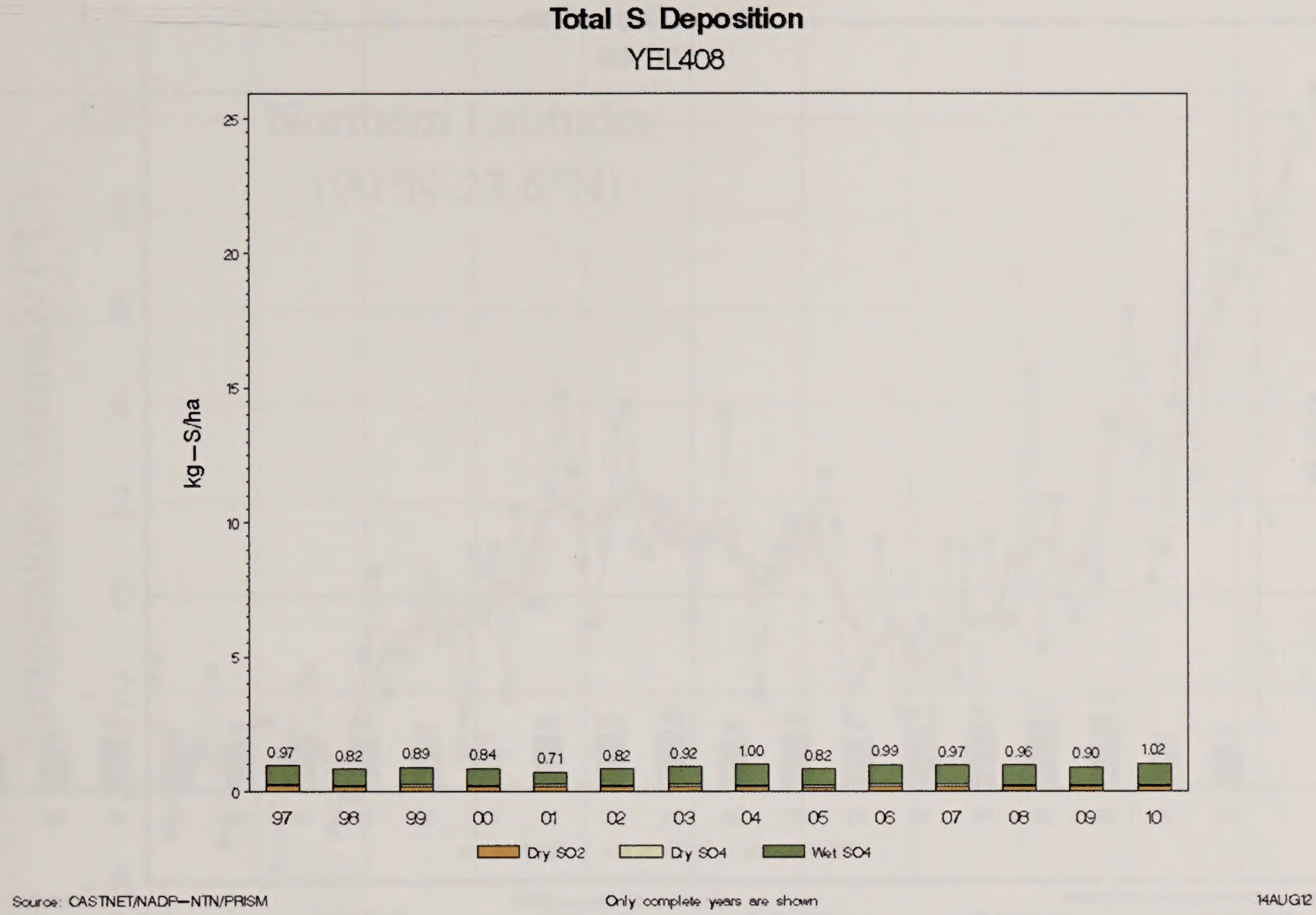


Figure 3-43. Total Sulphur Deposition in Centennial

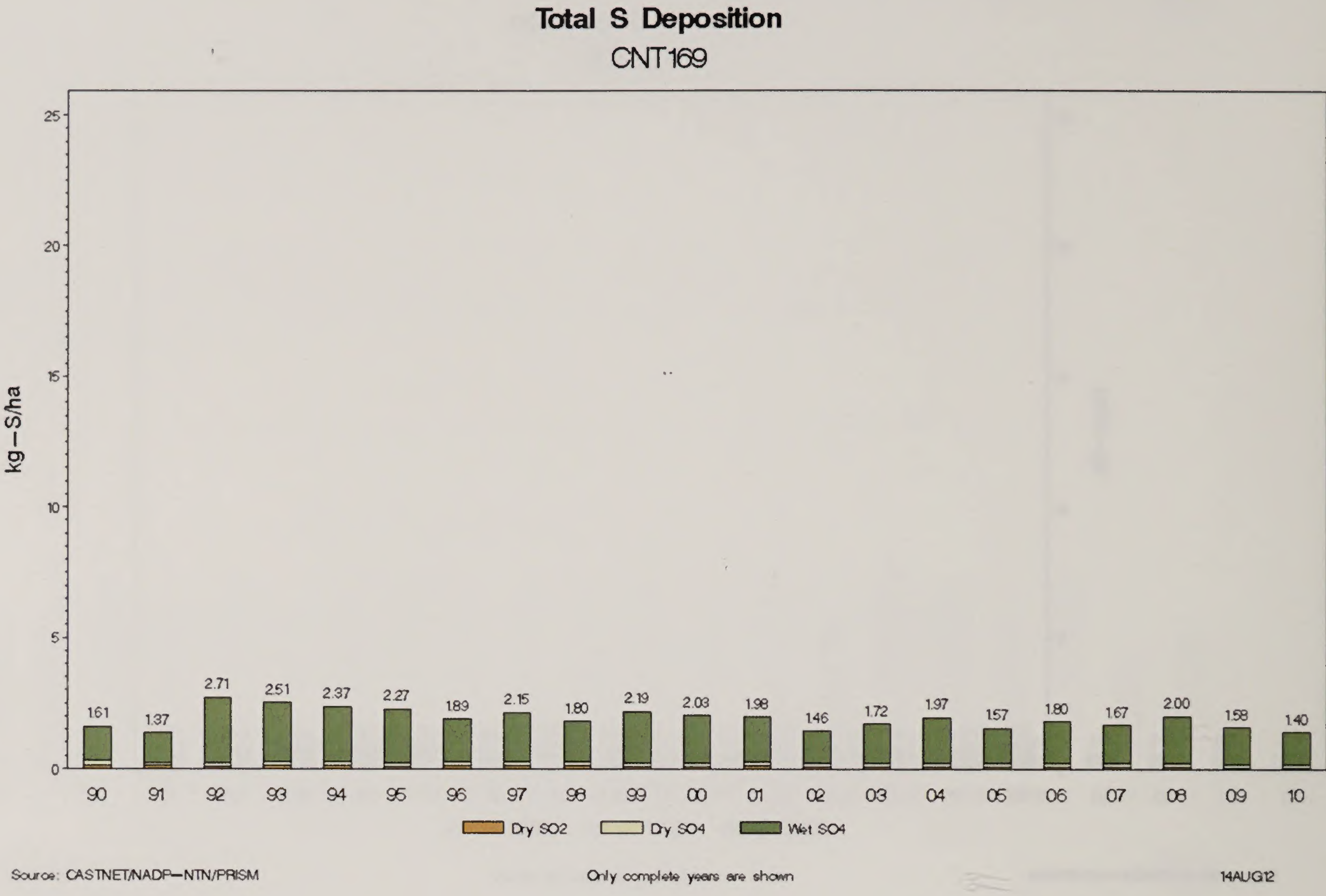
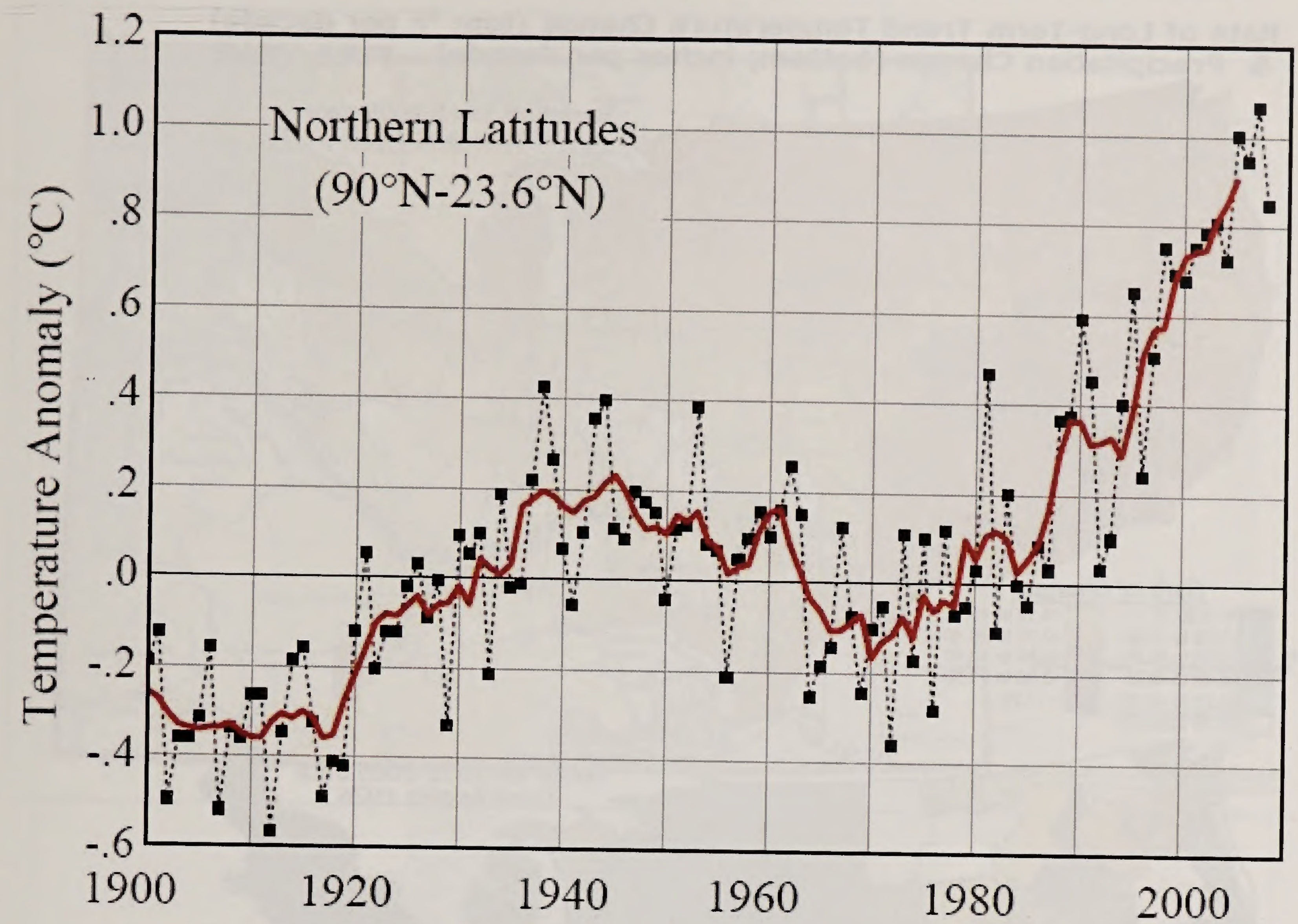


