3.0 Affected Environment

This chapter describes the affected environment for the Application Area, including conditions and trends of the human and natural environment that potentially could be impacted by the alternatives described in Chapter 2.0. The CEQ regulations discuss “human environment” in 40 CFR 1508.14: the term broadly relates to biological, physical, social, and economic elements of the environment. The description of the affected environment is defined and limited by the identified issues brought forward by the public and the BLM. As appropriate, ranges and trends for individual resources have been provided in the following resource sections, taking into account change factors such as development and climate change. Within the description of resources, the term “Application Area” refers to the area, encompassing 222,689 acres, specified in the applicant’s Wind Site Testing and Monitoring Application and Application Areas for ROWs of ancillary facilities filed with the BLM (shown in **Figure 1-2**).

The CEQ regulations require the BLM to obtain information when preparing NEPA documents if it is “relevant to reasonably foreseeable significant adverse impacts,” if it is “essential to a reasoned choice among alternatives,” and if “the overall cost of obtaining it is not exorbitant” (40 CFR 1502.22). The majority of the data that are used to characterize the affected environment were collected from the RFO of the BLM, USEPA, USFWS, U.S. Geologic Survey (USGS), National Resources Conservation Service (NRCS), WGFD, Wyoming Department of Environmental Quality (WDEQ), and other county and local agencies. The data include published and unpublished reports, maps, and data in digital format. In addition, field surveys for wildlife, special status species, soils, vegetation verification, recreation, and visual resources were conducted by AECOM and subcontractors specifically for this project.

3.1 Air and Atmospheric Values

3.1.1 Air Quality

The federal CAA amendments of the 1990s require all states to control air pollution emission sources so that National Ambient Air Quality Standards (NAAQS) are met and maintained. Air quality within the Application Area has the potential to be affected by such activities as emissions from the construction of facilities, access roads, and maintenance and management of installed equipment. This section describes the existing air quality resource of the region and the applicable air regulations that would apply to the proposed project.

Air quality in a given location is defined by pollutant concentrations in the atmosphere and is generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). One measure of a pollutant is its concentration in comparison to a national and/or state ambient air quality standard. The NAAQS are established by the USEPA and are outlined in 40 CFR 50. These standards represent the maximum allowable atmospheric concentrations that may occur without jeopardizing public health and welfare, and include a reasonable margin of safety to protect the more sensitive individuals in the population. The NAAQS represent maximum acceptable concentrations that generally may not be exceeded more than once per year, except the annual standards, which may never be exceeded. An area that does not meet the NAAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. The State of Wyoming has adopted the NAAQS as state air quality standards and has additional Ambient Air Quality Standards for other pollutants that are more applicable to oil and gas projects; these standards are not included in this document as they would not pertain to this project. The Application Area is considered to be in attainment; that is, the air quality is within the NAAQS.

Pollutants emitted during construction and operation of a wind energy project include particulates (fugitive dust), as well as nitrogen dioxide (NO_2), carbon monoxide (CO), and sulfur dioxide (SO_2) from roadways, batch plants, construction activities and engines powering construction equipment and other mobile sources. Fugitive volatile organic compounds (VOCs) emissions are relatively small compared to other potential pollutants. These same pollutants, as well as others, are emitted by industrial facilities in the region including refineries, natural gas pipelines, compressor stations, mines, and sawmill operations. Fugitive VOCs also are emitted by exploration and production of oil and natural gas in the region. The pollutants of interest for the proposed project are listed in **Table 3.1-1** below.

Table 3.1-1 National and State Ambient Air Quality Standards

		Wyoming Standards	National Standards	
Pollutant	**Averaging Time**	**Concentration**	**Primary**	**Secondary**
Ozone	8-hour[1]	0.08 ppm	0.08 ppm	0.08 ppm
CO	1-hour	35 ppm	35 ppm	35 ppm
	8-hour	9 ppm	9 ppm	9 ppm
SO_2	1-hour[2]	None	196 $\mu g/m^3$	None
	3-hour	1,300 $\mu g/m^3$	None	1,300 $\mu g/m^3$
	24-hour	365 $\mu g/m^3$	365 $\mu g/m^3$	None
	Annual Average	80 $\mu g/m^3$	80 $\mu g/m^3$	None
NO_2	Annual Average	100 $\mu g/m^3$	100 $\mu g/m^3$	100 $\mu g/m^3$
	1-hour[3]	None	188 $\mu g/m^3$	None

Table 3.1-1 National and State Ambient Air Quality Standards

		Wyoming Standards	National Standards	
Pollutant	**Averaging Time**	**Concentration**	**Primary**	**Secondary**
PM_{10}	24-hour[4]	150 μg/m^3	150 μg/m^3	150 μg/m^3
PM_{10}	Annual Average	50 μg/m^3	None	None
$PM_{2.5}$	24-hour	35 μg/m^3	35 μg/m^3	35 μg/m^3
$PM_{2.5}$	Annual Average	15 μg/m^3	15 μg/m^3	15 μg/m^3

[1] 3-year average of the fourth highest (98 percentile) daily 8-hour maximum.

[2] 3-year average of the 99th percentile of the highest daily 1-hour maximum.

[3] 3-year average of the 98th percentile of the highest daily 1-hour maximum.

[4] 3-year average of the 98th percentile of the highest daily average concentration.

Other state-only standards are not cited.

3.1.1.1 NAAQS

The criteria for potential air quality impacts include NAAQS requirements for CO, particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), SO_2, and NO_2/nitrogen oxides (NO_X). Applicable federal and state standards are presented in **Table 3.1-1**.

Other industrial, commercial, or government facilities in the general area also may be sources of air pollutants. For the latest year available (2002) on the USEPA Airdata website, the larger industrial sources of emissions of criteria pollutants in Carbon County are provided in **Tables 3.1-2** through **3.1-6**. The numerous small sources in the county are not included in these tables (the totals in the table do not add to 100 percent).

VOCs are not in themselves considered a criteria air pollutant. VOCs are largely responsible for the formation of ground level ozone; therefore, VOCs are reported in emissions inventories.

3.1.1.2 Air Quality Measurements

<u>NO_2</u>

Several ambient air quality stations are operated in Wyoming by the State of Wyoming or other operators; however, there are few data collection sites that measure ambient air quality in the vicinity of the Application Area in Carbon County. The highest measured 1-hour value of NO_2 in Carbon County at a site near the Atlantic Rim was 13 parts per billion (ppb) in 2007 and 14 ppb in 2008. The annual average at Atlantic Rim was 2 ppb in 2008. These annual and 1-hour values are well below the allowable annual average NAAQS of 53 ppb (USEPA 2009b).

An ambient air quality site near the town of Wamsutter in Sweetwater County is used to track meteorology and air quality downwind of an area of extensive natural gas development. The Wamsutter Station includes gaseous (NO_X, SO_2, and ozone), continuous particulate ($PM_{10,}$ tapered element oscillating microbalance, and meteorological monitoring. This station began operations on March 13, 2006. The Wamsutter site is generally upwind of the Application Area and provides a conservative representation of regional air quality. The highest annual average NO_2 measurements at Wamsutter were 7 ppb in both 2006 and 2007 (WDEQ 2008).

Table 3.1-2 Sources of NO_2

NO_2 Sources	2002 Emissions (tons per year [tpy])	Portion of Total Emissions in Carbon County (percent)
Sinclair Oil Corp-Sinclair Refinery	1,207	49.52
Colorado Interstate Gas (CIG) Rawlins Compressor	794	32.56
Williams Field Services - Echo Springs	193	7.91
CIG Muddy Gap Comp	113	4.63

Table 3.1-3 Sources of SO_2

SO_2 Sources	2002 Emissions (tpy)	Portion of Total Emissions in Carbon County (percent)
Sinclair Oil Corp - Sinclair Refinery	3,256	99.97
Louisiana Pacific Saratoga Mill	0.89	0.03
44 Lumber and Timber	0.15	<0.01

Table 3.1-4 Sources of PM_{10}

PM_{10} Source	2002 Emissions (tpy)	Portion of Total Emissions in Carbon County (percent)
Arch of Wyoming Medicine Bow Mine	130	37.27
Sinclair Oil Corp - Sinclair Refinery	104	29.85
Arch of Wyoming Seminoe - II Mine	45.7	13.13
Louisiana Pacific Saratoga Mill	44.7	12.85

Table 3.1-5 Sources of $PM_{2.5}$

$PM_{2.5}$ Sources	2002 Emissions (tpy)	Portion of Total Emissions in Carbon County (percent)
Sinclair Oil Corp - Sinclair Refinery	71.4	39.65
Arch of Wyoming Medicine Bow Mine	45.3	25.16
Louisiana Pacific Saratoga Mill	39	21.66
Arch Of Wyoming Seminoe Mine	16.0	8.86

Table 3.1-6 Sources of VOC

VOC Sources	2002 Emissions (tpy)	Portion of Total Emissions in Carbon County (percent)
Sinclair Oil Corp - Sinclair Refinery	1,762	80.94
Williams Field Services - Echo Springs	133	6.11
Sinclair Oil Corp-Bairoil Station	82.6	3.79
Louisiana Pacific Saratoga Mill	63.6	2.92
CIG Rawlins Compressor	57.8	2.66

PM_{10}

Two exceedences of PM_{10} occurred at the Wamsutter monitor in 2007. The first occurred on March 27, 2007, with a concentration of 227 µg/m^3, and the second occurred on April 18, 2007, with a concentration of 199 µg/m^3. During the spring of 2007, a pipeline was being constructed less than 1 mile south of the Wamsutter station. On both days, strong winds occurred, blowing dust from the pipeline construction site northeast to the Wamsutter station (WDEQ 2008).

SO_2

WDEQ, Air Quality Division, has not reported any exceedences of the 3-hour, 24-hour, or annual SO_2 standards at the two monitoring sites near the Application Area (Murphy Ridge, near the Wyoming/Utah border, and Wamsutter). One year of data were collected at the sites in 2007. The measured values for Wamsutter are 0.010, 0.002, and 0.001 ppm for the 3-hour, 24-hour, and annual averages respectively (WDEQ 2008).

$PM_{2.5}$

There are six state-run monitoring sites that collect $PM_{2.5}$ data along with the four monitors in the Powder River Basin $PM_{2.5}$ network. None of the monitors are in the vicinity of the Application Area, and none of the monitors indicate concerns within the state of Wyoming with meeting the annual or 24-hour $PM_{2.5}$ NAAQS (WDEQ 2008).

3.1.2 Visibility

Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what can be seen. Regional haze regulations were developed to maintain visibility on the least impaired days, and improve visibility on the most impaired days in mandatory federal Class I areas across the U.S. are defined as certain national wilderness areas (greater than 5,000 acres), national memorial parks (greater than 5,000 acres), and national parks (greater than 6,000 acres) that were in existence as of August 1977, and are afforded the highest level of protection. Ambient air criteria that apply within Class I areas are more stringent than those that apply to other areas (i.e., Class II areas). In addition to more stringent ambient air increments, Class I areas also are protected by the regulation of air quality related values (AQRVs) which include visibility, within their borders. Federal land managers are responsible for the management of Class I areas.

Mandatory Class I areas within 300 km of the project include Rocky Mountain National Park, Rawah Wilderness Area, Mount Zirkel Wilderness Area, Flat Tops Wilderness Area, and Eagles Nest Wilderness Area, all in Colorado, as well as Bridger and Fitzpatrick Wilderness areas in Wyoming.

Interagency Monitoring of Protected Visual Environments (IMPROVE) has measured visibility in national parks and wilderness areas in the United States since the 1980s. Visibility can be expressed in terms of deciviews (dv), a measure for describing perceived changes in visibility. One dv is defined as a change in visibility that is just perceptible to an average person, representing an estimate of 10 percent 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 percent clearest – mean visibility for the 20 percent of days with the best visibility;
- Average – the annual mean visibility ; and
- 20 percent haziest – mean visibility for the 20 percent of days with the poorest visibility.

In Rocky Mountain National Park, visibility on the 20 percent clearest days varies from 4 to 6 dv (visual range of about 150 to 173 miles). Average visibility varies from 8 to 10 dv (about 112 to 126 miles). Visibility for the 20 percent haziest days varies from 12 to 14 dv (about 71 to 88 miles). Trend analysis of Rocky Mountain National Park visibility data reveals no significant worsening of visibility from 1995 through 2004. Also, for comparison, **Figure 3.1-1** provides the reconstructed fine mass data (data values) for Rocky Mountain National Park from 2007 through mid-2009. Similar to the visibility data, no upward trend is evident in these data. Fine particulate matter consists of particles with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). Fine particles are responsible for most atmospheric particle-induced extinction.

Visibility data for an IMPROVE visibility monitoring station near Centennial, Wyoming (Brooklyn Lake) indicates that the visibility on the 20 percent clearest days is 3.2 dv (visual range 178 miles). Average visibility (normal day) is 7.3 dv or 117 miles visual range. On the 20 percent haziest days, the visibility is11 dv, or roughly 81 miles visual range.

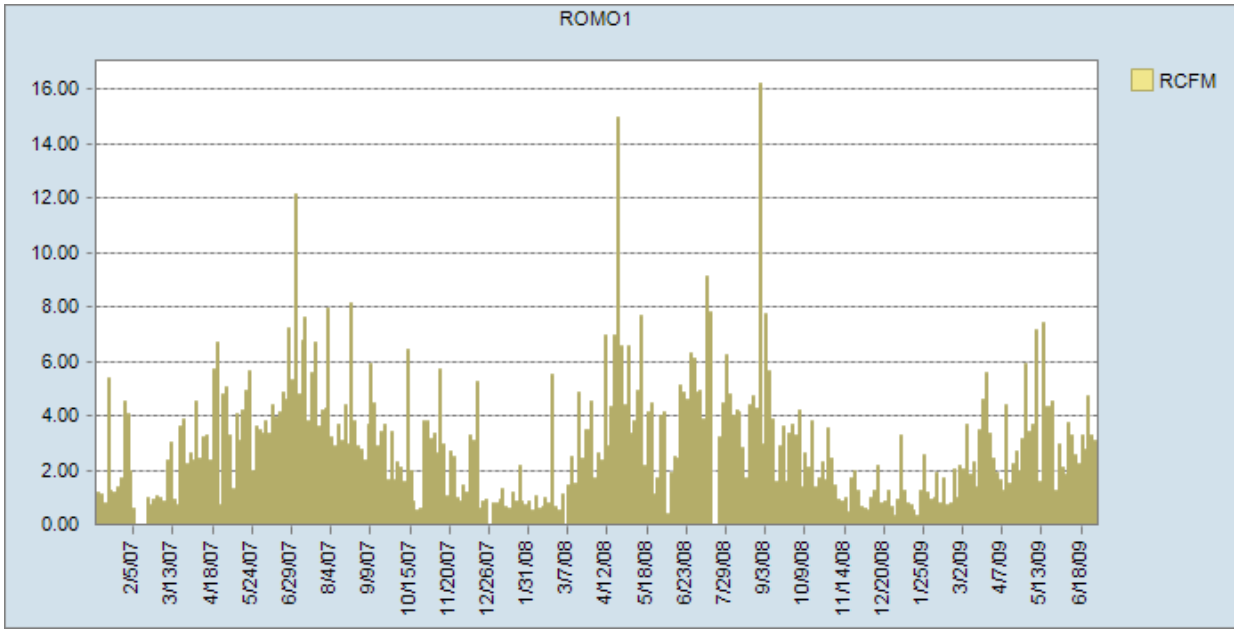
These data indicate that visibility near Centennial is in the range of visibility measured over the last 10 years at Rocky Mountain National Park. Visibility data from the long-term study (Wyoming 2003) suggest that visibility is comparable to other sites around Wyoming.

3.1.3 Climate and Meteorology

The climate of the Application Area is classified as desert and semiarid steppe (BLM 2009; Trewartha and Horn 1980) with cold winters and hot summers. Annual precipitation (rainfall and snowfall) in the region ranges from 8 to 10 inches. A climate summary for Rawlins is presented in **Table 3.1-7**.

Steppe climate is characterized by a large seasonal range in temperature (cold winters and warm summers) and by precipitation levels that are low but still sufficient for the growth of short sparse grass. The dryness of the mid-latitude steppe climate of southeast Wyoming is due to the area's distance from the Pacific Ocean, the main source of precipitation for storms in the western portion of the RFO. This aridity is intensified by the Sierra Nevada, Pacific Coast, and Rocky Mountain Ranges, which intercept the flow of humid coastal air. In addition, annual rainfall amounts can vary greatly from year to year.

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, wind (speed and direction), and stability. Mixing height is the height above ground within which rising warm air from the surface will mix by convection and turbulence. Local atmospheric conditions, terrain configuration, and source location determine dilution of pollutants in this mixed layer. Mixing heights vary diurnally, with the passage of weather systems, and with season. Temperature inversions, where air temperatures near the ground are colder than the temperatures above, are common in the basins and other lower elevations of the region. Inversions commonly occur in winter when snow accumulation on the ground combines with short daylight hours. In summer, inversions dissipate rapidly



Source: http://views.cira.colostate.edu/web/DataWizard/.

Figure 3.1-1 Trend Analysis of Rocky Mountain National Park Reconstructed Fine Mass Data

Table 3.1-7 Rawlins, Wyoming, Period of Record Monthly Climate Summary

Period of Record: 3/ 6/1951 to 5/31/2008													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (degrees Fahrenheit [°F])	30.8	33.8	41.3	52.6	63.9	75.4	83.8	81.1	70.5	57.0	40.7	32.0	55.2
Average Min. Temperature (°F)	12.6	14.7	20.4	27.6	36.3	44.6	51.5	50.0	40.8	31.2	20.4	14.0	30.3
Average Total Precipitation (inches)	0.45	0.50	0.69	1.01	1.30	0.90	0.76	0.76	0.84	0.81	0.55	0.46	9.03
Average Total Snowfall (inches)	7.9	7.5	7.8	7.1	1.6	0.2	0.0	0.0	1.2	3.4	7.7	7.5	51.9
Average Snow Depth (inches)	2	2	1	0	0	0	0	0	0	0	1	1	1

Source: Western Regional Climate Center 2009.

when early morning sunlight warms the air near the ground surface. Inversions can hinder air pollutant dispersion by preventing emissions from mixing with the ambient air in the vertical direction. On average, mean morning mixing heights in the area are approximately 1,000 feet; mean afternoon mixing heights are more than 7,800 feet (Holzworth 1972). Mean morning mixing heights tend to be lowest in fall, and highest in spring.

Morning atmospheric stability conditions tend to be stable because of the cooling of the layers of air nearest the ground. Afternoon conditions, especially during the warmer months, tend to be neutral to unstable because of the rapid heating of the surface under clear skies. During the winter, periods of stable afternoon conditions may persist for several days in the absence of synoptic (continental scale) storm systems to generate higher winds with more turbulence and mixing. A high frequency of inversions at lower elevations during the winter can be attributed to the nighttime cooling and sinking air flowing from higher elevations to the low lying areas in the basins. Although winter inversions are generally quite shallow, they tend to be more stable because of reduced surface heating.

The latitude of the Application Area is within the belt of prevailing westerly winds that circle the globe around the earth's northern hemisphere. However, the Application Area is located in complex terrain where the local winds are affected by topographic features.

Because of the typically dry atmosphere, bright sunny days and clear nights frequently occur. This in turn allows rapid heating of the ground surface during daylight hours and rapid cooling at night. Since heated air rises, and cooled air sinks, winds tend to blow uphill during the daytime and down slope at night. This upslope and down slope cycle generally occurs in all the geographical features, including mountain range slopes and river courses. The complexity of terrain features cause complex movements in the cyclic air patterns, with thin layers of moving air embedded within the larger scale motions. The lower level, thermally driven winds also are embedded within larger scale upper wind systems (synoptic winds). Synoptic winds in the region are predominantly west to east, are characterized by daily weather variations that enhance or diminish the boundary layer winds and are significantly channeled by regional and local topography.

Weather stations in the vicinity of the Application Area include stations located in Rawlins in Carbon County, and Wamsutter in Sweetwater County. Rawlins is located at an elevation of 6,736 feet and is north of the Application Area. Meteorological data available from the Rawlins weather station from 1951 through May 2008, as well as on-site data from the CCSM sites, form the basis of the climate and weather characterization below.

Air pollutant dispersion in the Application Area also is dependent on wind direction and speed. Although wind direction is highly influenced by the local terrain, on-site measurements indicate that the wind direction tends to be southwesterly, i.e. blowing from the southwest to northeast (PCW 2008a).

Wyoming is quite windy, and during the winter there are frequent periods when the wind reaches 30 to 40 mph with gusts to 50 or 60. Prevailing directions in the different localities vary from west-south-west through west to northwest. In many localities winds are so strong and constant from those directions that trees show a definite deformation towards the east or southeast (National Oceanic and Atmospheric Administration [NOAA] 1985).

Wind speeds within the CCSM sites are greater than those generally recorded for nearby Rawlins. Average wind speeds in the Chokecherry site are approximately 21 mph (9.5 m/s) and winds are predominantly from the southwest (PCW 2008a).

Average wind speeds in the Sierra Madre site are approximately 22 mph (9.9 m/s) and also are predominantly from the southwest. **Figure 3.1-2** shows the average monthly wind speeds recorded for the CCSM sites (PCW 2008a).

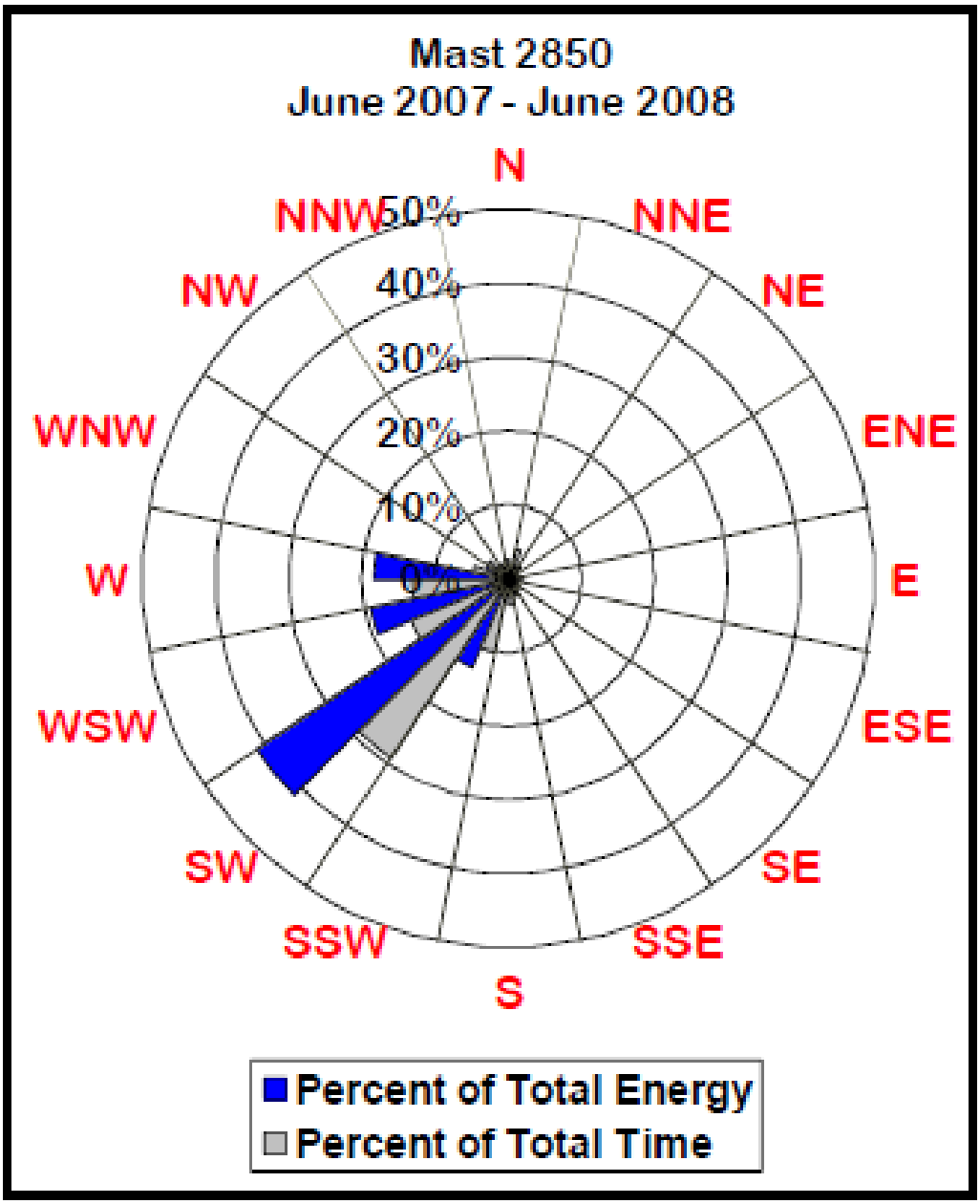


Figure 3.1-2 Windrose for the Application Area

3.1.4 Climate Change

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) GHG emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. GHGs include CO_2 and other pollutants, the emissions of which are based on CO_2-equivalents (CO_2e) due to each compound's effect on trapping infrared radiation. CO_2e is the concentration of CO_2 that would cause the same level of radiative forcing as a given type and concentration of GHG. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused $CO_2(e)$ concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change (IPCC) recently concluded that warming of the climate system is unequivocal and most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations (IPCC 2007).

Global mean surface temperatures have increased nearly 1.8°F from 1890 to 2006. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001, the IPCC projected that by the year 2100, global average surface temperatures could increase by 2.5 to 10.4°F above 1990 levels. The National Academy of Sciences (NAS [2010]) has confirmed these projections, but also has indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

As with any field of scientific study, there are uncertainties associated with the science of climate change; however, this does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and documents trends (USEPA 2010).

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially CO_2 and methane) from fossil fuel development; large wildfires; activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 may influence climate for 100 years. It may be difficult to discern whether climate change is already affecting global resources, as well as the Application Area. In most cases there is little information about potential or projected effects of global climate change on resources. It is important to note that projected changes are likely to occur over several decades to a century. Therefore, many of the projected changes associated with climate change may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models are global in nature; therefore, they are not at the appropriate scale to estimate potential impacts of climate change on a regional scale that represents the vicinity of the project.

3.2 Cultural Resources and Native American Concerns

3.2.1 Cultural Resources

Cultural resources are finite locations of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional, cultural, or religious importance to specified social and/or cultural groups. Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit.

3.2.1.1 Regulatory Framework

Federal historic preservation legislation provides a legal environment for documentation, evaluation, and protection of archaeological and historic sites that may be affected by federal undertakings, or by private undertakings operating under federal license or on publicly managed lands. NEPA states that federal agencies shall take into consideration impacts to the natural environment with respect to an array of disciplines, and that alternatives must be considered. The courts have made it clear that archaeological and historic sites (i.e., cultural resources) are regarded as part of the natural environment. The NHPA of 1966, as amended, established the Advisory Council on Historic Preservation (ACHP) and the National Register of Historic Places (NRHP). The NHPA mandates that federal agencies consider the effects of an undertaking on cultural resources that are listed or eligible for inclusion in the NRHP. Section 106 of the NHPA establishes a four-step review process by which cultural resources are given consideration during the conduct of federal undertakings. Cultural resources that are listed or eligible for inclusion in the NRHP are referred to as “historic properties.”

The BLM RFO currently is preparing a PA for the CCSM Wind Energy Project. The PA defines general and specific measures that would be undertaken by the BLM, Wyoming SHPO, and PCW to ensure that the BLM’s objectives and responsibilities regarding the protection of historic properties under the NHPA would be fulfilled. Specifically, the PA outlines the steps to be taken to: 1) identify prehistoric and historic sites; 2) evaluate them for eligibility for inclusion in the NRHP; 3) identify potential adverse effects; 4) develop measures to avoid, reduce, or mitigate adverse effects; and 5) address inadvertent discoveries. Additionally, the PA assigns roles and responsibilities for implementation of the PA, which ensures that all interested parties are given an opportunity to comment on the effects of an undertaking to historic properties and any mitigation for such effects. Additional information on BLM procedures for protecting historic properties is provided in **Appendix E**.