Figure 3-44. Climate Change in Northern Latitudes



Source: NASA, Goddard Institute for Space Studies (http://data.giss.nasa.gov/gistemp/graphs_v3/)

Figure 3-45. Average Temperature and Precipitation Trends

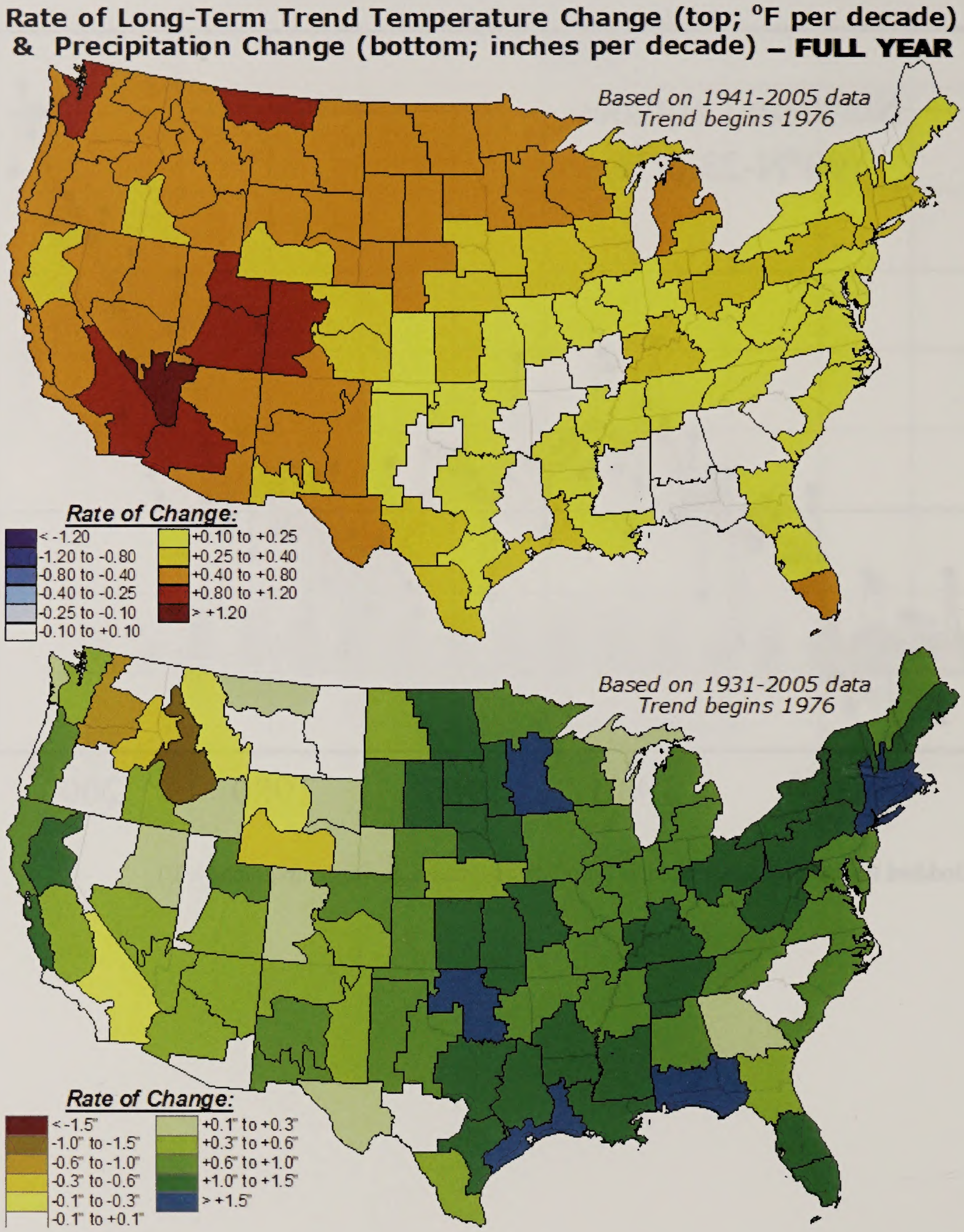


Figure 3-46. Socioeconomic Study Area, Planning Area, and Surface Land Tenure

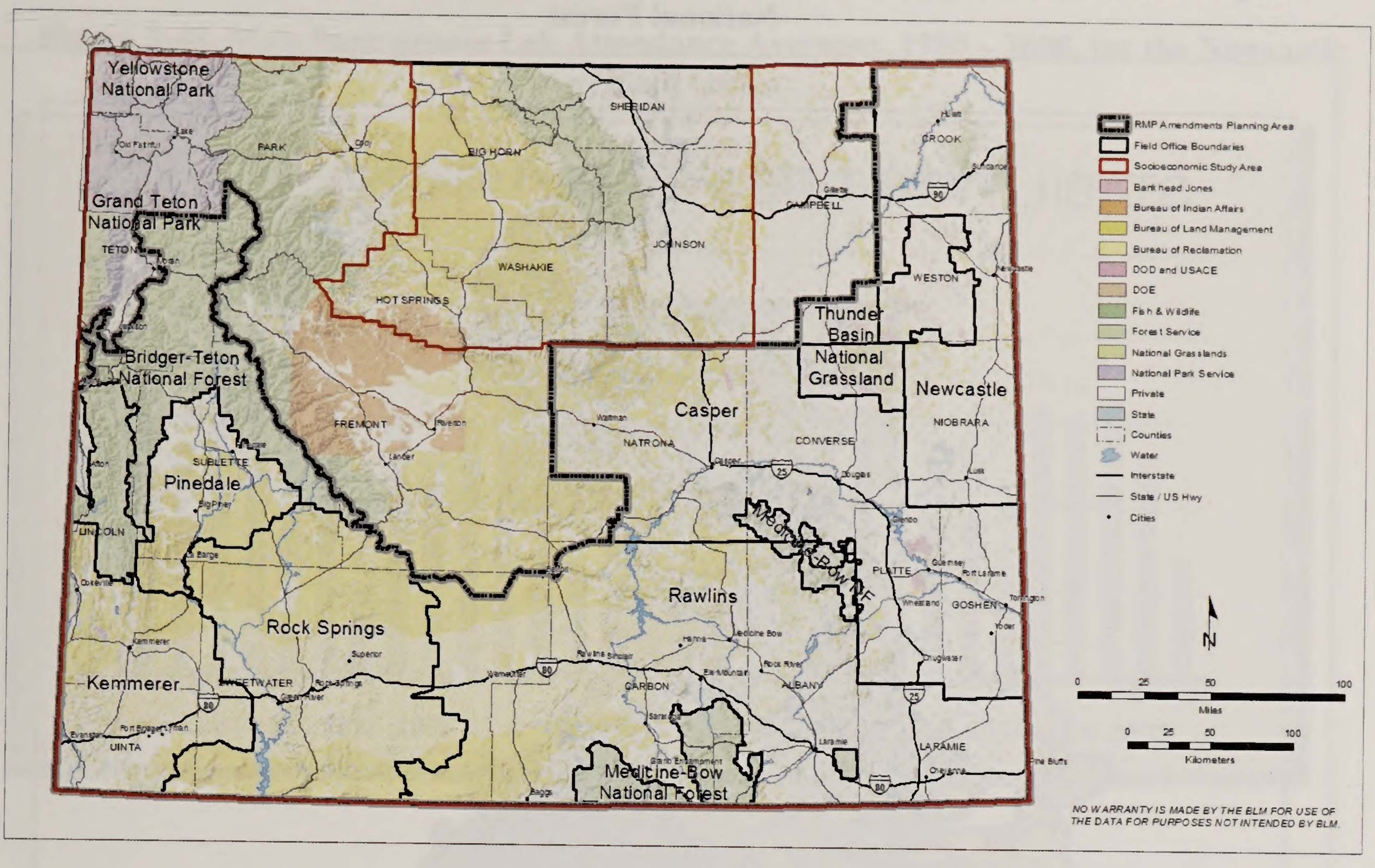


Figure 3-47. Distribution of Soil Stability Ratings Forestwide for the Bridger-Teton National Forest

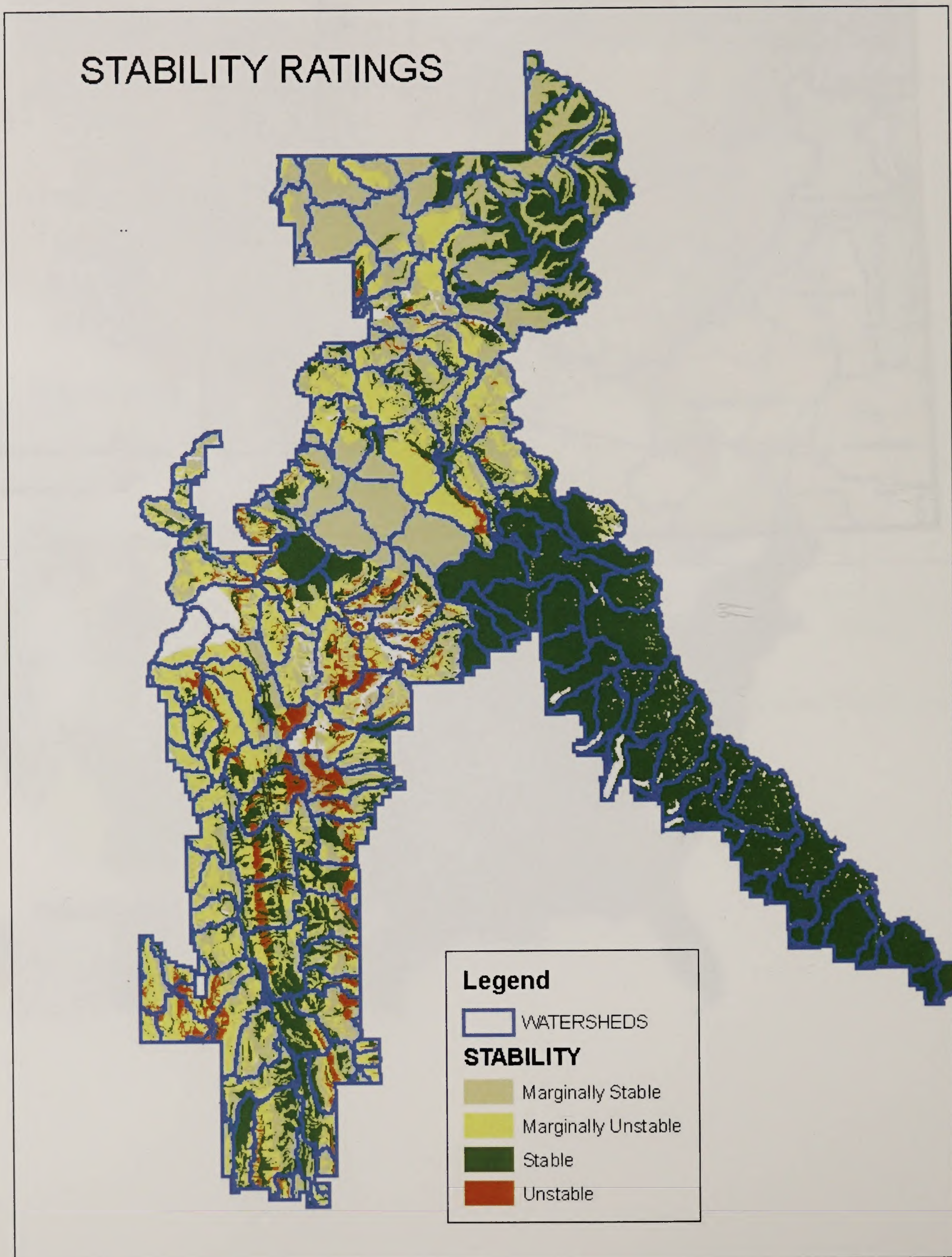


Figure 3-48. Male Sage-grouse Lek Attendance Averages, 1980 – 2008, for the Newcastle Field Office

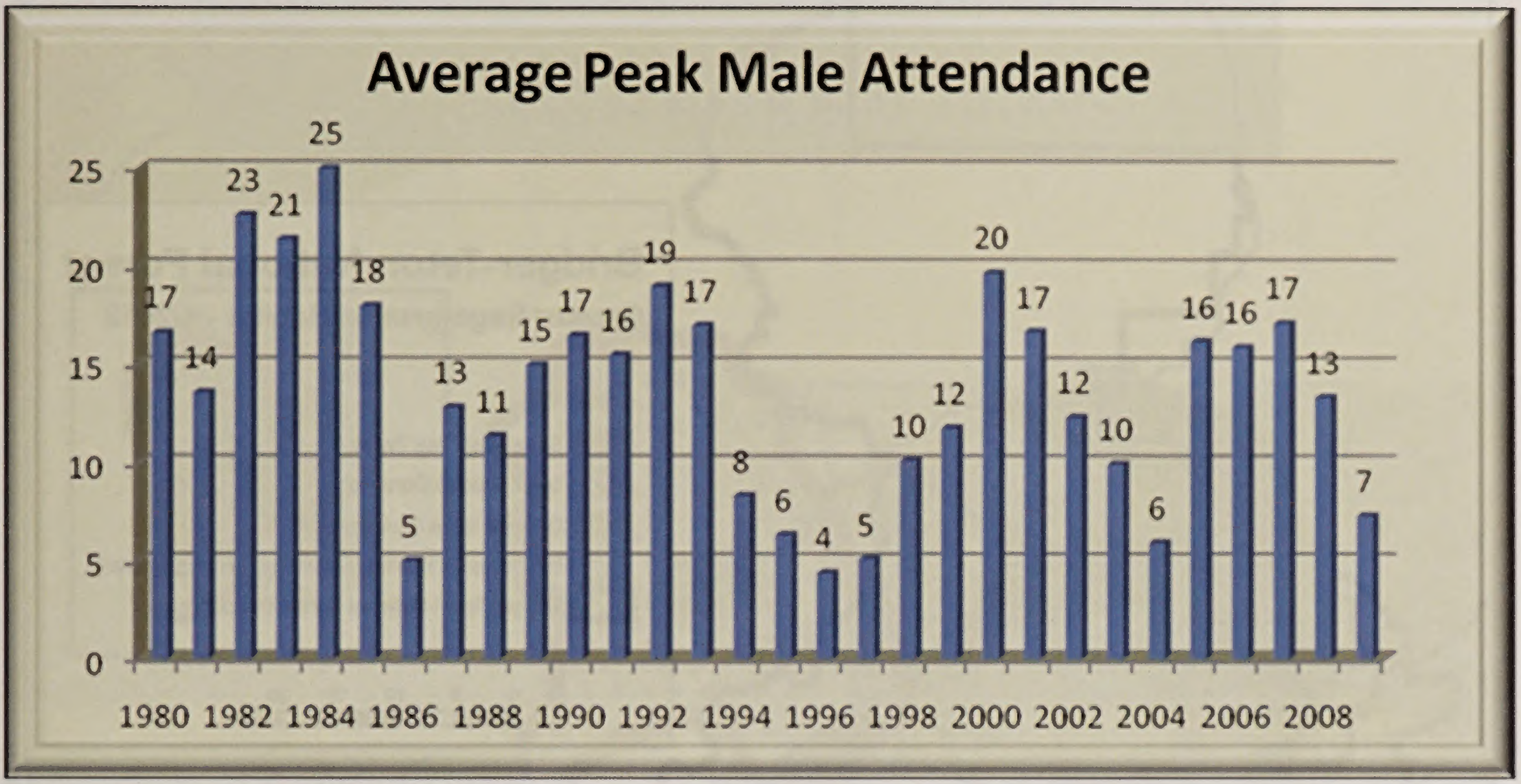


Figure 3-49. Greater Sage-Grouse Habitat for the Bridger-Teton National Forest

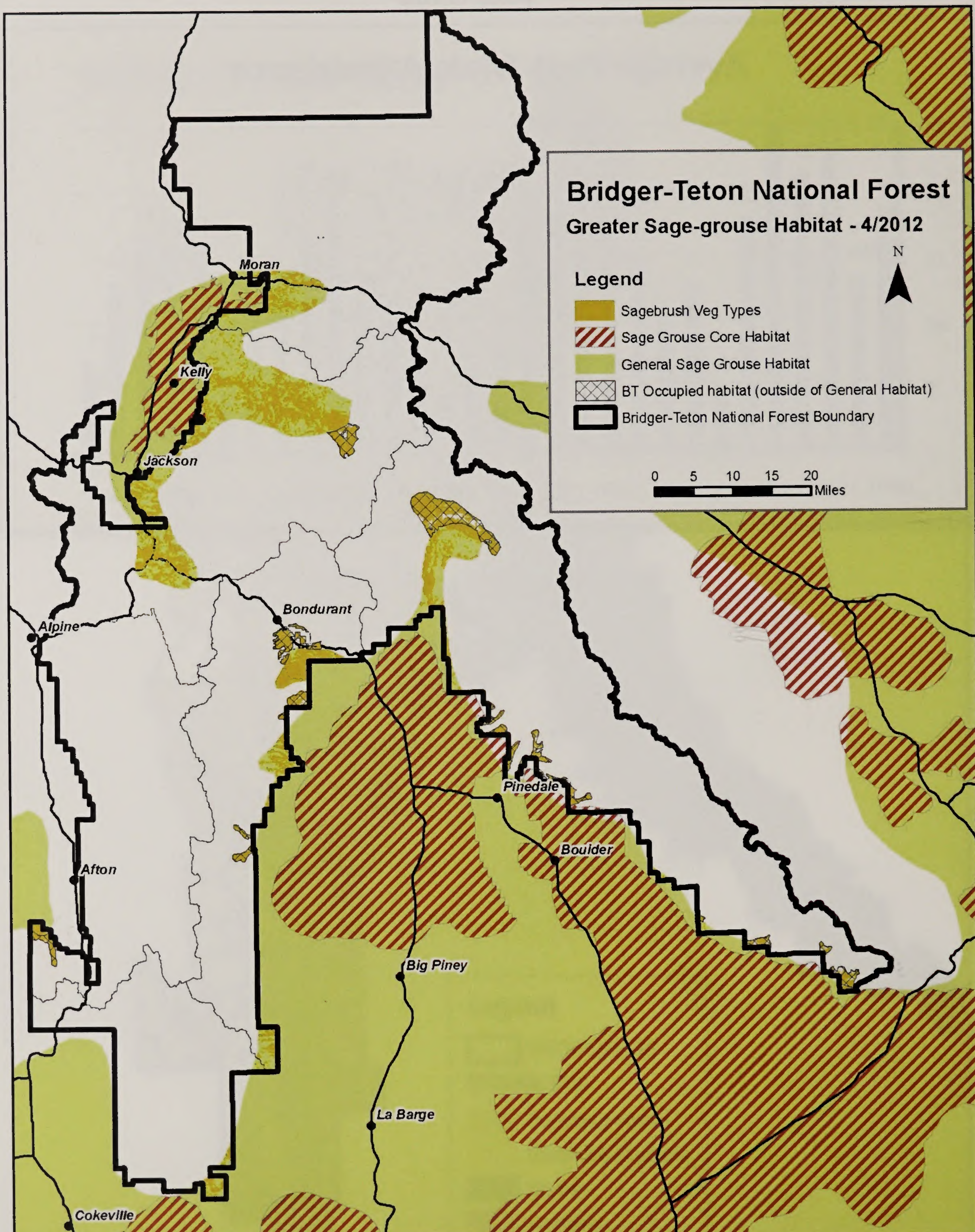


Figure 3-50. General Location of Designated Greater Sage-Grouse Core Habitats in the Thunder Basin National Grassland

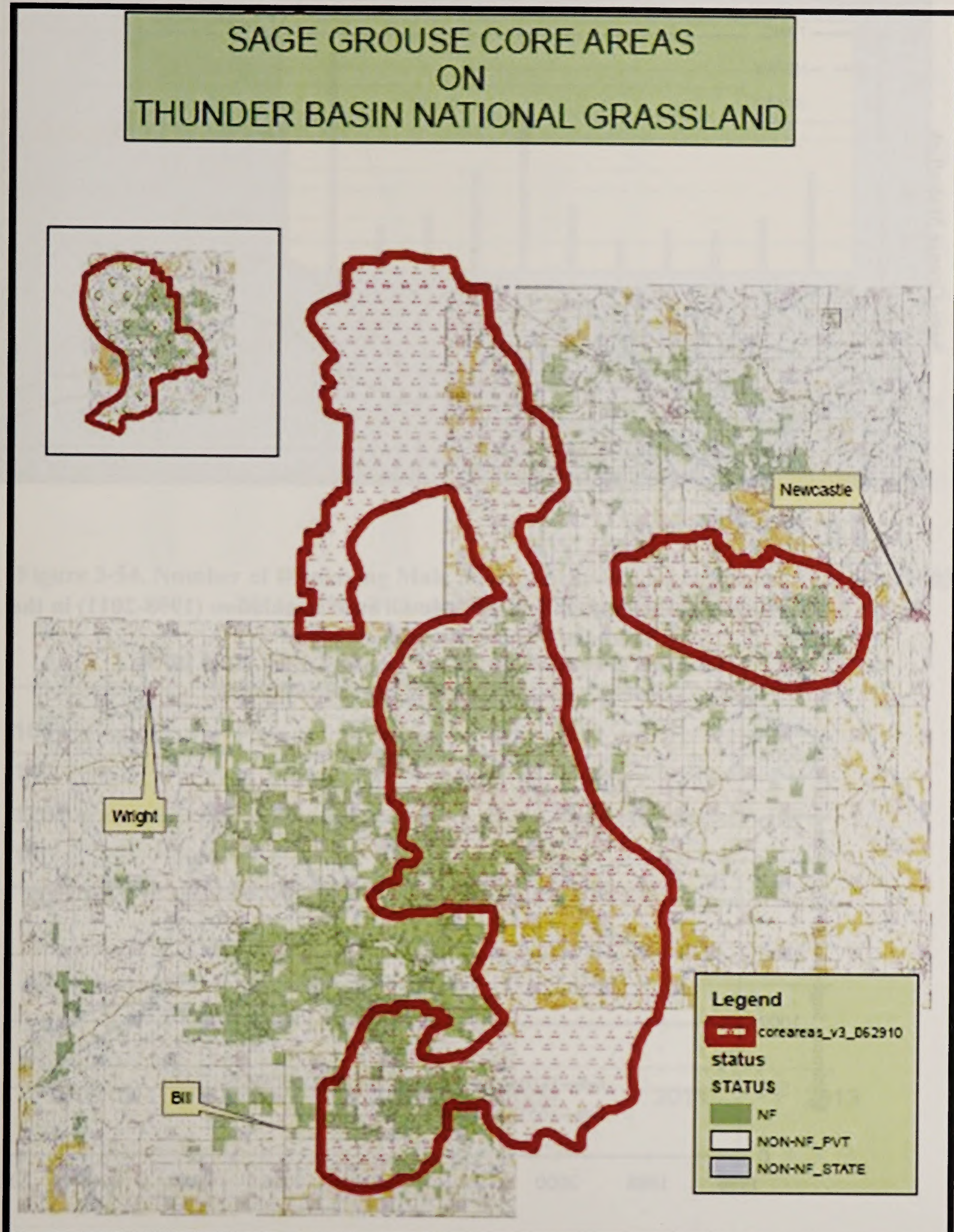


Figure 3-51. Average Number of Displaying Male Greater Sage-Grouse per Lek (1996-2011) in the Thunder Basin National Grassland