<u>Prehistoric Narrative</u>

The Application Area lies along a rough boundary zone between a plains-grasslands adaptation type and an interior basin adaptation type. The plains-grasslands adaptation type is epitomized by bison hunters of the prairies in the Northwestern Plains of eastern Wyoming and southern Montana. The interior basin adaptation type is typified by hunter-gatherers of the basins of southwestern Wyoming, who relied less on bison hunting and more on resources such as antelope, rabbits, and roots and seeds. One culture-historical classification scheme is used in the grasslands of the Northwestern Plains (Frison 1991), while another scheme has been developed for southwestern Wyoming (Metcalf 1987; Thompson and Pastor 1995). In a prehistoric context written for the BLM RFO RMP, McNees et al. (2010) have drawn from both schemes, in the process updating the sequences in light of recent data. Four major periods, defined by the Northwestern Plains scheme, provide the overall structure to the prehistoric sequence; in chronological order these periods are Paleoindian, Archaic, Late Prehistoric, and Protohistoric. The Archaic and Late Prehistoric periods are further divided internally into phases defined for the southwestern Wyoming sequence. Information in the following paragraphs is drawn from the four sources cited above.

The Paleoindian period (12,000 to 7500 B.P. [years before present]) is the earliest well-documented era of human occupation in Wyoming and is represented by groups that occupied North America at the end of the last glaciation. Paleoindians in the plains-grassland areas subsisted primarily on large game such as mammoths and bison (of which some species are now extinct) with only rare evidence of smaller game or plant food use. In the basin areas more balanced hunter-gatherer subsistence practices were followed, featuring exploitation of large as well as smaller mammals. Finer divisions within the Paleoindian period, termed complexes, are based largely on distinctions in projectile point styles. Prominent in the Paleoindian period are the early Clovis and Folsom complexes, characterized by fluted point styles, and numerous later manifestations such as Hell Gap, Cody, Lusk, and James Allen that feature a variety of unfluted and sometimes stemmed styles.

The temporal transition from the Paleoindian to the Archaic period (7500 to 1500 B.P.) is indistinct and may have begun by 8500 B.P. or earlier in southwestern Wyoming. The Archaic period is divided into an early stage (7500-3500 B.P.) and a late stage (3500-1800 B.P.), each of which is further partitioned into phases. Projectile points of the Early Archaic period tend to be large, corner- and side-notched forms similar to those found in the Great Plains. Climatic warming and drying in western North America ultimately led to the Altithermal episode, which was characterized by significantly elevated temperatures, reduced effective moisture, and a general desiccation of the landscape for a period of 2000 to 3000 years. Early Archaic groups responded by switching to an emphasis on smaller game animals and plant resources. Compared to the preceding Paleoindian period and subsequent periods, bison hunting appears to have formed a relatively minor portion of the subsistence base. Hunting activities emphasized small game such as rabbits and medium-size game like antelope and deer.

The Early Archaic is divided into the Great Divide phase (7500 to 6000 B.P.) and Opal phase (6000 to 3500 B.P.). The Great Divide phase is defined more by its lack of Paleoindian and later Archaic artifacts than any intrinsic characteristics. The projectile points of this phase consist of a variety of side-notched, stemmed, and lanceolate (leaf-shaped) varieties. Evidence of jackrabbits, cottontails, and ground squirrels is common at Great Divide phase sites. The lengthy Opal phase is marked by the appearance in the archaeological record of simple habitation structures such as basin houses and an increase in the occurrence of slab-lined hearths and storage pits. Stone tools include large corner-notched, side-notched, stemmed, and lanceolate projectile points and large side-notched knives. Seeds are more common than in the preceding Great divide phase, as are ground stone implements. The remains of small game animals are common at Opal phase sites.

The transition to the Late Archaic is marked by a shift to the exploitation of larger game animals, particularly bison, as climatic conditions became somewhat cooler and wetter and grazing conditions improved. Projectile point styles during this period include a greater percentage of large corner-notched dart points, often called Elko or Pelican Lake. The Late Archaic is divided into the Pine Springs phase (3500 to 2800 B.P.) and Deadman Wash phase (2800 to 1800 B.P.). During the Pine Springs phase larger mammals like deer, elk, antelope, mountain sheep, and bison were exploited in greater quantities with a corresponding decline in the use of smaller game. The Deadman Wash phase corresponds with maximum neoglacial conditions, during which time the climate was relatively wet. Large game animals became increasingly important during the Deadman Wash phase, and plant remains are increasingly common at sites, suggesting the beginnings of an emphasis on seed processing that characterizes the following Late Prehistoric period. The projectile points are triangular corner-notched types that resemble Pelican Lake points common to areas further east.

The transition from the Archaic to the Late Prehistoric period (1800 to 250 B.P.) is marked by the development of pottery and the introduction of the bow and arrow. The Late Prehistoric period is divided into the Uinta and Firehole phases. The Uinta phase covers the span from 1800 B.P. to 650 B.P. and is represented by large numbers of sites occupying a broad range of ecological zones. Projectile point size is reduced significantly due to the shift to archery, with a predominance of Rose Spring points. The ceramics found at these sites are generally crude and include both locally-manufactured and imported

wares. Basin houses are a common trait, as are abundant hearths. The Firehole phase (650 to 250 B.P.) is of short duration and ends with the introduction of European trade goods and traders into the region. This phase also demonstrates a continuation of the increased exploitation of plant foods seen in the Deadman Wash phase and the use of crude structures. Desert side-notched, Cottonwood triangular, and tri-notched points are predominant during the Firehole phase; the tri-notched forms are thought to indicate the presence of Shoshoneans.

The Protohistoric period dates from approximately 250 B.P. (1700 A.D.) until the full development of the fur trade in the 1840s. The easiest way to differentiate the Protohistoric period from the preceding Firehole phase is through the presence or absence in the archaeological record of European trade goods. One of the most important changes in this period was the acquisition of the horse in the early eighteenth century. The horse greatly increased the mobility and range of the Shoshonean groups whose aboriginal territory encompasses the Application Area. Other tribal groups such as the Crow and Ute occasionally would venture into Shoshone territory to hunt or raid. Artifact assemblages from this period are often quite diverse with a mix of stone and metal projectile points, knives, copper trade goods, and glass beads.

Historic Narrative

The early exploration of southern Wyoming was undertaken informally by fur traders and trappers, particularly after the mid-1820s (Zier et al. 1983; Mueller and Zier 2006). Scientific mapping and description of the area began in the early 1840s with the expeditions of John C. Fremont. In 1841 the first emigrants crossed Wyoming, creating the Oregon Trail. The use of the trail increased through the 1840s and 1850s, declined during the Civil War and dropped dramatically with the completion of the transcontinental railroad in the late 1860s (Zier et al. 1983). The Overland Trail route, which acted as a more southerly transcontinental route than the Oregon Trail, was explored by Fremont in the early 1840s and the Stansbury expedition in 1849 (Goetzmann 1959). This route tied into the main Oregon Trail system at Fort Bridger in southwestern Wyoming, first traversing southern Wyoming by passing north of the Medicine Bow and Sierra Madre Mountains and then crossing the Red Desert. The Overland Trail was used mainly for freight and mail hauling. This route witnessed significant emigrant activity in the mid-1860s due to hostile Indian activity along the Oregon Trail.

The Pacific Railway Acts of 1862 and 1864 authorized land grants to encourage the construction of the transcontinental railroad. In southern Wyoming, the UPRR generally followed the route of the Overland Trail. Track crews entered the state east of Cheyenne in late 1867, and construction passed through the southwestern corner of the state in 1869. The UPRR rapidly rendered the Oregon and Overland Trails obsolete. By 1901, the original UPRR grade was abandoned, the tracks and ties were removed, and the railroad was realigned and rebuilt. Much of the original grade has been impacted by pipelines, roads, and other developments over time (as well as by the Lincoln Highway and the modern UPRR).

Coal mining began in southwestern Wyoming in 1867 and the first mines were operated by the UPRR. Railroad construction and coal mining brought a diverse selection of ethnic groups to the area, including people of Celtic, Mediterranean, Chinese and Slavic origins. The logging industry also owes its origins to the UPRR as so-called “tie hacks” were deployed to the timbered portions of the state to produce millions of railroad ties, many of which were floated down rivers such as the North Platte and Green to the railroad crossing points. Tie hacks began working in the region in the 1860s and endured into the 1930s. Timber harvesting began shortly after the turn of the twentieth century with the establishment of the Medicine Bow National Forest and continues to the present day (McNees et al. 2010).

Gold mining and exploration in the Medicine Bow Mountains of Albany and Carbon counties occurred from 1868 through the late 1920s. However, over time only the few mines in the Centennial District actually produced any gold, which was a fraction of the gold produced from the South Pass Mining District. Exploration continued for gold, silver, and copper, with the copper discoveries in the

Grand Encampment area of the Sierra Madre Mountains proving to be the largest. By 1908, the price of copper dropped significantly and by the time the Saratoga-Encampment Railroad was completed, the local copper industry had collapsed and the companies were in bankruptcy (Lowe 2005).

Wyoming's oil industry rose to prominence in the early decades of the twentieth century. Prior to 1906, oil recovery efforts were limited to surface oil seeps and springs. After 1906, and the acceptance and proliferation of scientific theories of petroleum geology, drilling efforts were aimed at geologic structures (e.g., anticlines) likely to contain oil (Metz 1986). Prior to 1912, the development of Wyoming's oil and gas deposits also was hampered by the lack of transportation facilities. Problems with marketing were a reality partly due to the small percentage of production in Wyoming compared to the total national output at the time. However, by the beginning of the second decade of the twentieth century, well-capitalized national oil companies successfully applied new recovery methods, invested in promising new fields, and built refineries and pipelines in Wyoming. Historic oil fields in Carbon County include Bailey Dome, Bell Springs, Big Medicine Bow, and Hatfield.

The livestock industry is considered to have originated in the 1840s to 1860 during the heyday of the Oregon Trail when tens of thousands of cattle, sheep, and horses were herded across the area (Zier et al. 1983). With completion of the transcontinental railroad, the stock ranching industry boomed due to access to the large markets on the East and West coasts. Cattle ranching was well established in the 1860s and the sheep industry by the 1870s. The first permanent ranches in southwestern Wyoming formed in the early 1870s, with many of these becoming large by the 1880s. After the devastating blizzard of 1886, the sheep industry made significant gains, and by 1900 there were 3.3 million head of sheep in Wyoming (Wentworth 1948). The biggest jump in the number of sheep in Wyoming started in 1897 when the market value of sheep increased. By 1901, the price of sheep had doubled, and in 1910, the number of sheep reached an all-time high of 7 million. Today, evidence of both cattle and sheep ranching in the area can be found through homesteads, ranches, sheepherder camps, and sheepherder cairns (sometimes used to demarcate grazing boundaries).

After the invention of the internal combustion engine, oil processing for gasoline skyrocketed. By 1900, hydrocarbon production was on the rise specifically to fuel gas and diesel engines. Automobile roads mark a progressive improvement of earlier wagon roads, often straightening and altering their paths for the different requirements of the vehicles. The coast-to-coast Lincoln Highway was proposed in 1912-1913. In 1913, the route of the Lincoln Highway in Wyoming followed the basic course of the Overland Trail and later the UPRR grade. Between 1919 and 1924, Wyoming completed its portion of the Lincoln Highway which re-aligned the 1913 route in many places. The Lincoln Highway entered Wyoming east of Pine Bluffs and followed county roads through Egbert and Hillsdale to Archer where it rejoined U.S. Route 30. It followed U.S. Route 30 (now largely I-80) through Cheyenne, Laramie, Medicine Bow, and Rawlins to Granger Junction. From there, it followed former U.S. Route 30 South and U.S. Route 530 (now I-80) to the Utah state line.

The highway system that had been growing since the 1920s and was expanded after each World War, essentially replaced the need for many of the alternate rural routes. The post-World War II spread of transportation and automobiles also diminished the need for railroad networks. Well-developed transportation networks and an expanding mineral energy market helped the growth of larger population centers like Casper and Rock Springs, and often helped urbanize the surrounding areas. Today, cattle ranches, coal fire plants, and oil and gas developments are found in the vicinity of the Application Area. An upgraded and modernized railroad and the highway still carry transportation along a main east-west corridor, now I-80.

3.2.1.2 Methods and Information Sources

A Class I files search was conducted through the Wyoming Cultural Resources Office to identify previously conducted cultural resources investigations and previously recorded cultural resources within

the files search study area. The files search study area encompassed the Application Area, plus an area extending 5 miles beyond the Application Area boundary. A total of 344 cultural resources investigations have been previously conducted in the files search study area (SWCA Environmental Consultants [SWCA] 2010). Of these, 128 are within the Application Area boundary. These include 111 Class III intensive field inventories, 4 Class II sample surveys, 3 historic overview surveys, 5 monitoring projects, 1 site testing project, 1 mitigation project, and 3 other projects.

A total of 1,211 cultural sites have been documented in the files search study area. Of these, 467 are located within the Application Area. The 467 sites include 286 prehistoric sites, 83 historic sites, 93 multicomponent sites consisting of both prehistoric and historic components, and 5 sites of unknown cultural affiliation. Of the 467 sites, 2 are listed on the NRHP, 67 are eligible for inclusion in the NRHP, 197 are not eligible for inclusion in the NRHP, and 201 currently are unevaluated.

A total of 744 previously recorded prehistoric and historic sites were identified within the 5-mile buffer that extends beyond the Application Area boundary. Although these sites are located outside of proposed disturbance areas, they are considered in the analysis because of their location within the viewshed of the proposed project. Of greatest concern are visual effects to sites in which site setting contributes to their eligibility to the NRHP. These include, but are not limited to, the Rawlins Historic District, Parco/Sinclair Historic District, Rawlins to Baggs Road, Rawlins to Fort Washakie Road, Overland Trail, Lincoln Highway, and Fort Fred Steele, as well as to sites of traditional, cultural, or religious significance to Native Americans.

Based on the Class I files search, one site occurs every 351 acres or one site every 0.5 square mile (mile^2) within the Application Area. Site density for the larger files search study area, which includes the Application Area plus a 5-mile buffer decreases to one site every 436 acres or one site every 0.7 mile^2. It should be noted that these site densities are based solely on inventoried areas and are provided here as an estimate of site densities that can be expected within the entire Application Area and buffer. To date, approximately 2 percent of the Application Area has been inventoried to Class III standards.

Prehistoric Sites

The 286 previously recorded prehistoric sites consist of 145 open camps/occupation sites, 89 lithic scatters, 30 stone feature sites, 1 lithic quarry, 3 rockshelters, 12 stone feature and habitation sites, 2 stone circle and lithic scatter sites, 1 house pit, 1 kill site, 1 milling/processing site, and 1 stone circle/burial site (**Table 3.2-1**).

Prehistoric sites in the Application Area represent a wide range of human activities. Many of the sites are surface manifestations of hunter-gatherer campsites representing repeated, inseparable occupations over hundreds or thousands of years. Other sites are buried and contain intact, vertically separated cultural components. Based on the Class I files search, the most common site types are short-term open camps/occupation sites with limited activity areas. At these locations, stone tools were made or repaired, plant resources were processed, or animals killed or butchered. Most short-term camps/occupation sites contain flaked stone tools and debitage (waste flakes and debris), but little evidence of subsistence strategies.

Cultural material identified at the previously recorded prehistoric sites falls into two broad categories: artifacts and features. Artifactual sites consist of lithic scatters (flaked stone debitage and/or tools only), and camps (exhibiting combinations of artifact classes, such as flaked stone and ground stone). Features identified at the sites include cairns, hearths (sometimes manifested as fire-cracked rock concentrations or charcoal stains), stone circles, miscellaneous stone alignments, and unique structures, such as hunting blinds. Artifacts commonly occur in association with features. Although most of the prehistoric sites remain undated, projectile points recovered from selected sites suggest that the Application Area was utilized during the four major periods of human occupations that have been

identified for the region. In general, NRHP-eligible prehistoric sites are eligible under Criterion D based on their potential to yield information important in understanding the regional prehistory.

Table 3.2-1 Previously Recorded Prehistoric Sites by Descriptive Site Type Located in the Application Area

Descriptive Site Type	No. of Sites
Open Camps/Occupation	145
Lithic Scatters	89
Stone Features	30
Lithic Quarry	1
Rockshelters	3
Stone Features/Habitation	12
Lithic Scatter with Stone Circles	2
Housepit	1
Kill Site	1
Milling/Processing	1
Stone Circle/Burial	1
Site Total	**286**

Source: SWCA 2010.

Historic Sites

The 83 previously recorded historic sites consist of 18 debris scatters, 14 rock cairns, 5 bridges, 2 railroads, 1 building, 1 canal, 1 cemetery/grave, 13 roads, 3 trails, 1 transmission line, 1 homestead, 1 inscription, 5 mines, 5 stock herding camps, and 12 other sites (**Table 3.2-2**). Of these, most consist of localities that exhibit only artifacts, localities that exhibit only features, and localities with artifacts in combination with features. Sites without features include metal can scatters, glass scatters, and most commonly, debris scatters comprised of a combination of two or more material types such as metal cans, glass, and leather. Many debris scatters most likely represent dumping episodes, while others may be the remains of stockmen's camps. A wide range of feature types were previously recorded at historic sites, including living structures and structural remnants, cairns, ditches/canals, hearths, bridges, and an inscription. Artifactual evidence suggests that the majority of historic sites date from the latter part of the nineteenth century through the mid-twentieth century.

Multicomponent Sites

Of the 93 previously recorded multicomponent sites, 24 are prehistoric occupation/historic debris scatters, 48 lithic scatters/debris scatters, 2 lithic scatters/rock cairn sites, 2 lithic scatters/homesteads, 6 occupation/stock herding camps, 2 occupation and stone circle/debris scatters, 2 rock cairn sites, 1 rock cairn/debris scatter, 1 occupation/historic site, 1 occupation/rock cairn site, 1 lithic scatter/historic site, 1 lithic scatter/inscription, and 2 lithic scatters/stock herding camps (**Table 3.2-3**). The five unknown sites consist of cairn/cache/rock piles.

Table 3.2-2 Previously Recorded Historic Sites by Descriptive Site Type Located in the Application Area

Descriptive Site Type	No. of Sites
Debris scatter	18
Cairn(s)	14
Bridges	5
Railroads	2
Building	1
Canal	1
Cemetery/Grave	1
Roads	13
Trails	3
Transmission Line	1
Homestead	1
Inscription	1
Mines	5
Stock Herding Camps	5
Miscellaneous	12
Site Total	83

Source: SWCA 2010.

Table 3.2-3 Previously Recorded Multicomponent Sites by Descriptive Site Type Located in the Application Area

Descriptive Site Type	No. of Sites
Prehistoric Occupation/Historic Debris Scatter	24
Prehistoric Lithic Scatters/Historic Debris Scatters	48
Prehistoric Lithic Scatters/Historic Rock Cairns	2
Prehistoric Lithic Scatters/Historic Homesteads	2
Prehistoric Occupation/Historic Stock Herding Camps	6
Prehistoric Occupation/Historic Stone Circle/Debris Scatters	2
Prehistoric Rock Cairns/Historic Rock Cairns	2
Prehistoric Rock Cairn/Historic Debris Scatter	1
Prehistoric Occupation/Historic Site	1
Prehistoric Occupation/Historic Rock Cairn	1

Table 3.2-3 Previously Recorded Multicomponent Sites by Descriptive Site Type Located in the Application Area

Descriptive Site Type	No. of Sites
Prehistoric Lithic Scatter/Historic Site	1
Prehistoric Lithic Scatter/Historic Inscription	1
Prehistoric Lithic Scatter/Historic Stock Herding Camps	2
Site Total	93

Source: SWCA 2010.

Class III Inventories

Site-specific Class III inventories of all proposed disturbance areas associated with the proposed project would be conducted once these areas have been identified. The site-specific inventories would be completed prior to project construction and with enough lead time to allow for evaluation of sites located during the inventories, assessment of impacts, and mitigation, if necessary. Based on the files search data, prehistoric sites most likely would be found on elevated ridge tops overlooking creeks; historic sites most likely would be found at lower elevations in flatter areas and near permanent water sources. Results of the inventories would be documented in a technical report, which would include a cultural background of the area, the results of the files searches and field surveys, descriptions of each site, a historic context to evaluate each site for NRHP eligibility, and management recommendations. The report would be submitted to the BLM and Wyoming SHPO for review and concurrence.

3.2.2 Native American Concerns

3.2.2.1 Regulatory Framework

Federal law and agency guidance require the BLM to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by actions on public lands. This consultation includes the identification of places (i.e., physical locations) of traditional cultural importance to Native American tribes. Places that may be of traditional cultural importance to Native American people include, but are not limited to, locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world; locations where religious practitioners go, either in the past or the present, to perform ceremonial activities based on traditional cultural rules or practice; ancestral habitation sites; trails; burial sites; and places from which plants, animals, minerals, and waters possessing healing powers or used for other subsistence purposes, may be taken. Some of these locations may be considered sacred to particular Native American individuals or tribes.

In 1992, the NHPA was amended to explicitly allow that “properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion in the NRHP.” If a resource has been identified as having importance in traditional cultural practices and the continuing cultural identity of a community, it may be considered a traditional cultural property. Properties of traditional religious and cultural importance to Native Americans, including traditional cultural properties, must meet one or more of the National Register criteria (i.e., must be historically significant) in order to be determined eligible for inclusion in the NRHP. In addition to NRHP eligibility, some places of traditional cultural and religious importance also must be evaluated to determine if they should be considered under other federal laws, regulations, directives, or policies. These include, but are not limited to, the NAGPRA of 1990, AIRFA of 1978, ARPA of 1979, and EO 13007 of 1996, Indian Sacred Sites.

NAGPRA established a means for Native Americans, including Indian tribes, to request the return of human remains and other sensitive cultural items held by federal agencies or federally assisted museums or institutions. NAGPRA also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in Native American human remains and sensitive cultural items located on public lands.

AIRFA established a federal policy of protecting and preserving the inherent right of individual Native Americans to believe, express, and exercise their traditional religions including, but not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

ARPA requires notification of the appropriate Indian tribe before approving a cultural resource use permit for the excavation (testing and data recovery) of archaeological resources, if the responsible public land manager determines that a location having cultural or religious importance to the tribe may be harmed or destroyed.

EO 13007 defines a sacred site as any specific, discrete, narrowly delineated location on public 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, provided that the tribe or appropriately authoritative representative has informed the federal agency of the existence of such a site.

EO 13007 requires federal agencies to the extent permitted by law, and not clearly inconsistent with essential agency functions, to accommodate access to and ceremonial use of Indian sacred sites, to avoid adversely affecting the physical integrity of such sites wherever possible, and, where appropriate, to maintain the confidentiality of sacred sites.

3.2.2.2 Native American Consultation

In compliance with the NHPA, as amended, the BLM initiated government-to-government consultation for the CCSM Wind Energy Project EIS on July 23, 2009, by sending letters to the following federally recognized tribes: Northern Cheyenne, Eastern Shoshone, Northern Arapaho, Fort Peck Assiniboine and Sioux, and Northern Ute tribes. The letters were sent to inform the various tribes of the proposed undertaking and invite the tribes to participate in the EIS planning process. Additionally, the letter included a request for historical information on the use and significance of the Application Area such as places of traditional, religious, and cultural importance to the tribes. Included with the letters was a map of the Application Area and a self-addressed stamped postcard for the tribes to indicate their level of interest and return to the BLM.

On August 22 and September 22, 2009, the BLM held tribal information meetings at the BLM RFO. In attendance at the August meeting were representatives from the Northern Cheyenne and Fort Peck tribes. Representatives from the Ute Indian Tribe of the Uintah and Ouray Reservation attended the meeting in September. On August 28 and September 22, 2009, the BLM took tribal representatives on a tour of the Application Area. Representatives of the Northern Cheyenne and Fort Peck tribes participated in the field tour conducted in August while representatives of the Ute Indian Tribe of the Uintah and Ouray Reservation participated in the field tour in September.

A Class II sample inventory has been conducted in the Application Area. The objective of the inventory was to identify sensitive sites (i.e., places of cultural, traditional, or religious importance) outside of Class III inventory areas that could be affected by the proposed project. The BLM requested the Class II inventory to help facilitate Native American consultation as the NEPA process moves forward. As a result of the inventory, 43 sensitive sites were recorded. These 43 sites include stone cairns, some with lithic scatters or associated artifacts, and stone alignments. The BLM, in consultation with interested

tribes, will evaluate the cultural, traditional, and religious values of the sites. If any of the sites would be affected by the proposed project, mitigation would be developed by the BLM and interested tribes, and incorporated into the PA currently being developed by the BLM.

3.3 Geology, Geologic Hazards, and Mineral Resources

3.3.1 Geology

3.3.1.1 Physiography and Topography

The Application Area is located in the Wyoming Basin Physiographic province (Fenneman 1928). The Wyoming Basin is 40,000 miles^2 (Howard and Williams 1972) and consists of a number of sub-basins found between the Southern and Northern Rocky Mountain Provinces (**Figure 3.3-1**). The Application Area is in the Kindt Basin, a small sub-basin southeast of Rawlins, Wyoming. Other sub-basins in the Application Area vicinity include the Great Divide Basin, Washakie Basin, Hanna Basin, Carbon Basin, Shirley Basin, and the Laramie Basin. The Washakie and Great Divide sub-basins are sometimes considered part of the Greater Green River Basin that occupies most of southwestern Wyoming, but the sub-basins are structurally and topographically distinct from the Green River Basin located west of Rock Springs (Love 1961). Also within the Wyoming Basins are small mountain ranges and uplifts such as the Green, Ferris, Seminoe, and Shirley Mountains that trend east to west 30 to 40 miles north of the Application Area. Elevations across the Wyoming Basin generally range from 6,000 to 7,000 feet above mean sea level (amsl) in the basins to more than 8,000 feet elevation in the mountain ranges. Topography in the basin areas is typified by rolling plains dissected by badlands.

Elevations in the Kindt Basin range from 7,000 to over 8,000 feet amsl. In the Chokecherry site, the land surface gradually slopes up to the south punctuated by hogbacks and structures formed by large folds in the underlying Cretaceous rocks. The Sierra Madre site is largely located on a cuesta named Miller Hill, which is a ridge formed by gently tilted sedimentary rocks. The cuesta has a gentle slope to the south and southwest and steep slopes along a prominent escarpment to the north and northeast. The cuesta is formed from a layer of Miocene-age Tertiary rocks that mantle the foothills of the Sierra Madre. To the north and west of Miller Hill is a major topographic feature called the Atlantic Rim, a hogback ridge composed of upper Cretaceous sandstones essentially marking the eastern edge of the Washakie Basin. The Continental Divide crosses the Application Area and follows the edge of the Miller Hill escarpment.

3.3.1.2 Stratigraphy

Bedrock Geology

The geologic units that outcrop in the Application Area range in age from upper Cretaceous to Recent and are listed in **Table 3.3-1**. **Figure 3.3-2** is a generalized bedrock geologic map of the Application Area. **Table 3.3-1** lists and describes the bedrock and surficial deposits that are exposed within the Application Area. **Table 3.3-1** is a stratigraphic chart showing the geologic units that would be found in the region composed of the Kindt, Hanna, Carbon, Shirley, and the Laramie Basins and adjacent uplifts. Rocks that do not outcrop in the Application Area are in the subsurface and range in age from Precambrian to Permian. The Jurassic and lower Cretaceous rocks that outcrop in the Application Area (Morrison, Sundance, and Cloverly Formations) were deposited in primarily fluvial continental environments. The upper Cretaceous rocks were deposited under conditions ranging from marine, marginal marine, delataic, and fluvial. The lower part of the Tertiary unit that outcrops on Miller Hill was probably derived from detrital material shed from the uplift of the Sierra Madre (Vine and Prichard 1959). The remainder of the unit was probably deposited in freshwater fluvial environments with material derived from volcanic eruptions. The resistant conglomerate unit is primarily responsible for the escarpment along the north and northeast rim of Miller Hill. The age and correlation of the Tertiary deposits is uncertain with various workers either calling it Pliocene-age North Park Formation or Miocene-age Brown's Park Formation (Vine and Prichard 1959). With similarities of lithology to both formations and no diagnostic fossils, Love and Christiansen (1985) assigned a general "Tertiary Miocene" designation to the Tertiary rocks on Miller Hill.