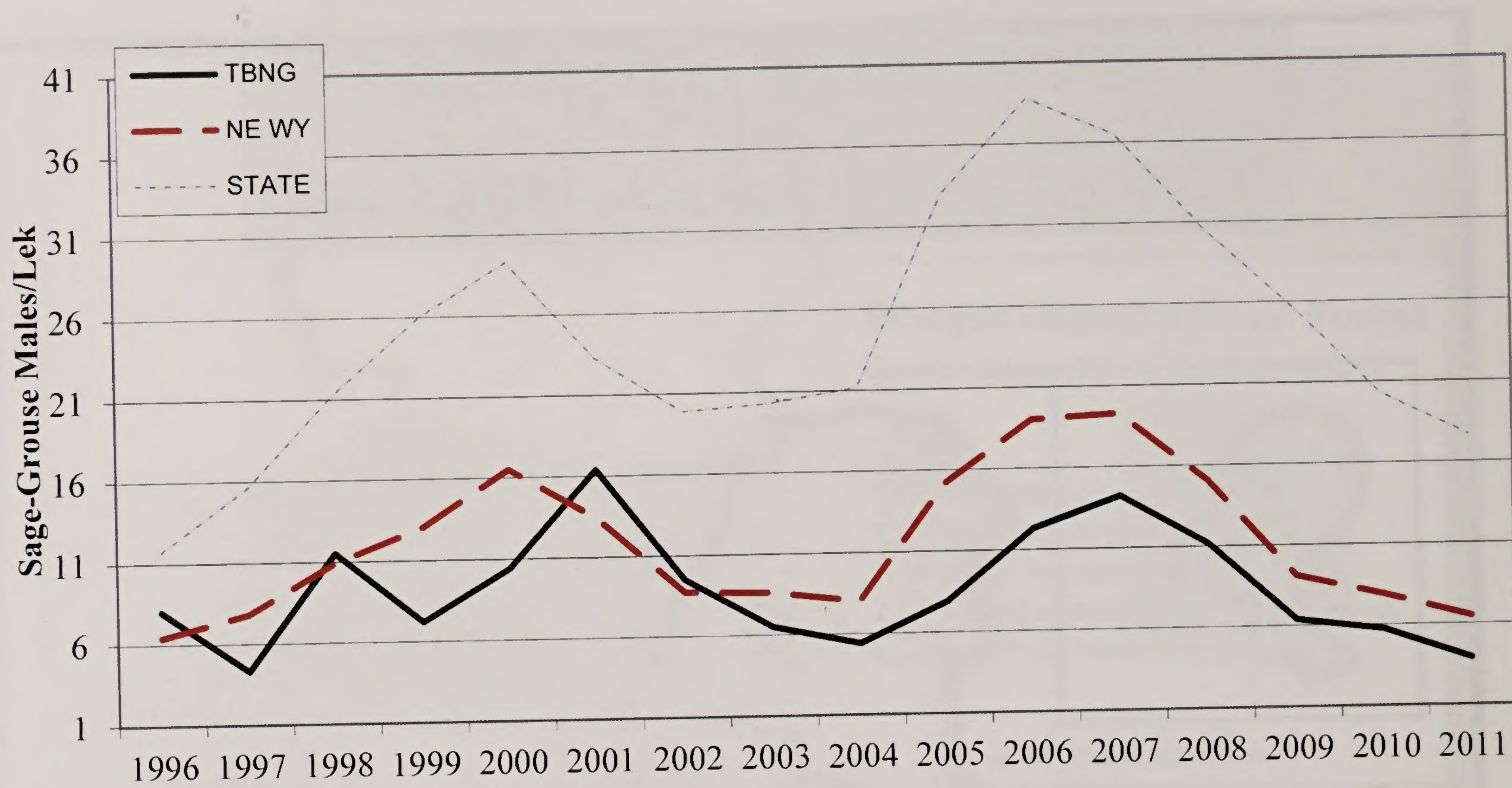


Figure 3-52. Minimum Estimated Greater Sage-Grouse Population (1998-2011) in the Thunder Basin National Grassland

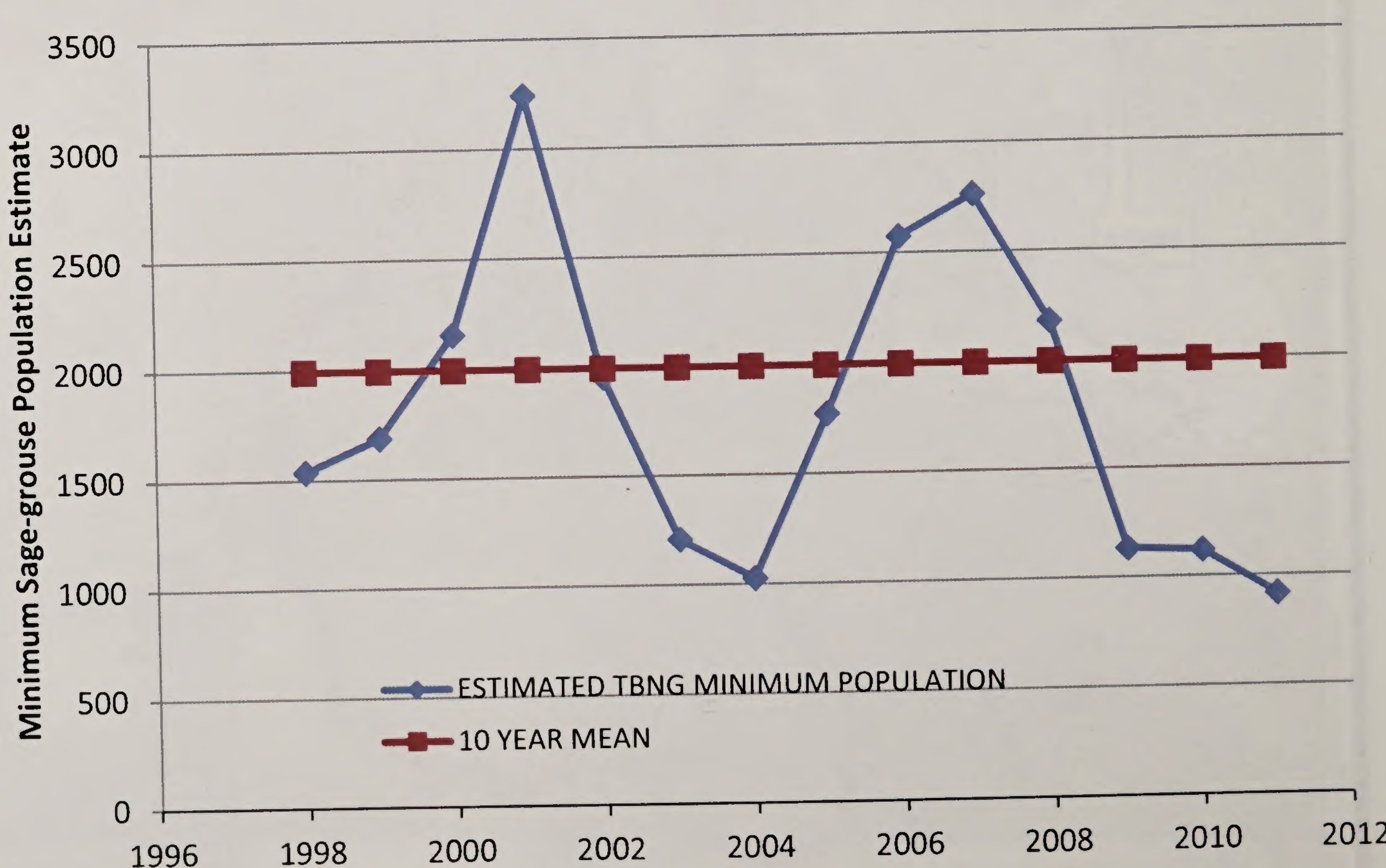


Figure 3-53. Prairie Dog Acres in the Thunder Basin National Grassland

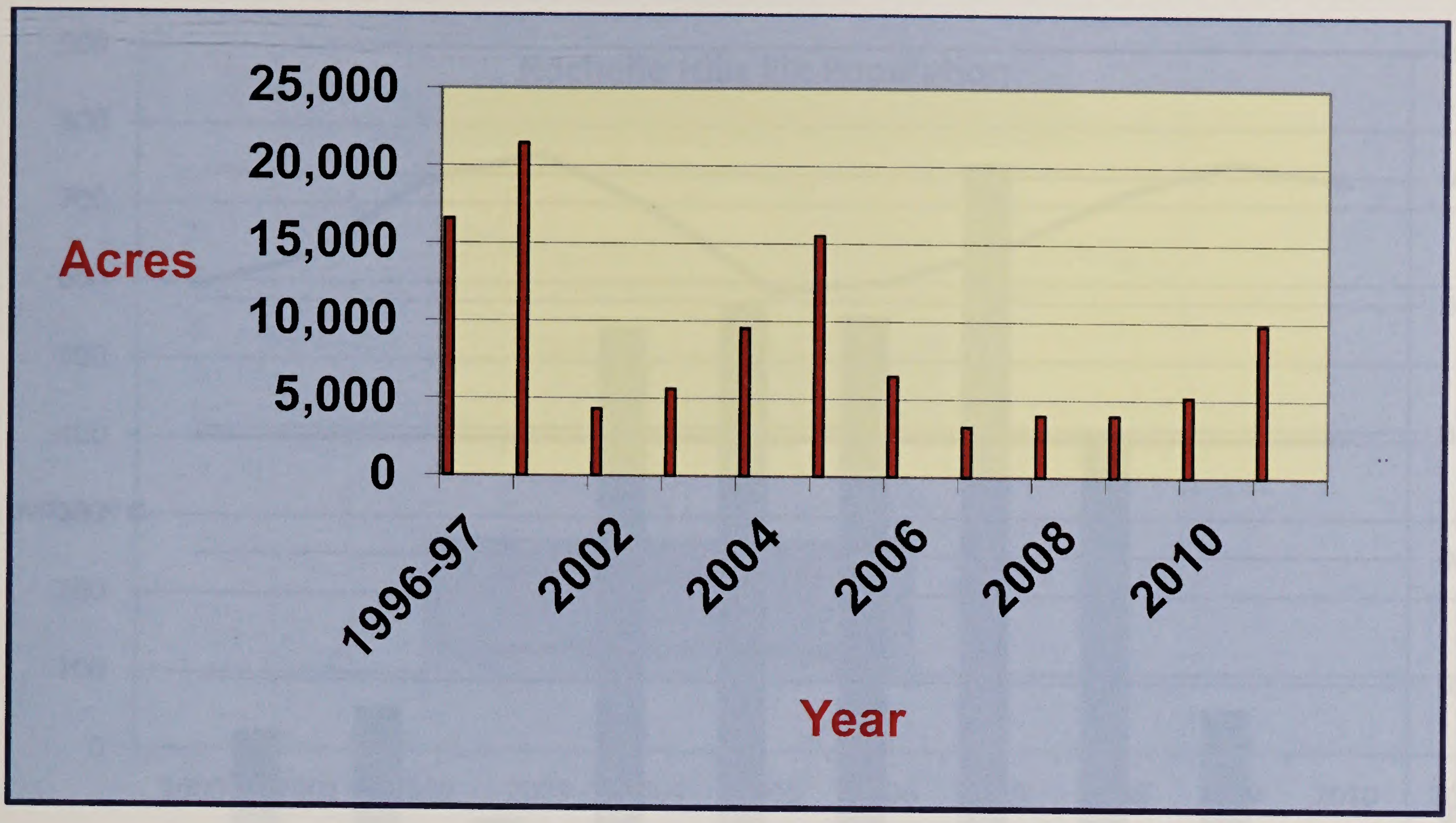


Figure 3-54. Number of Displaying Male Sharp-tailed Grouse Observed Annually (2003-2011) in the Thunder Basin National Grassland