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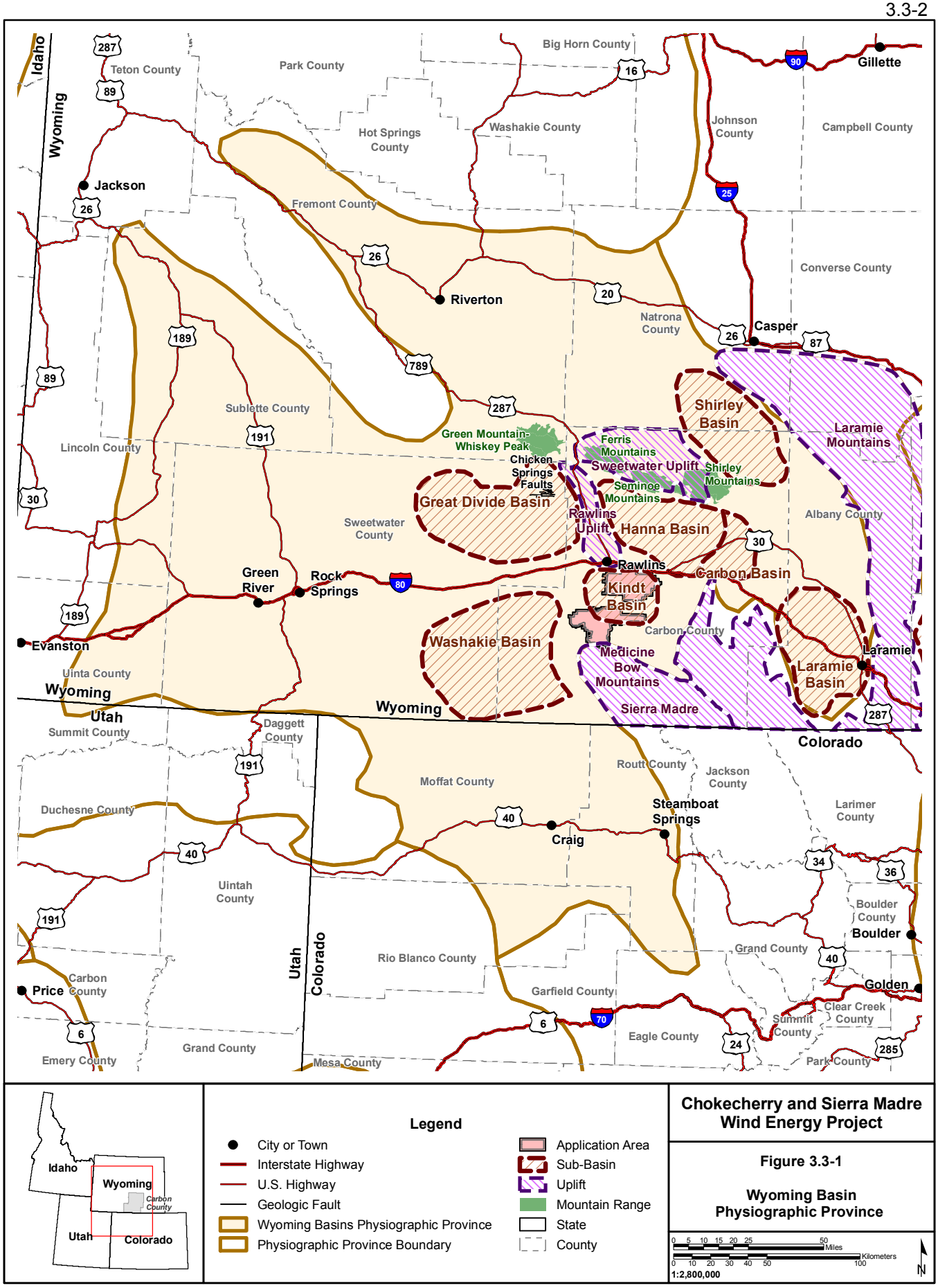


Legend

- City or Town
- Interstate Highway
- U.S. Highway
- Geologic Fault
- Wyoming Basins Physiographic Province
- Physiographic Province Boundary
- Application Area
- Sub-Basin
- Uplift
- Mountain Range
- State
- County

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.3-1

Wyoming Basin Physiographic Province

0 5 10 15 20 25 50 Miles
0 10 20 30 40 50 100 Kilometers
1:2,800,000
N

Table 3.3-1 Summary of Geologic Units in the Application Area

Geologic Formation (Fm)/Deposit (Map Symbol)	Period	Description
Alluvium (Qal), slopewash; terrace and bench deposits, playa (Qp), landslide (Qls).	Quaternary – Recent	Unconsolidated gravel, sand, silt, and clay. Thickness is variable.
Undefined Tertiary Rocks (Tm)	Tertiary – Miocene/ Pliocene	Conglomeratic sandstone in lower 100 feet, grading upward to sandstone, tuff, tuffaceous sandstone, and limestone. Thickness: 800 feet.
Lewis Shale (Kle)	Upper Cretaceous	Dark marine shale with thin sandstones and siltstones and occasional bentonite layers. Thickness: 2,100 feet.
Mesaverde Group (Kmv)	Upper Cretaceous	Sandstone, carbonaceous shale, and coal. Thickness: 2,600 feet.
Steele Shale (Ks)	Upper Cretaceous	Dark gray, silty, marine shale with thin beds of sandstone and siltstone. Thickness: 3,600 feet.
Niobrara (Kn)	Upper Cretaceous	Gray to black shale with calcareous lenses. Thickness: 1,200 feet.
Frontier Formation (Kf)	Upper Cretaceous	Frontier: Thin beds of sandstone and shale. Mowry: Dark gray to black siliceous and bentonitic shale. Thickness: 700 feet.
Frontier Formation/Mowry Shale/Thermopolis Shale undivided (Kft)	Upper/Lower Cretaceous	Frontier: Thin beds of sandstone and shale. Mowry/Thermopolis Shales: Dark gray to black siliceous and bentonitic shales. Thickness: 1,150 feet.
Cloverly Formation	Lower Cretaceous	Medium to coarse-grained quartz sandstone with occasional carbonaceous shale partings. Prominent cliff former. Thickness: 130 feet.
Morrison and Sundance Formations undivided	Jurassic	Morrison: Interbedded varicolored clays and siltstones, thin sandstones, and nodular limestone. Sundance: course to fine-grained sandstone. Thickness: 250 feet.
Chugwater Formation	Triassic	Interbedded red sandstone, siltstone, and shale.

Sources: Love and Christiansen 1985; Hallberg and Case 2006a,b; Hallberg et al. 1998; Perman 1990; Slattery 2007; Vine and Prichard 1959; Watson 1980; Wilson et al. 2001.

Surficial Geology

The surficial geological materials consist of alluvium, slopewash, terrace and bench deposits, playa, and landslides. Recent alluvial deposits are generally found in the modern stream valleys. Slopewash is widespread and is often mixed with other surficial deposits and bedrock. Terrace and bench deposits are adjacent to major drainages and are remnants of deposits that have been eroded in the latest stage of down cutting. Landslide deposits are common on the steep north slope of Miller Hill. Landslides are described in more detail in Section 3.3.3.

3.3.1.3 Structure

The Application Area is located in a small structural sub-basin called the Kindt Basin (**Figure 3.3-3**) (Dyman and Condon 2007). The origin of the designation of this small basin is obscure, but is shown on a map and discussed in a publication on the coal resources of eastern Carbon County (Veatch 1907). The basin is about 15 miles by 15 miles and is located southeast of Rawlins, Wyoming. The deepest portion of the basin is immediately south of I-80 and the Precambrian basement slopes up to the south and southeast. The Kindt Basin is bounded by the Sierra Madre uplift to the south, the Washakie Basin to the west, the Rawlins uplift on the north, the Hanna Basin on the northeast, and to the east the northern extension of the Medicine Bow Mountains uplift. The series of basins formed by the Laramie, Shirley, Hanna, and Kindt Basins is a structurally complex area formed in Paleocene time during the Laramide Orogeny (mountain building) responsible for the present-day Rocky Mountains in Colorado, Utah, and Wyoming.

There are a couple of geologic structures of note in the Application Area. One is the Grenville Dome (Otteman and Snoke 2005), an anticline in the north part of the Chokecherry site south of I-80 and the Town of Sinclair, Wyoming. The anticline is an extension of the Rawlins uplift and the core of the structure at the surface is composed of Mowry Shale and the ridges around the core are composed of Frontier Formation sandstones. The other structure is a prominent west to east trending hogback 2 to 3 miles south of I-80 in the northeast portion of the Chokecherry site (Mears et al. 1986). The hogback is composed of steeply south-dipping sandstone beds of the Mesaverde Group and essentially marks the surface expression of the north boundary of the Kindt Basin. In the Miller Hill area, the Miller Hill anticline trends from Miller Hill northeastward (Vine and Prichard 1959). The structure occurs in the rocks that underlie the Tertiary unit that caps Miller Hill and is the same structure on which the Hatfield oil and gas field was developed (**Table 3.3-2**).

3.3.2 Mineral Resources

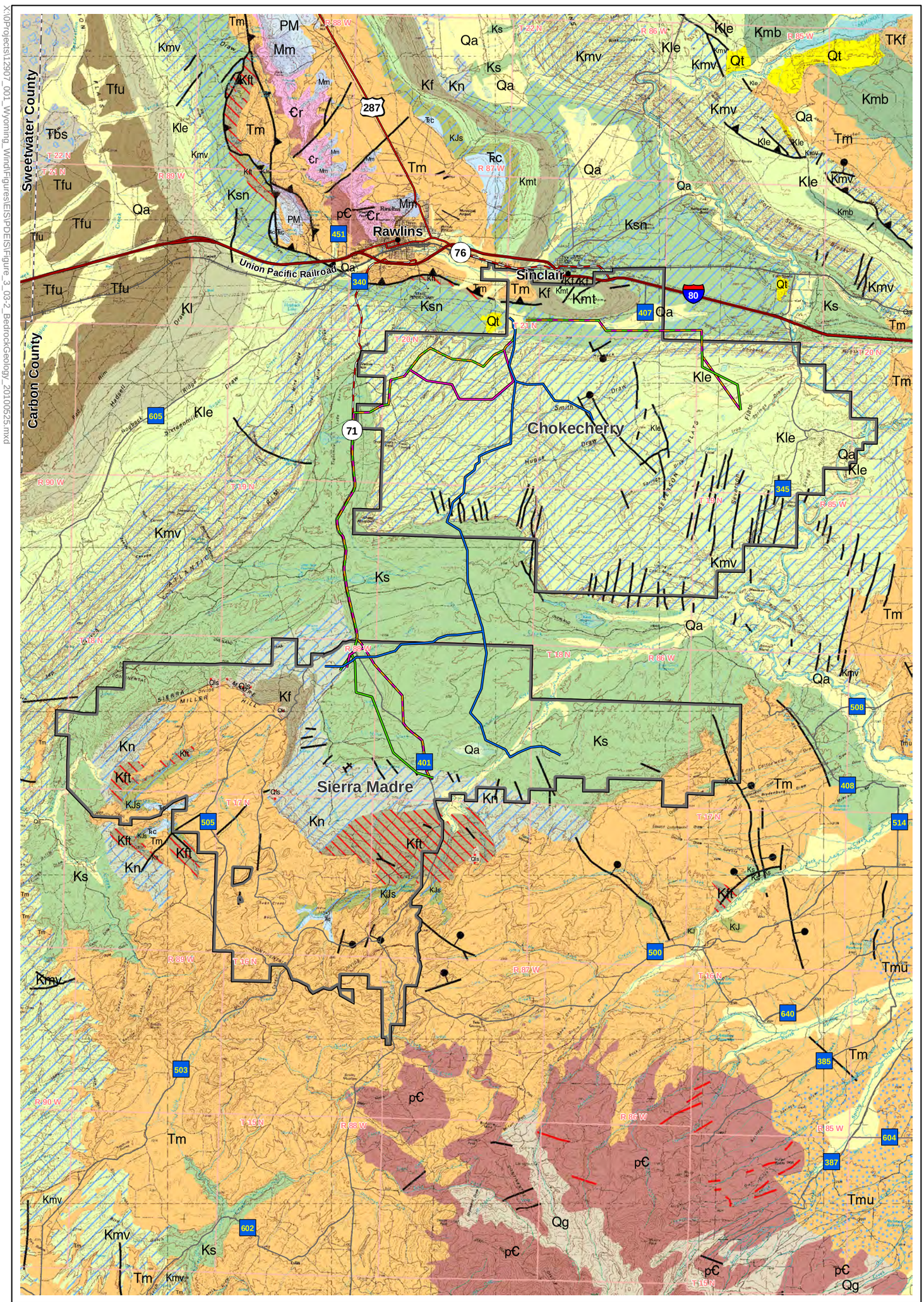
3.3.2.1 Leasable Minerals

Leasable minerals are those minerals that are leased to individuals for exploration and development. The leasable minerals have been sub-divided into two classes, fluids and solid. Fluid minerals include oil and gas, geothermal resources and associated by-products, and oil shale, native asphalt, oil impregnated sands and any other material in which oil is recoverable only by special treatment after the deposit is mined or quarried. Solid leasable minerals are specific minerals such as coal and phosphates. These minerals are associated with the following laws; Mineral Leasing Act of 1920, as amended and supplemented, Mineral Leasing Act for Acquired Lands of 1947, as amended, and the Geothermal Steam Act of 1970, as amended (American Geological Institute [AGI] 1997). Leasable minerals are acquired by applying to the federal government for a lease to explore and develop the minerals.

<u>Oil and Gas</u>

The primary leasable mineral resources in the Application Area are oil and natural gas. Production was established in the area in 1915 with the discovery of natural gas at Hatfield Dome in T19N, R88W. **Table 3.3-2** lists the oil and gas fields in the vicinity of the Application Area. Only Hugus Field with one active oil well is located directly in the Application Area.

The U.S. Geological Survey (USGS) assessed the potential for undiscovered oil and gas resources in the Hanna, Laramie, and Shirley basins hydrocarbon resources assessment province (Dyman and Condon 2007). The Kindt Basin was included in the assessment province, but no resource potential probabilities were provided for the sub-basin. However, the entire assessment area has a probable mean of technically recoverable undiscovered resource of 132 million barrels of oil and 317 billion cubic feet of gas, and 13.5 million barrels of natural gas liquids (conventional and unconventional resources).



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.3-2

Bedrock Geologic Formations

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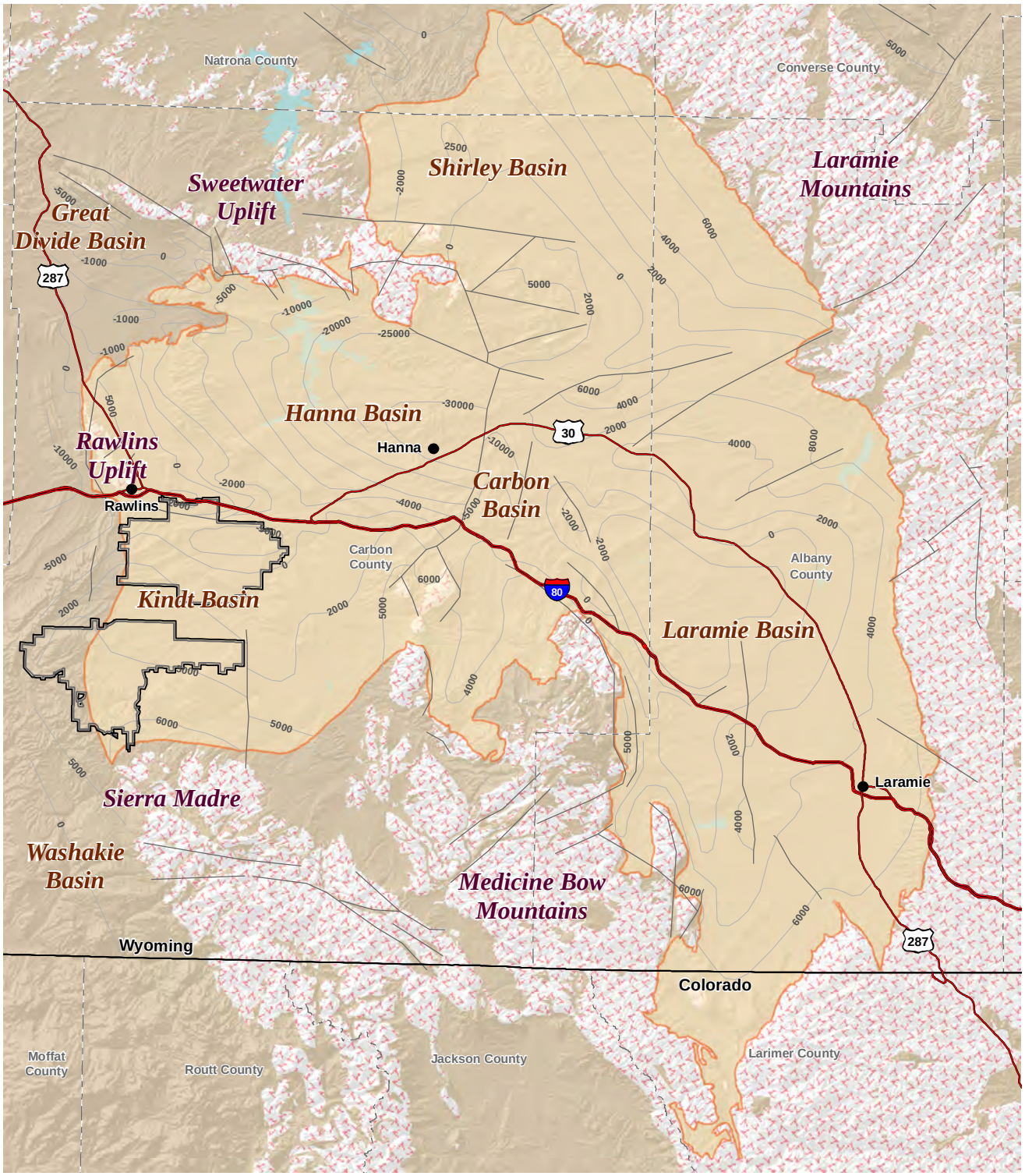
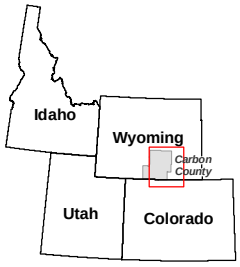
X:\0Projects\12907_001_Wyoming_Wind\Figures\EIS\DEIS\Figure_3_03-3_KindtBasin_20100526.mxd





Legend

- City or Town
- Contour Top of Precambrian
- Major Fault
- Interstate Highway
- U.S. Highway
- Application Area
- Basins
- Precambrian - Cored Uplifts
- Undifferentiated Rocks and Deposits
- State
- County

Data Source: Dymon and Condon (2007)

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.3-3

Kindt Basin and Adjacent Uplift and Basins

0 5 10 15 20 25 Miles
0 10 20 30 40 Kilometers
1:1,100,000
N

Table 3.3-2 Oil and Gas Fields in the Application Area

Name	Location	Discovery Year	Formation	Cumulative Production[1]		Status
				Oil (barrels)	Gas (thousand cubic feet)	
Espy	19N-89W	1964	Kn, Kf, Thaynes Limestone (Triassic)	1,065,335	178,119	Producing
Hatfield	19N-20N-88W	1915	Dakota, Nugget, Thaynes, Phosphoria	1,483,953	6,294,109	Producing
Hugus	19N-87W	1976	Ks, Kn	29,036	738	Producing
Rim	19N-88W	No data – indicated as Known Geologic Structure on BLM Oil and Gas Plat, there is no production information in Wyoming Oil and Gas Conservation Commission database.				
Sugar Creek	19N-90W	1968	Kf, Muddy, Thaynes	4,858	889,398	Abandoned

[1] As of January 2011.

Sources: Bauer 1992; BLM 2007b; Wyoming Oil and Gas Conservation Commission 2011; Wyoming State Geological Survey 2002.

Since the Kindt Basin contains the hydrocarbon source and reservoir rocks common to the entire assessment province, there is potential for undiscovered hydrocarbon resources in the Application Area. A number of oil and gas tests drilled in the vicinity of Miller Hill indicated that the total sedimentary rock section is thinning rapidly toward to the south diminishing the potential for hydrocarbon traps (Vine and Prichard 1959). The Kindt Basin was assigned a low potential for hydrocarbon development (Wyoming Reservoir Management Group 2004).

Coal

The Kindt Basin Coalfield is an eastward extension of the Green River Coal Region (Averitt 1972; Veatch 1907). The Kindt Basin coal field is immediately south of the UPRR and southeast of Rawlins, Wyoming. The field is composed of coal-bearing Mesaverde Group outcrops and the limit of the Mesaverde outcrop essentially defines the coal field (Berryhill et al. 1950) (**Figure 3.3-2**). To the west, the Mesaverde outcrops on the Atlantic Rim are part of the Little Snake River Coalfield.

In the Kindt Basin Coalfield, the Mesaverde Group is up to 3,600 feet thick and is generally comprised of alternating beds of sandstone and shale. Coal seams are present in the upper part of the Mesaverde at irregularly spaced intervals. The coalbeds are lenticular and variable in thickness ranging from 2 to 6 feet thick. On the north side of the Kindt Basin field the coalbeds dip at 45 degrees to 75 degrees southward; on the south side the dip is about 11degrees northward (Berryhill et al. 1950). The coal is of high volatile “C” bituminous rank. An analysis, on an as-received basis, from the Dillon mine indicated 11,010 British thermal units/pound heat value, 0.5 percent sulfur, and 8.4 percent ash. There is a low potential for development of the coal seams in the Kindt Basin because the seams are thin with limited lateral extent

(ENSR and BAH 2003). Based on this, the Rawlins RMP did not identify the Kindt Basin as an area with coal development potential over the Plan's 20-year planning horizon.

Historic coal mining has been conducted in the area and there were mines in T19N R85W, Sections 19, 26, 28, and 35; and T19N R86W, Sections 13 and 14 (Veatch 1907). These mines are not located within the Application Area.

Other Leasable Minerals

No other leasable minerals have been identified in the Kindt Basin (ENSR and BAH 2003). Geothermal resources have been identified in the Saratoga Valley where hot springs are present near Saratoga, Wyoming (Breckenridge and Hinckley 1978). No geothermal potential has been identified in the Application Area and development of geothermal resources in the Kindt Basin is probably unlikely.

3.3.2.2 Saleable Minerals

Saleable minerals are common mineral materials that include sand, gravel, roadbed, ballast, and common clay and are sold by contract with the federal government. These have been identified as all other minerals that were not designated as leasable or locatable. These minerals are regulated under the Mineral Material Act of July 23, 1947, as amended, and the Surface Use and Occupancy Act of July 23, 1955 (AGI 1997).

Sand and Gravel

Sand and gravel deposits may be present in alluvial, alluvial fan, terrace, and bench deposits located in the Application Area. Sand and gravel resources may be present in alluvium associated with the North Platte River which is located to the east of the Application Area, but no quantitative estimate of sand and gravel resources is available (ENSR and BAH 2003). Two "free-use permits" as designated by the BLM were located in T18N, R88W, Section 10. Free-use pits permits are generally issued to federal or state agencies. However, the pits have been reclaimed and there are no existing free-use permits in the Application Area.

Crushed Stone

There are two quarries, one located north and the other west, of Rawlins with a combined capacity of 500,000 tons per year. The quarries' mine limestone or sandstone which are crushed to various sizes for use as road base, in concrete, or winter road sanding by the Wyoming Department of Transportation (WYDOT).

3.3.2.3 Locatable Minerals

Locatable minerals include precious and base metallic ores and nonmetallic minerals such as bentonite, gypsum, chemical grade limestone and chemical grade silica sand. Uncommon varieties of sand, gravel, building stone, pumice, rock and cinders are also managed as locatable minerals. Locatable minerals are acquired under the General Mining Law of 1872, as amended and Surface Use and Occupancy Act of July 23, 1955 (AGI 1997).

The only identified locatable mineral deposits in the vicinity of the Application Area are uranium prospects located in the Miller Hill area and at Ketchum Buttes, approximately 6 miles south of the Sierra Madre site (ENSR and BAH 2003). The Miller Hill prospects are primarily located in T16 and 17N and R87 and 88 W. Vine and Prichard (1959) described exploration of the uranium potential of the area. The mineral uranophane is the primary uranium mineral and was found concentrated mainly in the freshwater limestones in the Tertiary Miocene unit. Mineralization was thought to have occurred due to the reaction of silica- and uranium-rich solutions with the limestone beds. The investigation included

trench excavation and grab sampling, but the results yielded concentrations of uranium that for the most part were not economical for commercial extraction.

The Ketchum Butte uranium prospects, while not within the Application Area, are located nearby in T15N, R88W, Section 18 (USGS 2008a). The prospects are formally known as the Cloudy Group Claims and have been described as roll-front deposits in sandstones of the Brown's Park Formation (ENSR and BAH 2003). Another claim group in the Ketchum Buttes area has been recently explored for potential and may have as much as 1.5 million pounds of uranium oxide potentially leachable through in-situ methods of extraction (Market Wire 2006).

3.3.3 Geologic Hazards

Geologic hazards are "natural geologic events that can endanger human lives and threaten human property" (National Atlas 2008a). Although there are a variety of geological hazards, the ones that will be considered here are seismic hazards, landslides, sinkholes, and swelling clay.

3.3.3.1 Seismic Hazards

There are three major phenomena associated with seismic hazards: Seismicity, faults, and ground motion. The following paragraphs describe the potential for seismic hazard occurrence in the Application Area.

Seismicity

Seismicity concerns the intensity, frequency, and location of earthquakes in a given area. Carbon County and vicinity has historically little earthquake activity (Case et al. 2002). Twenty-five earthquakes of magnitude 2.0 or higher have been recorded in Carbon County. A Mercalli Scale Intensity IV earthquake was felt southwest of Rawlins in 1896. From 1973 to November 2008, 32 earthquakes have been recorded within a 60-mile radius of the Application Area, the strongest being a 4.3 magnitude earthquake about 15.0 miles west (USGS 2008b).

Faults

Faults are dislocations whereby blocks of earth material on opposite sides of the faults have moved in relation to one another (USGS 2008c). Rapid slippage of blocks of earth past each other can cause energy to be released, resulting in an earthquake. An active fault is one where movement has occurred in the last 10,000 years and a potentially active fault is one where movement has possibly occurred during Quaternary time or the last 1.6 million years (USGS 2008c,d). The closest potentially active faults are the Chicken Spring faults located about 30 miles northwest of the Application Area in northeast Sweetwater County (Machette 1999a). The Chicken Springs faults are a group of faults that trend both north-south and east-west, are 2 to 12 miles in length. In one location a fault exhibits displacement of a Holocene stream channel. The displacement of the stream channel is evidence for movement within the last 15,000 years. There is another nearby fault system named the South Granite Mountains fault system, located about 30 to 35 miles north of the proposed site in northern Carbon County and northeastern Sweetwater County along the Crooks, Green, Ferris, and Seminoe mountains (Machette 1999b). The fault system is about 100 miles long. Faults in the South Granite Mountains fault system are considered to be potentially active to active. There are no documented active faults in the Application Area.