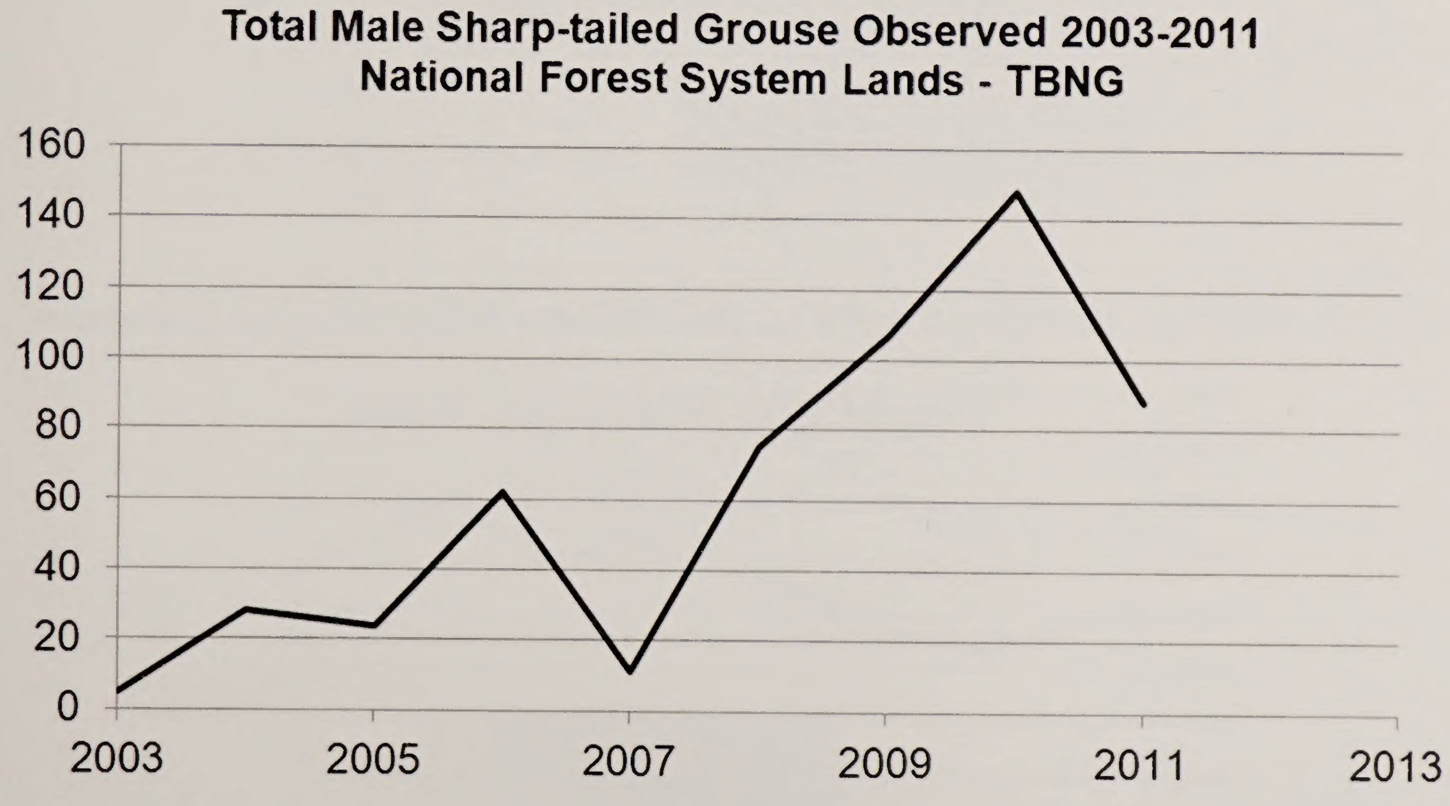


Figure 3-55. Percent of Active Raptor Nests in the Thunder Basin National Grassland

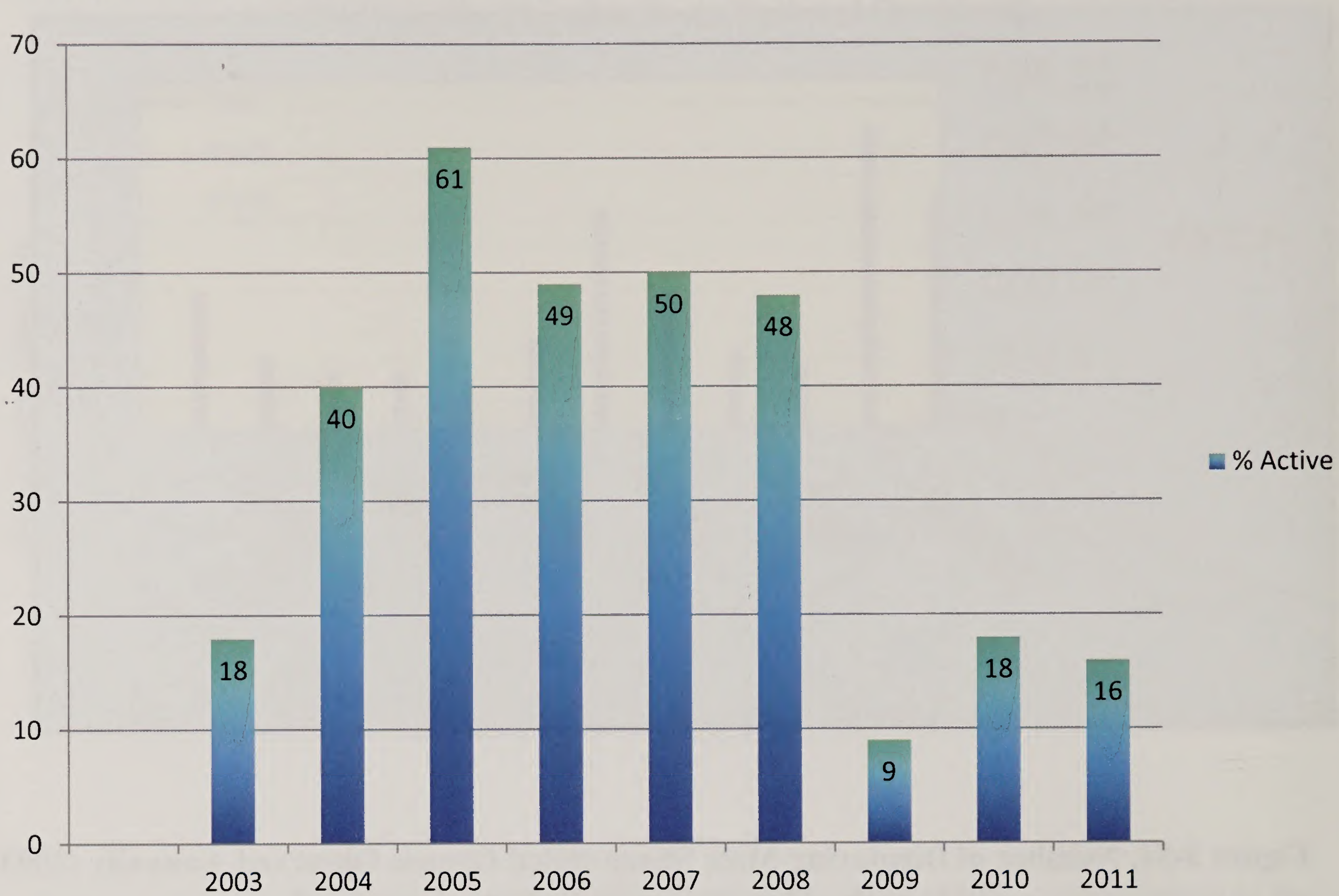


Figure 3-56. Elk Population for the Thunder Basin National Grassland

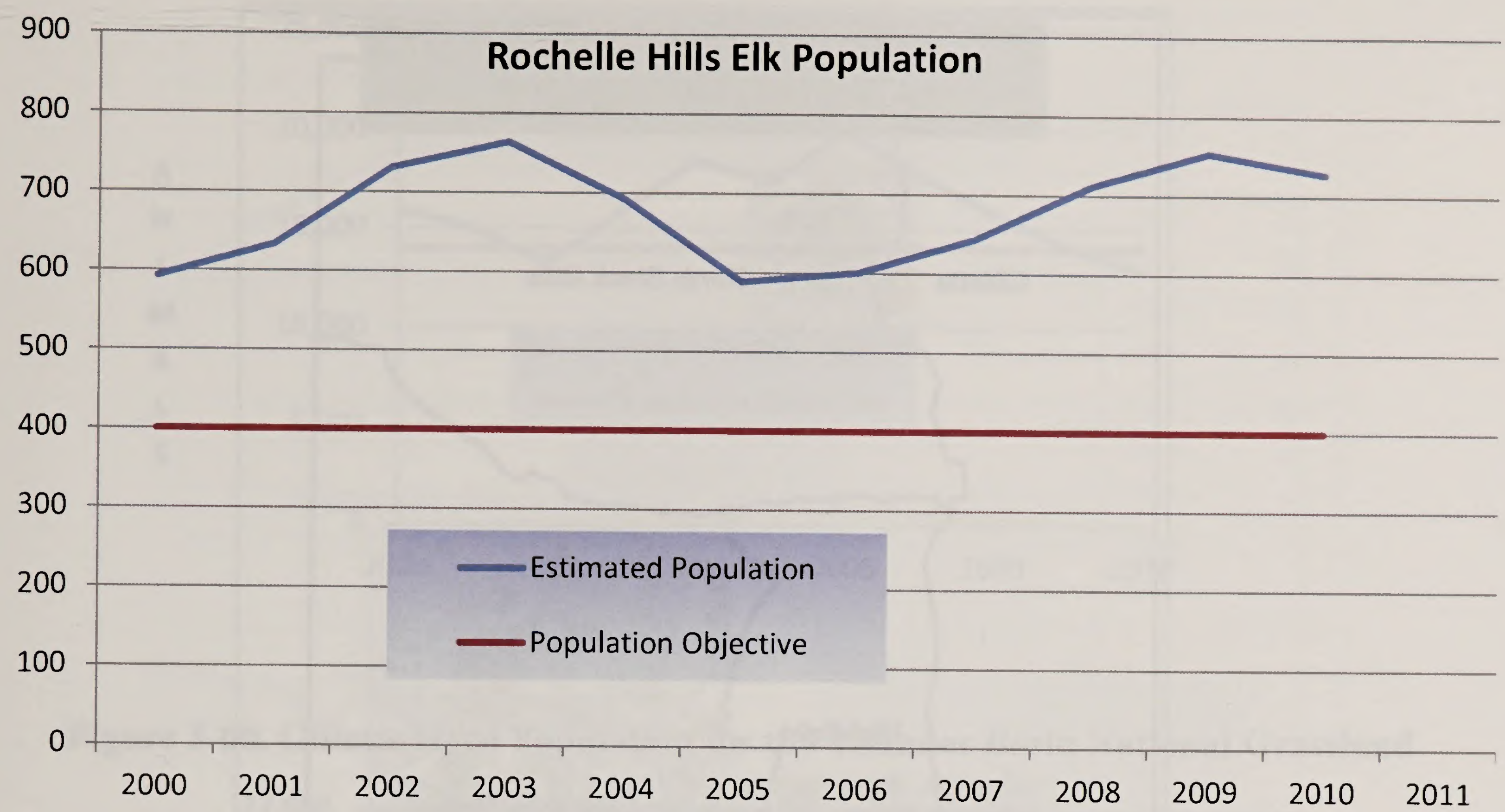


Figure 3-57. Pronghorn Antelope Herd Units for the Thunder Basin National Grassland

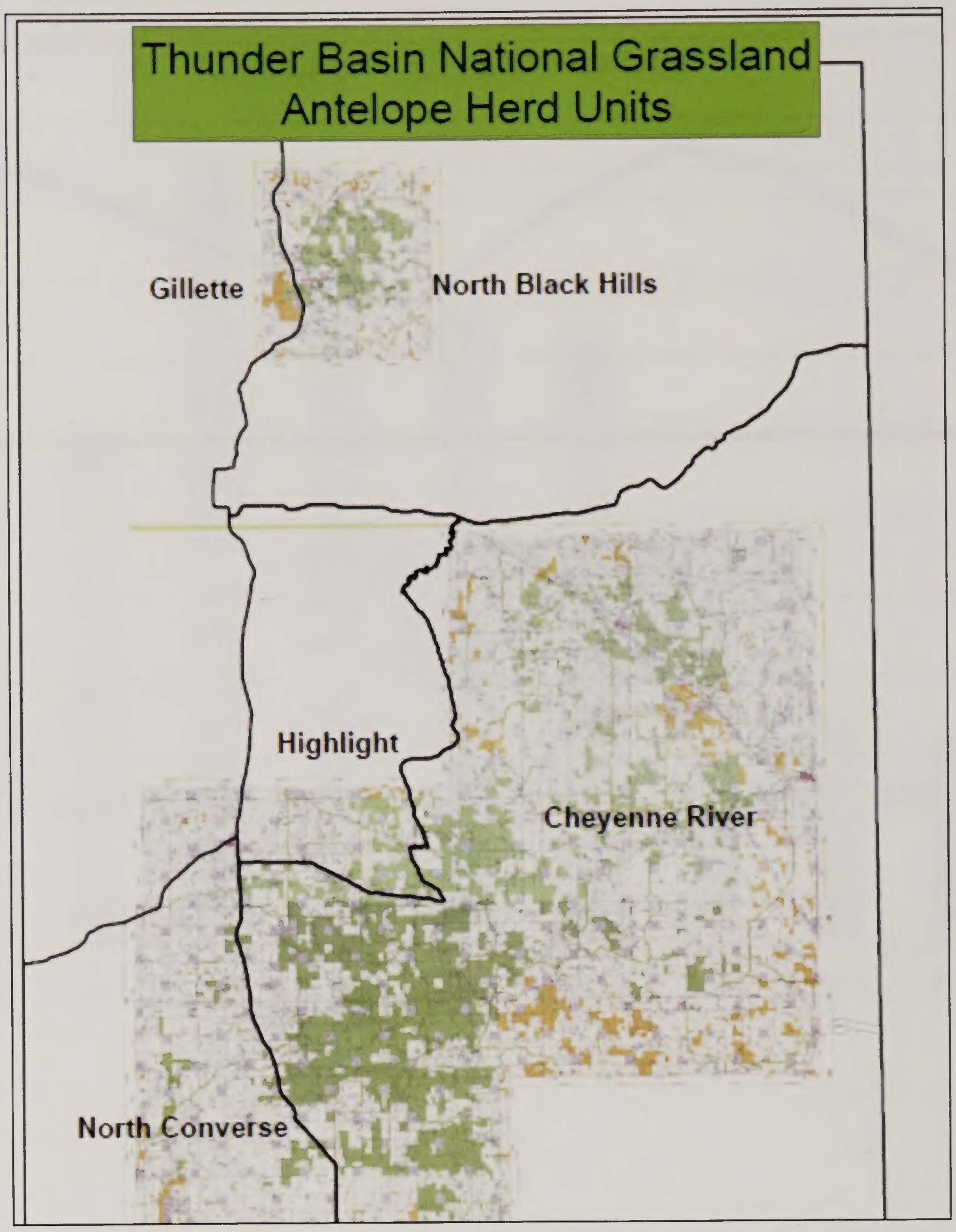


Figure 3-58. Highlight Herd Population for the Thunder Basin National Grassland

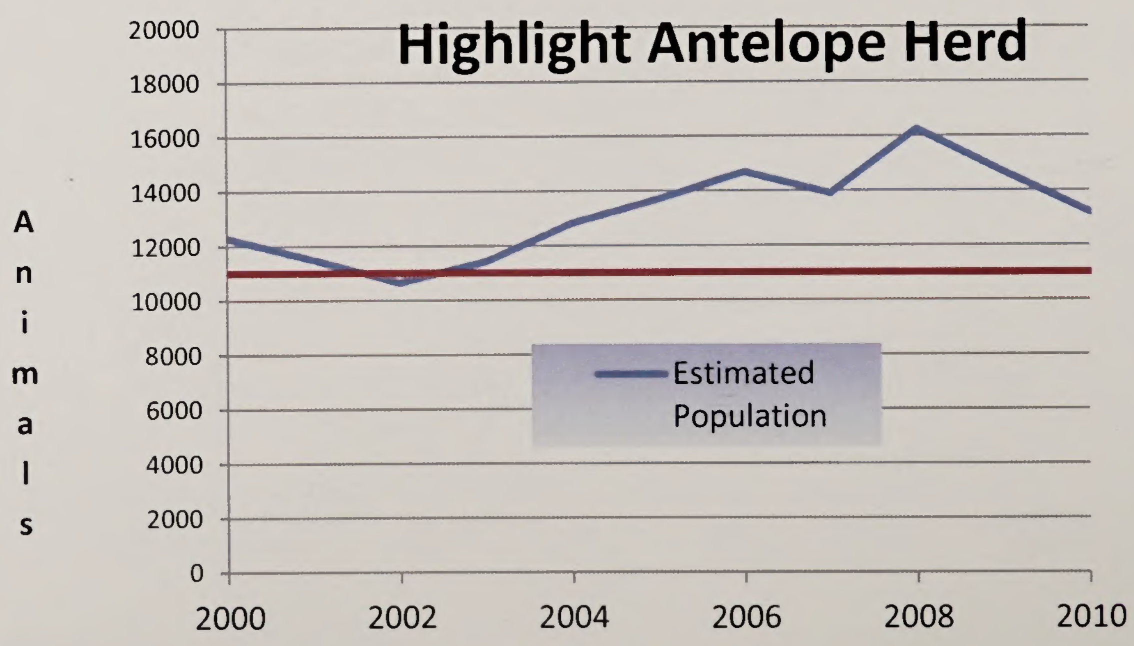


Figure 3-59. North Black Hills Population for the Thunder Basin National Grassland

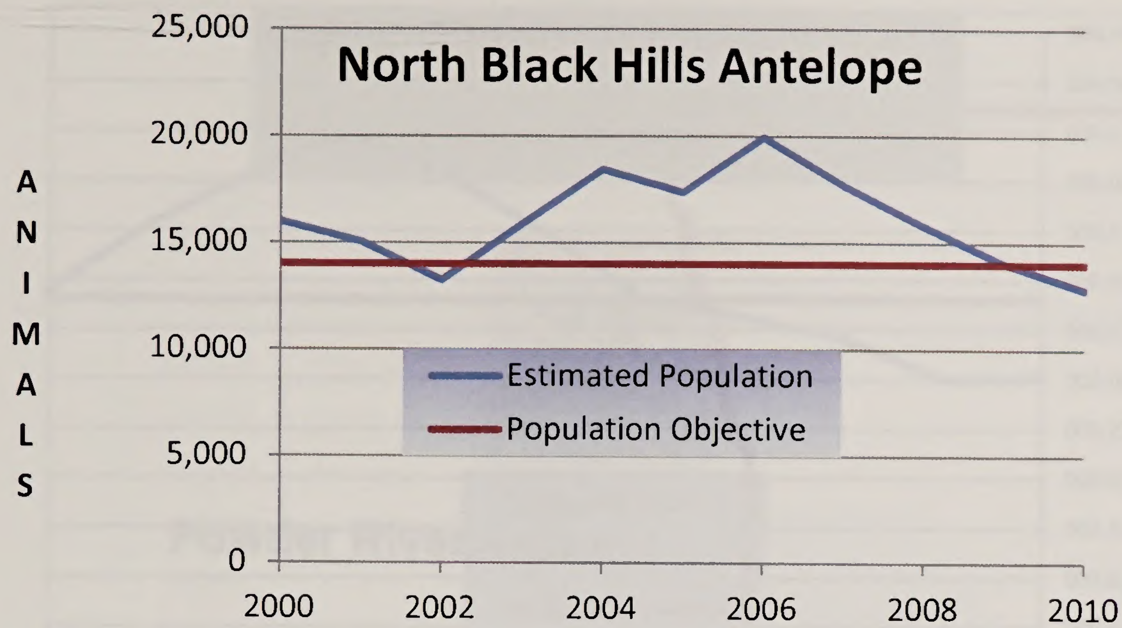


Figure 3-60. Gillette Herd Population for the Thunder Basin National Grassland

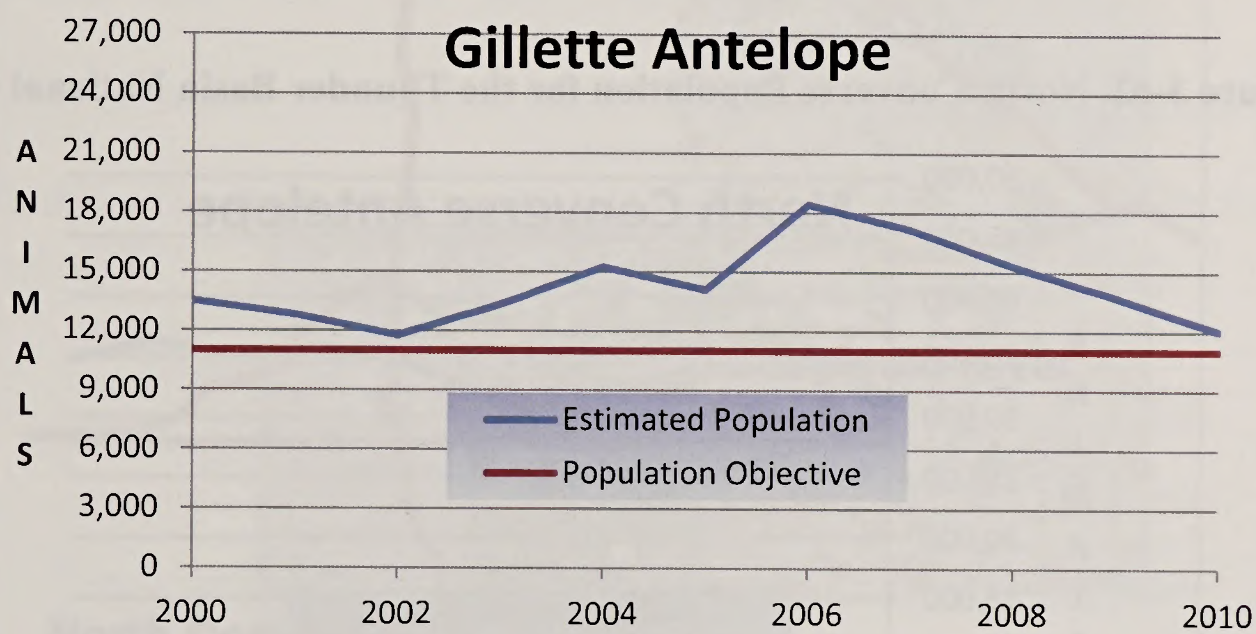


Figure 3-61. Cheyenne River Herd Population for the Thunder Basin National Grassland