Ground Motion

Ground motion hazards result when the energy from an earthquake is propagated through the ground. The USGS ground motion hazard mapping indicates that potential ground motion hazard in the Application Area is low. The hazard map used estimates of peak ground acceleration expressed as a percentage of the acceleration of gravity with a 10 percent probability of exceedence in 50 years

(USGS 2008e). Peak acceleration from a probable maximum earthquake event for the area is estimated to be less than 5 percent of gravity.

3.3.3.2 Landslides

Landslide is a term used for various processes involving the movement of earth material down slopes (USGS 2004). Landslides can occur in a number of different ways in different geological settings. Large masses of earth become unstable and begin to move downhill by gravity. The instability can be caused by a combination of factors including steep slopes, periods of high precipitation, undermining of support by natural processes (stream erosion), or unintentional undercutting or undermining the strength of unstable materials in the construction of roads and structures.

Landslide deposits have been mapped along the steep north-facing slope of Miller Hill (Wyoming State Geological Survey 2008) (**Figure 3.3-4**). The landslides generally consist of multiple block slides or debris flows of rock or earth. The landslides have most likely occurred as a result of mass-wasting occurring along the steep face of Miller Hill.

3.3.3.3 Subsidence

Subsidence is a decrease of surface elevation of the ground and may be caused by a variety of phenomena including, but not limited to, solution of subsurface strata, compaction, removal of groundwater, and earthquake ground motion. The surface expression from subsidence can range from localized precipitous collapses (sinkholes) to broad regional lowering of the earth's surface. No subsidence has been identified in the Application Area (National Atlas 2008b).

3.3.3.4 Swelling Clay

The bentonite layers in the Lewis Shale, Frontier Formation, and other upper Cretaceous units may present hazards associated with swelling clays (Olive et al. 1989; Wyoming State Geological Survey undated). These formations are considered to have “high swelling potential”. Bentonite has the property whereby when wet, it expands significantly in volume. When bentonite layers are exposed to successive cycles of wetting and drying, they swell and shrink, the soil fluctuates in volume and strength. Structures built on soil with high shrink-swell potential can be damaged as soils expand and shrink.

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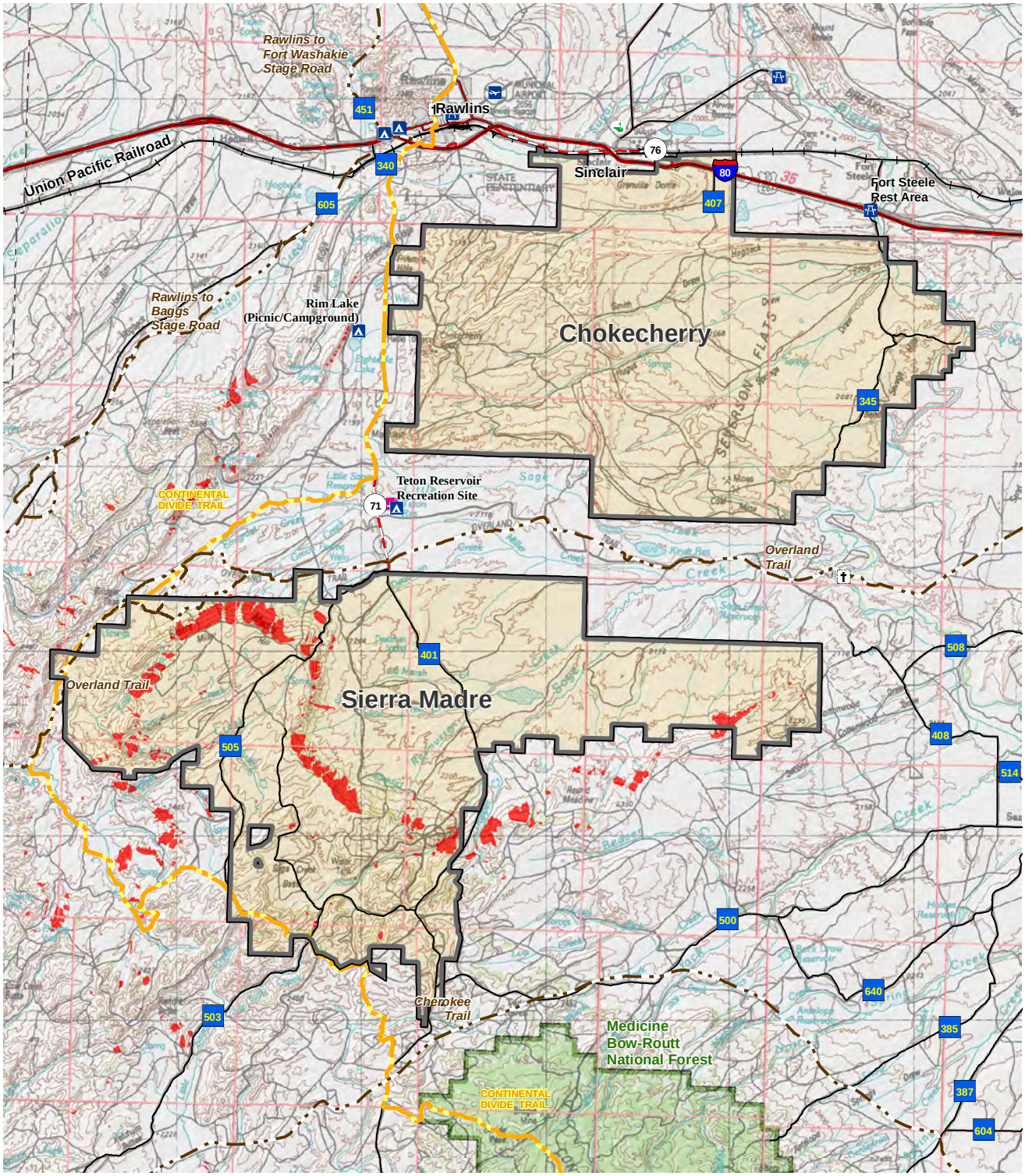
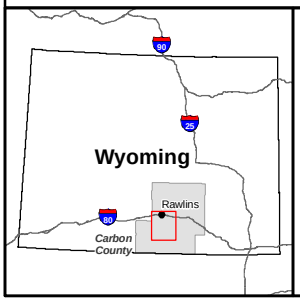




Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Continental Divide Trail
- Historic Trail
- Landslide Deposits
- National Forest
- Application Area

Source: Wyoming State Geologic Survey (2008)

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.3-4

Landslide Deposits

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

3.4 Land Use

3.4.1 Land Ownership and Use

3.4.1.1 Land Ownership

The Application Area comprises a total of 222,690 acres; 105,419 acres in the Chokecherry site and 117,270 acres in the Sierra Madre site. Most of the Application Area is in the checkerboard landownership pattern common along Union Pacific railroad routes across the west. Little consolidation of the checkerboard has taken place, so that the majority of the checkerboard remains intact. As a consequence, current landownership is a mix of private, public land, and to a lesser extent, state-owned lands as shown on **Figure 3.4-1**. Landowners in the Application Area include the BLM, the State of Wyoming, and private landowners. **Table 3.4-1** shows land ownership in the Chokecherry and Sierra Madre sites within the Application Area.

Table 3.4-1 Surface Land Ownership within the Application Area

Area	Surface Landowner	Acres	Percent of Application Area
Chokecherry	BLM	48,601	21.8
	State of Wyoming	1,937	0.9
	Total Private	54,881	24.6
	TOTCO	54,219	24.3
	Other Private Owners	662	0.3
Subtotal		**105,419**	**47.3**
Sierra Madre	BLM	58,574	26.3
	State of Wyoming	7,633	3.4
	Wyoming Game and Fish	744	0.3
	Total Private	50,319	22.6
	TOTCO	47,355	21.3
	Other Private Owners	2,964	1.3
Subtotal		**117,270**	**52.7**
Total Application Area		**222,690**	**100.0**

Source: BLM 2010a.

Private land in the Application Area includes sections within the checkerboard land ownership pattern as well as in-holdings south of T18N. Each section within the checkerboard is 1 mile square, while private inholdings south of T18N range in size from small parcels to relatively large consolidated blocks. Private landowners other than TOTCO include the Union Pacific/Anadarko, which owns land in sections located along the north boundary of the Chokecherry Site, and along SH 71 in sections adjacent to the west boundary of the Chokecherry site. Most of the private land not owned by TOTCO is in the Sage Creek Basin and east of Miller Hill in the Sierra Madre site, and along the Platte River within the Chokecherry site. Sections that contain private lands not owned by TOTCO, as well as land owned by the City of Rawlins, are listed in **Table 3.4-2**.

Table 3.4-2 Major Non-TOTCO Landowners within the Application Area

Surface Landowner	Location of Property
Union Pacific (BLM 2010)/Anadarko	T21N R87W, Sections 29,33,35; T20N R88W, Sections 1,11,13,23,25,35; and T19N R88W, Sections 1,11,13,23.
City of Rawlins	T17N R88W, Sections 26, 27, 33, 34, 35, 36
Other Private Owners	T18N R88W, Section 9; T20N R87W, Section 4; T17N R87W, Section 30

The checkerboard ownership pattern that characterizes the Application Area poses challenges for public access and land tenure. Transportation access within the Application Area is currently provided by Carbon County roads, BLM roads, and many undesignated roads and two-tracks on BLM, state, and private lands, as described in Section 3.10, Transportation. Access and land tenure are generally managed through easements and ROWs, which are addressed below in Section 3.4.3.

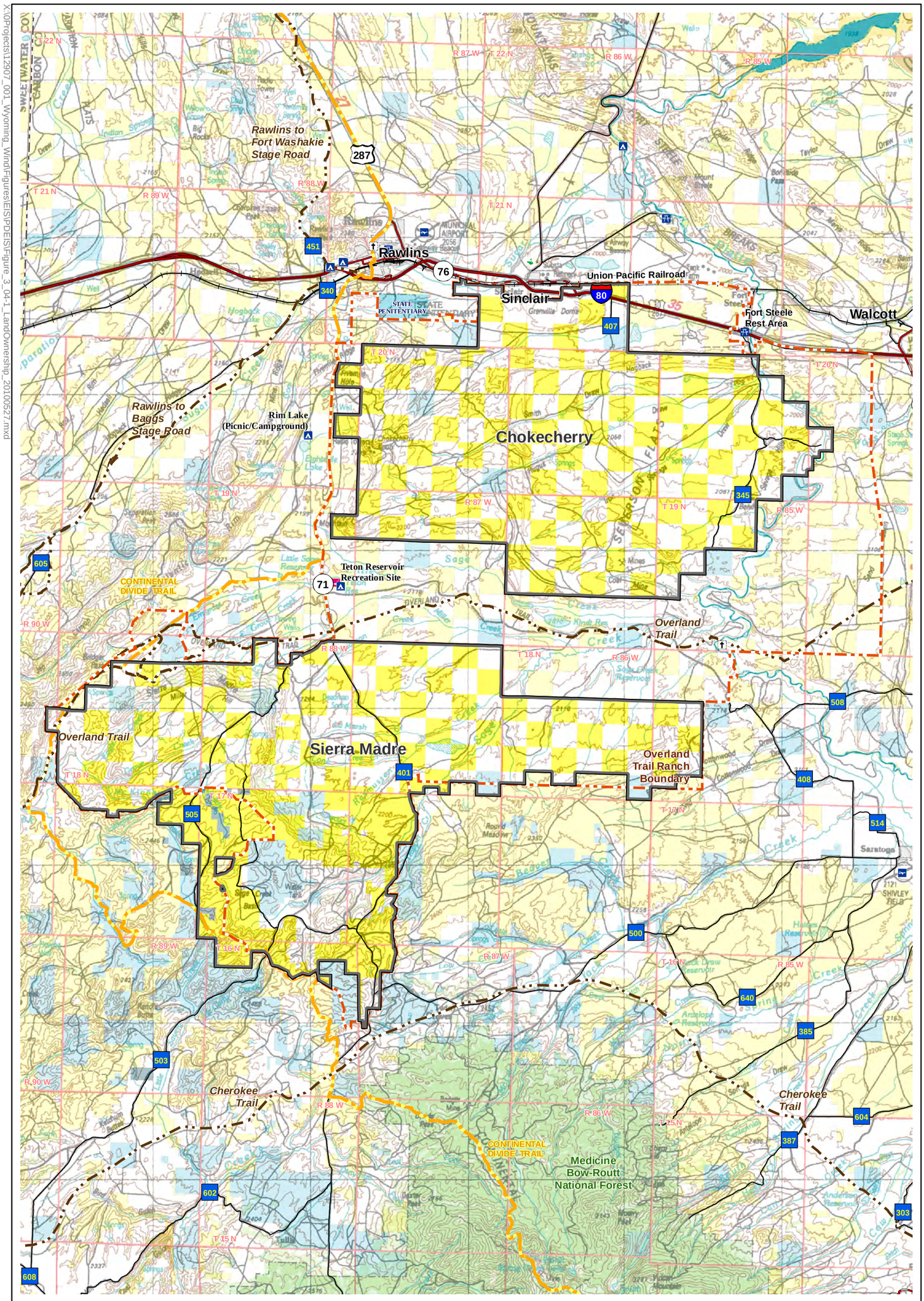
3.4.1.2 Land Use

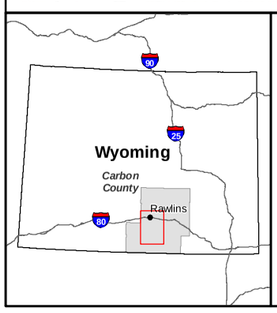
Livestock grazing is the primary land use of public land in the Application Area, as addressed in Section 3.6, Range Resources. Utilities and other facilities within authorized leases and ROW grants on public lands occur throughout the Application Area, as described in Section 3.4.3. Dispersed recreation occurs on public land outside of the checkerboard, primarily in the Sierra Madre site. Recreation uses are addressed in greater detail in Section 3.7, Recreation. The City of Rawlins owns land in the Sage Creek Basin portion of the Sierra Madre site that contains a collection of springs that are the primary water source for the city (City of Rawlins 2009a).