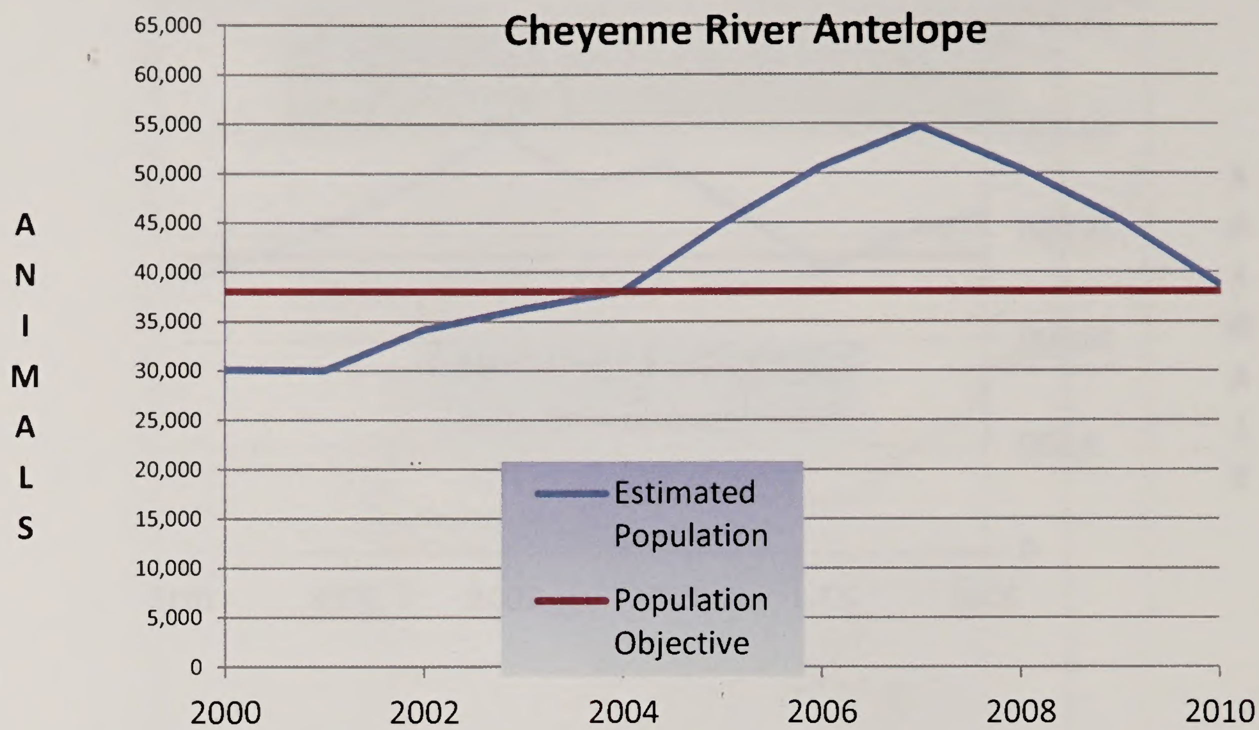


Figure 3-62. North Converse Population for the Thunder Basin National Grassland

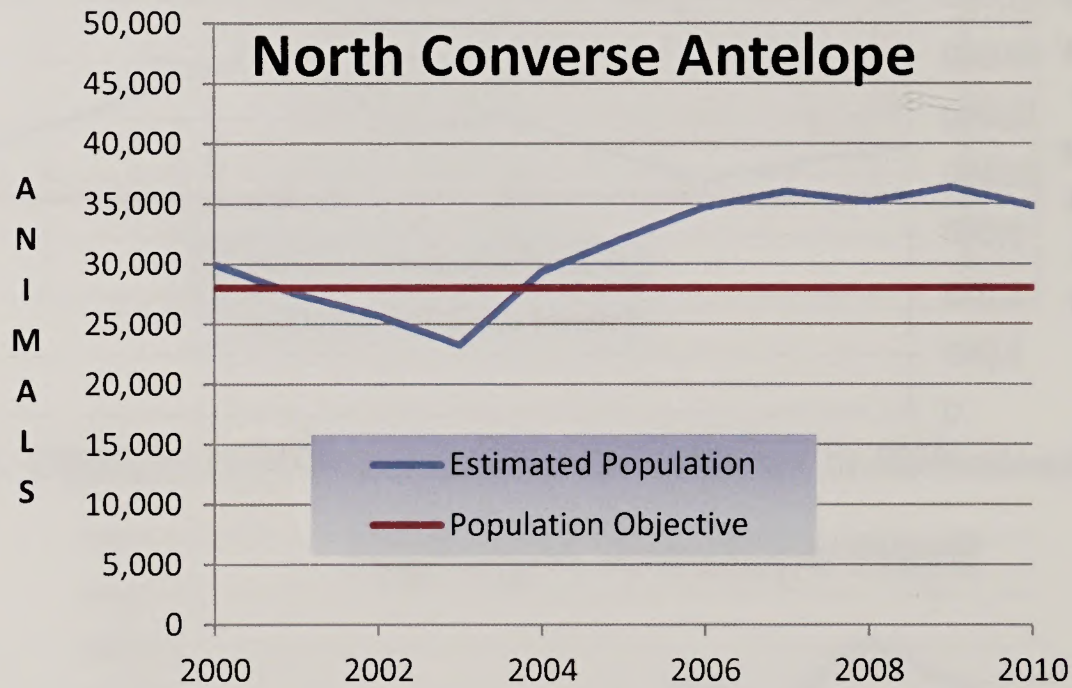


Figure 3-63. Mule Deer Herds for the Thunder Basin National Grassland

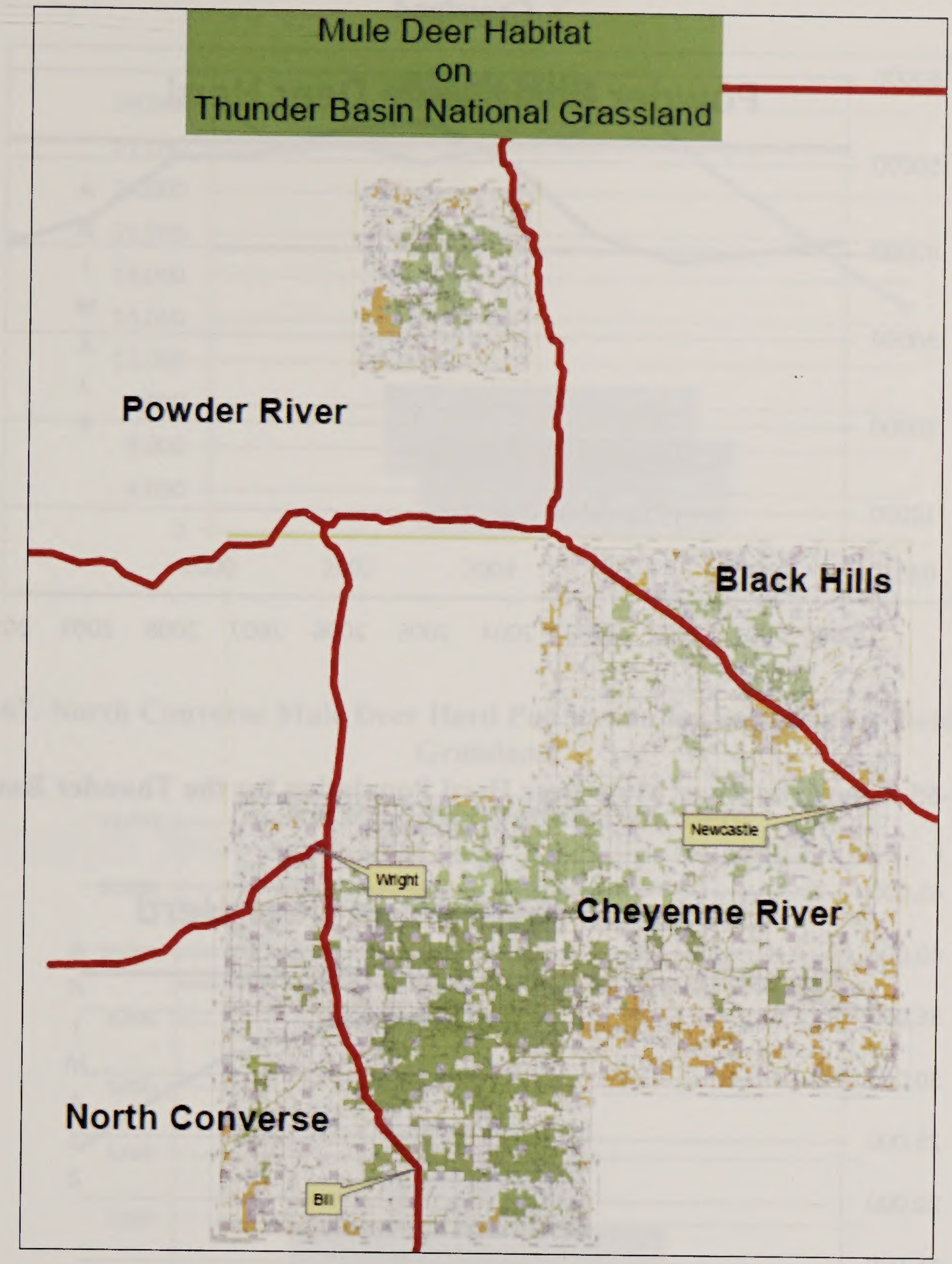


Figure 3-64. Powder River Mule Deer Herd Population for the Thunder Basin National Grassland

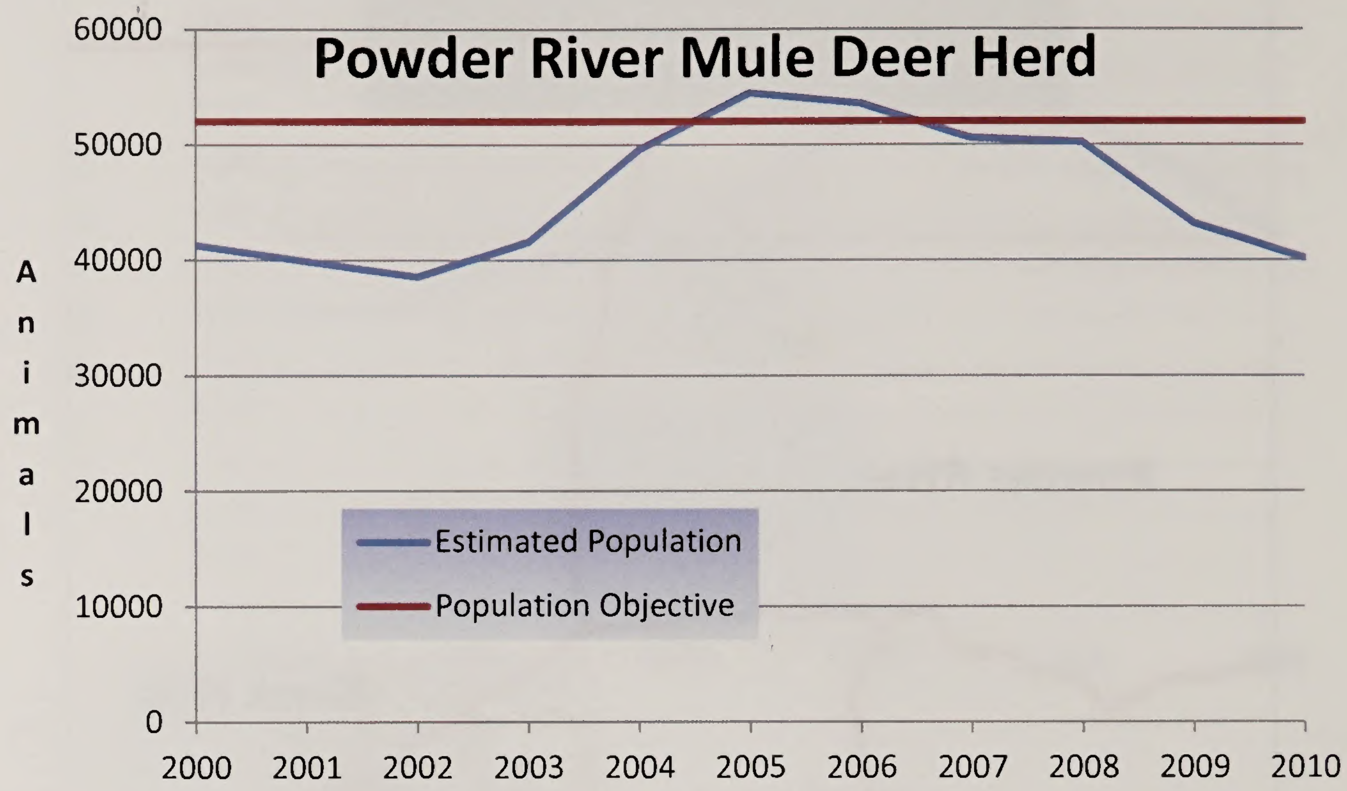


Figure 3-65. Cheyenne River Mule Deer Herd Population for the Thunder Basin National Grassland

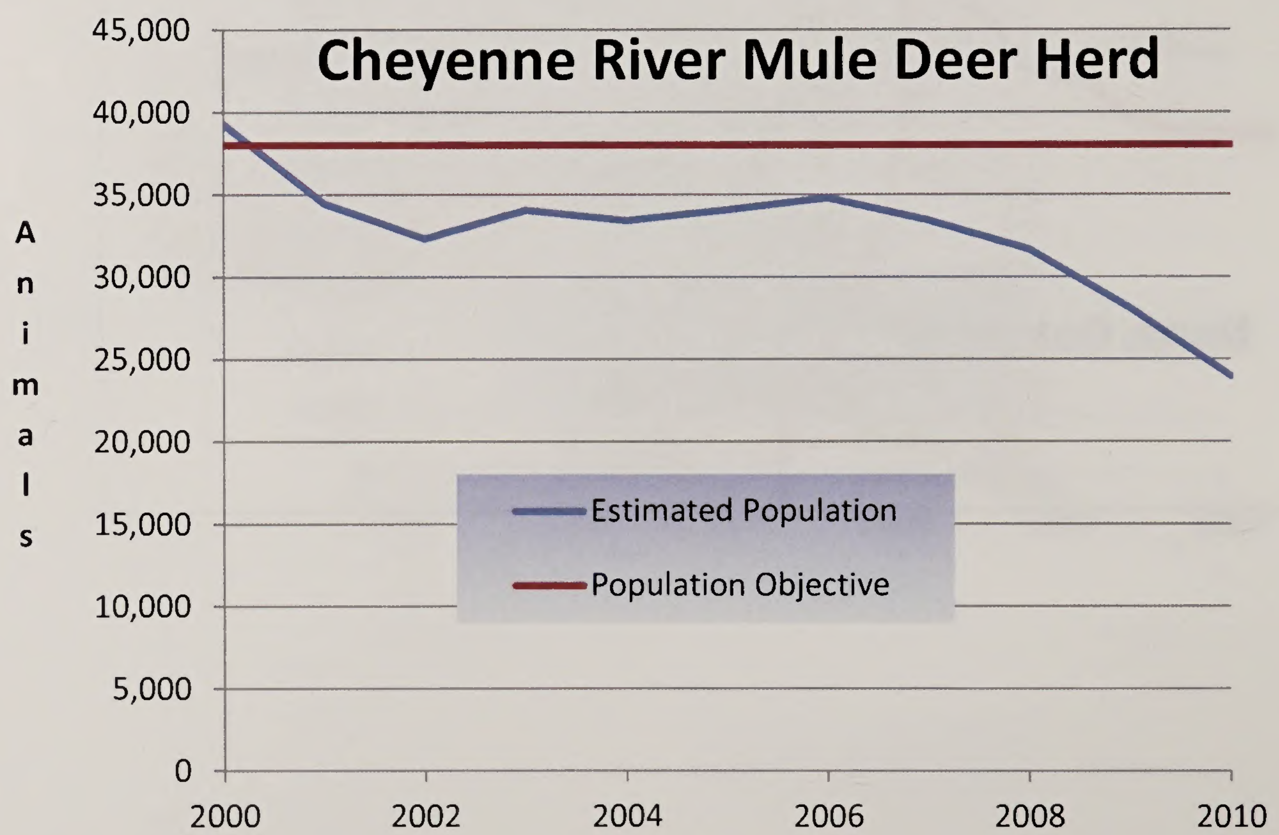


Figure 3-66. Black Hills Mule Deer Herd Population for the Thunder Basin National Grassland

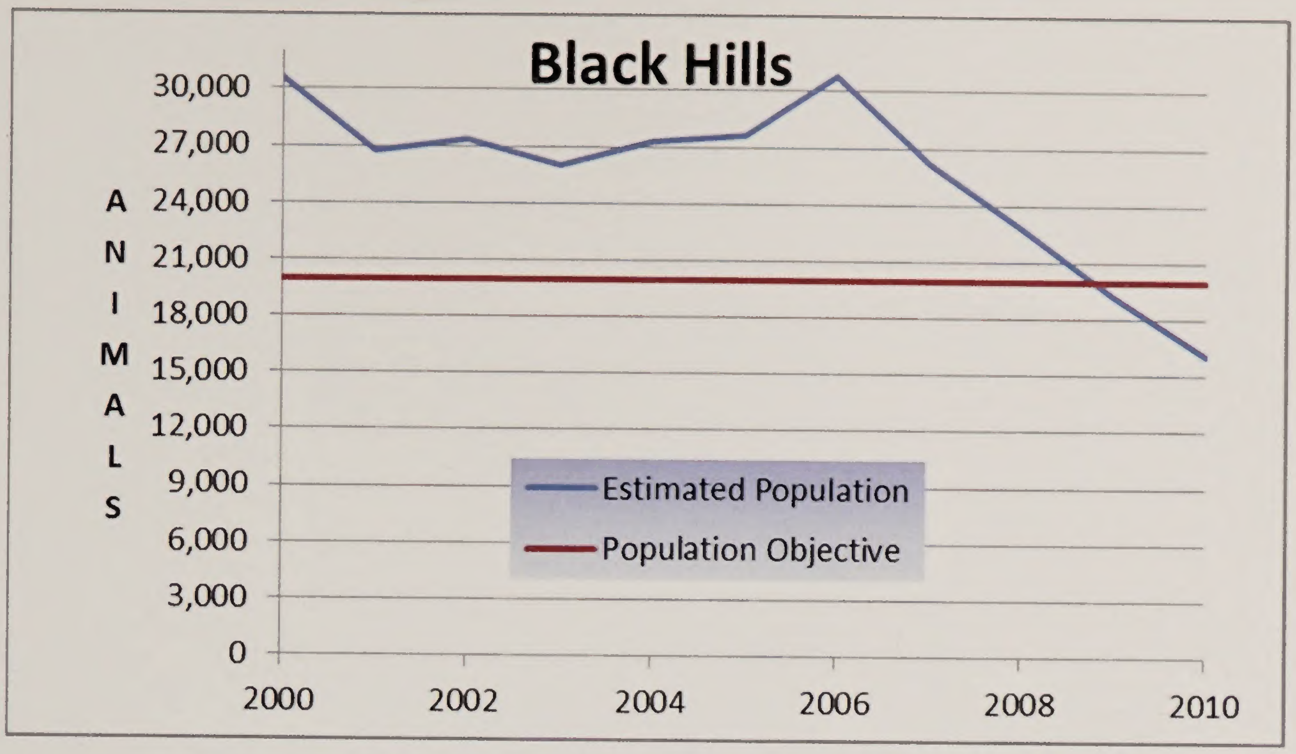
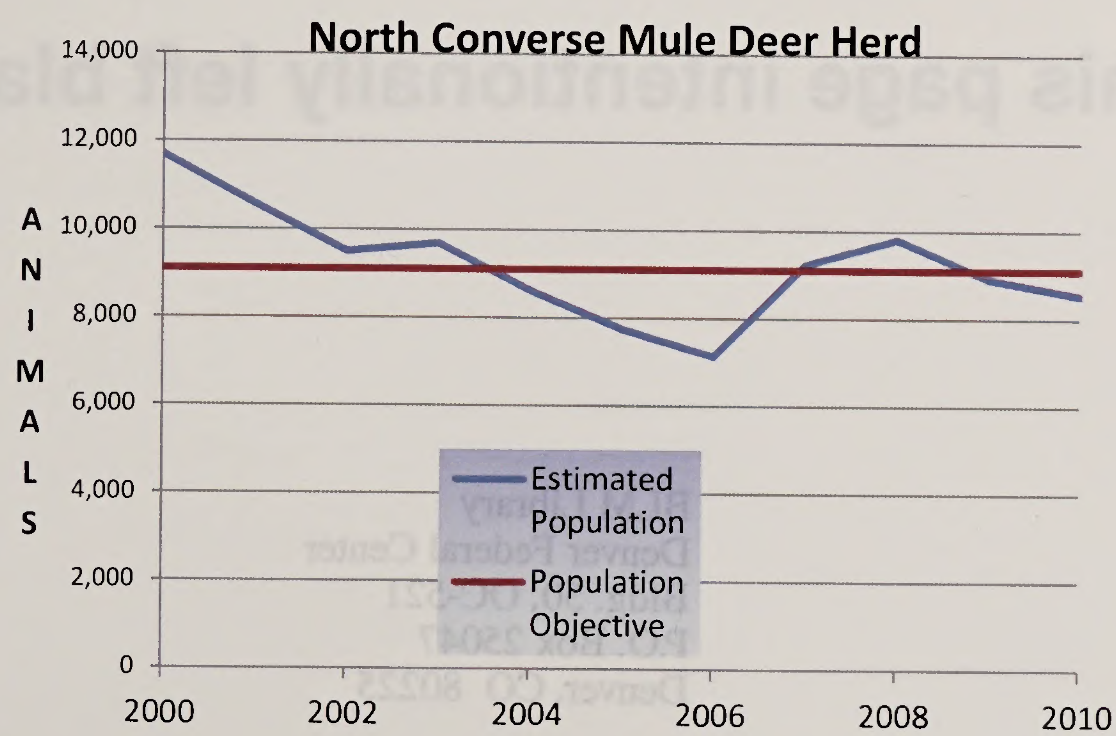


Figure 3-67. North Converse Mule Deer Herd Population for the Thunder Basin National Grassland



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