Livestock grazing is also the primary land use of private land owned by TOTCO in the Application Area. Other private land uses include residences within the Sierra Madre site and near the Platte River in the Chokecherry site, and a rock quarry in the Chokecherry site. Existing development on private land within the Application Area include TOTCO maintenance buildings and approximately 20 buildings that include second/vacation homes and associated out buildings in the southern portion of the Sierra Madre site. There are no year-round residences within the Application Area. The Wyoming State Penitentiary is located just outside of the Application Area, approximately 2 miles north of the Chokecherry boundary and 2 miles south of Rawlins on South Higley Road.

3.4.2 Land Ownership Adjustment and Consolidations

The Rawlins RMP identifies public lands for consideration of disposal under the disposal criteria of the FLPMA as identified in the Rawlins RMP. Lands considered for disposal through the FLPMA sale must meet one or more of the criteria outlined in Section 203(a) of the FLPMA. Disposal criteria characterize lands for potential disposal as lands that are difficult or uneconomical to manage; lands acquired for a specific purpose but no longer required for that or another federal purpose; or lands that will serve important public objectives, including but not limited to expansion of communities and economic development, that outweigh other public objectives and values. Land being considered for disposal within the Application Area includes T21N, R87W, Sections 32 and 34, and part of Section 35. These sections are located at the north boundary of the Application Area, in the checkerboard land ownership area just south of Rawlins.





Legend

- Historic Trail
- Continental Divide Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- Overland Trail Cattle Company Ranch Boundary

Land Owner

- Bureau of Land Management
- Bureau of Reclamation
- Forest Service
- Private
- State
- State Penitentiary
- Wyoming Game and Fish

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.4-1

Land Ownership

0 2 4 8 Miles
0 2 4 8 Kilometers
1:240,000

N

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Land is consolidated through fee or easement acquisition, exchange, condemnation, and donation processes. Land consolidation can resolve access and resource management challenges of checkerboard ownership lands; however, according to the Rawlins RMP there are currently no active efforts to consolidate land within the RFO, including the Application Area. Land consolidations are not further addressed in the Land Use analysis.

3.4.3 Withdrawals/Classifications

Withdrawals and classifications are typically placed on land or minerals to protect resource values or existing facilities, although they can selectively prohibit some management actions that would otherwise protect additional resource values. Current withdrawals in the Application Area include the Teton Reservoir Recreation Site.

3.4.4 ROWs and Leases

Land tenure involves the rights of individuals or other entities to secure access to public land and associated land resources. In general, public access and land tenure are managed through ROWs or easements. The checkerboard ownership pattern that characterizes the Application Area poses challenges for ROW management for linear ROWs such as roads and utilities that would need to cross private lands to access public lands. As stated in the 2003 Management Situation Analysis (BLM 2003b), management actions pertaining to transportation, utility and other access to public lands include the consideration that access across private lands will be pursued as needed through a variety of methods, including, but not limited to, purchase of ROWs or easements, land exchange, reciprocal ROWs, and other statutory authorities.

A review of the National Integrated Land System Geocommunicator (BLM 2011) identifies currently active leases and nearly 100 authorized and pending ROW grants in the Application Area for facilities that include electric transmission lines, county roads, BLM roads, state highways, water plants, oil and gas pipelines, fiber optic lines, telephone and telegraph lines, and wind test facilities. The majority of oil and gas leases are non-producing; however, there is a lease with one oil producing well in SESW T19N R87W, Section 12. The pending ROW grant for wind development facilities occupies most public land within the Application Area.

Access to public land is not available in some parts of the Application Area due to the lack of access ROWs or easements on private lands.

3.4.5 Transportation and Utility ROW Corridors

The Rawlins RMP identifies two designated ROW Corridors for transportation and utilities that cross through the Application Area: the I-80 Corridor and the Rock Springs to Dave Johnson Corridor. These ROW Corridors are shown on Map 2-2 (Designated ROW Corridors) of the Approved Rawlins RMP. The I-80 Corridor is used for buried utilities only. The Rock Springs to Dave Johnson Corridor is used for overhead utilities only. There are no other designated or major transportation and utility ROWs that cross through the Application Area. Existing major transportation and utility ROWs provide the greatest opportunities for the location of new utility and transportation systems.

A designated Section 368 energy corridor crosses through public lands in the Application Area in T21N R87W, Sections 32 and 34 and part of Section 35. These sections are located at the north boundary of the Application Area, in the checkerboard land ownership area just south of Rawlins, and have also been identified as potential disposal lands. The corridor was designated in accordance with Section 368 of the Energy Policy Act of 2005 (P.L.109-58) as part of a comprehensive, coordinated network of preferred locations for future energy transport projects that could be developed to satisfy the demand for energy (BLM 2008i).

3.4.6 Wind Energy Exclusion and Avoidance Areas

Areas with important resource values should be excluded, avoided, or mitigated in planning for new wind energy facilities (BLM IM No. 2009-043) (BLM2008d). Exclusion and Avoidance Areas for Linear Utility/Transportation Systems/Communication Sites and Wind Energy are shown on Maps 2-33a and 2-33b of the Approved Rawlins RMP. The following exclusion and/or avoidance resources occur in the Application Area:

- CDNST(avoidance area for linear utilities, exclusion area for wind energy);
- Upper Muddy Creek Watershed/Grizzly Wildlife Habitat Management Area (WHMA) (avoidance area);
- North Platte River Special Recreation Management Area (SRMA) (avoidance area);
- Historic Trails Management Area (avoidance area);
- Existing and new recreation sites (avoidance area); and
- VRM Class II areas (avoidance area).

The Rawlins RMP further states that if it becomes necessary for facilities to be placed within avoidance areas, effects will be intensively managed (BLM 2008).

3.4.7 BLM Special Management Areas

Applicable BLM management is discussed in Section 4.4. As shown on **Figure 3.4-2,** the Rawlins RMP identifies the following special designations and management areas in the Application Area:

- Upper Muddy Creek Watershed/Grizzly WHMA; and
- Overland Trail Historic Trail Management Area.

There also are two SRMAs in the Application Area, which are described in Section 3.7, Recreation:

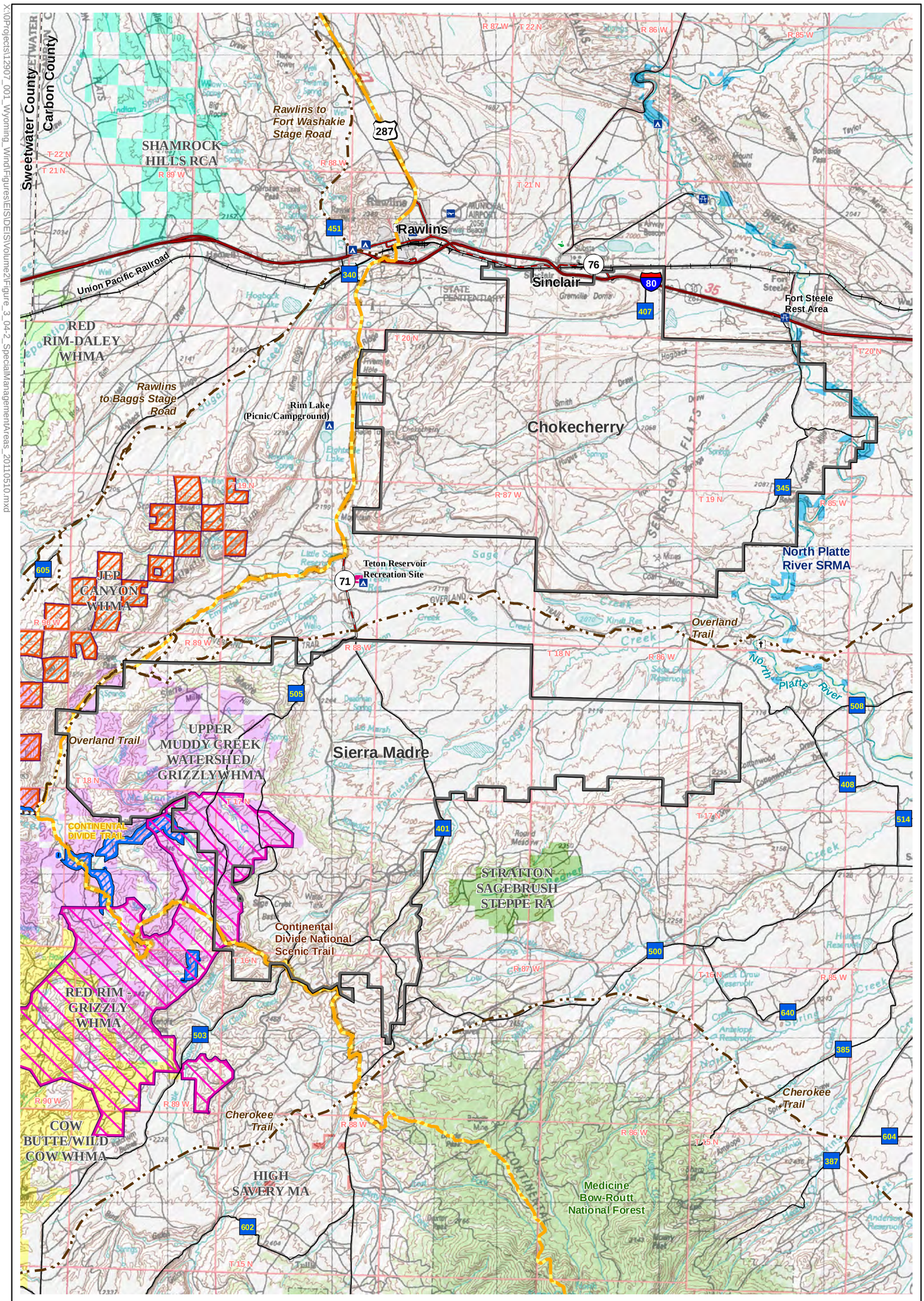
- CDNST SRMA; and
- North Platte River SRMA.

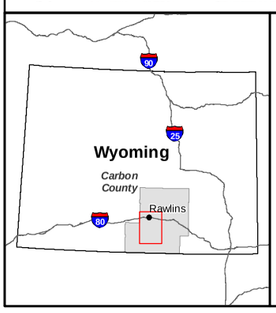
3.4.7.1 Wildlife Habitat Management Area

The Upper Muddy Creek Watershed/Grizzly WHMA was identified as a potential area of critical environmental concern (ACEC), but is currently managed as a WHMA in cooperation with WGFD, which affords it protections similar to a SRMA (Lionberger 2008). The Upper Muddy Creek Watershed Area includes 127,430 acres. Information on wildlife resources within the WHMA is provided in Section 3.14, Wildlife and Fisheries Resources.

3.4.7.2 Historic Overland Trail Management Area

The historic Overland Trail route passes between the CCSM sites; the Historic Trail Management Area is defined as 0.25 mile on either side of the Overland Trail. Approximately 3 miles of the Overland Trail cross the northern portion of the Sierra Madre site. The Overland Trail is considered to be eligible for listing on the NRHP, as described in Section 3.2, Cultural Resources and Native American Concerns.





Legend

- Continental Divide Trail
- Historic Trail
- Application Area

BLM and Wyoming Game and Fish Wildlife Habitat Management Area

- Red Rim - Grizzly Wildlife Habitat Management Area

BLM Special Recreation Management Areas

- Continental Divide National Scenic Trail
- North Platte River
- BLM Wild and Scenic River Corridor

BLM Special Management Areas

- Cow Butte/Wild Cow WHMA
- High Savery MA
- Red Rim-Daley WHMA
- Shamrock Hills RCA
- Stratton Sagebrush Steppe RA
- Upper Muddy Creek Watershed/ Grizzly WHMA

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.4-2

Special Management Areas

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:230,000

N

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3.4.7.3 Other Areas of Special Designation

There are no ACECs, Wilderness Areas, Wilderness Study Areas (WSAs) or designated Wild and Scenic Rivers in the Application Area. Special designations are shown on **Figure 3.4-2**.

3.4.7.4 Eligible Wild and Scenic Rivers

As part of the Rawlins RMP revision process, the BLM conducted a review of waterways in the RFO planning area for potential eligibility as Wild and Scenic Rivers (WSRs). Out of 402 waterways reviewed, 9 met the eligibility requirements for WSR designation. One of the 9, Littlefield Creek, crosses a corner of the Sierra Madre project site. The outstandingly remarkable values on public lands identified for Littlefield Creek that qualified it for eligibility were fisheries and ecological values (BLM 2002c). This segment, though an eligible WSR, was not recommended as suitable for inclusion in the WSR System in the Rawlins RMP.

3.4.8 Lands with Wilderness Characteristics

Section 201 of the FLPMA requires the BLM to maintain, on a continuing basis, an inventory of public lands. The BLM may conduct the inventory of lands, including lands with wilderness characteristics (LWCs), using available information (e.g., existing maps, photos, records related to range projects, monitoring data) and field verification. The inventory for wilderness characteristics is based on criteria defined in Section 2(c) of the Wilderness Act and incorporated in Section 603 of the FLPMA for sufficient size, naturalness, outstanding opportunities for either solitude or primitive and unconfined recreation, and supplemental values (ecological, geological, or other features of scientific, educational, scenic, or historical values).

The BLM reviewed the existing initial wilderness inventory conducted in 1979 to determine whether the project would directly affect any LWCs in the Application Area. A field verification of inventory units is planned for the summer of 2011 to confirm the inventory findings. The analysis only addresses inventory units that intersect the Application Area (**Table 3.4-3**). Since project-related disturbance would only occur in the conceptual area of development within the Application Area, inventory units that would not be directly disturbed by the project also were eliminated from further evaluation. Therefore, inventory units that did not meet the size criterion of 5,000 acres or any of the size exceptions, the naturalness criteria, or that did not intersect the conceptual area of development were not evaluated for wilderness characteristics.

Through this process, the BLM determined that there are six inventory units that intersect the Application Area, three of which are intersected by the conceptual area of development. Only two of the three units within the conceptual area of development were determined to possess wilderness characteristics: Sage Creek Basin West and Sage Creek Basin East (**Figure 3.4-3** and **Table 3.4-3**).

3.4.9 State and Local Planning and Zoning

State of Wyoming House Bill No. HB0072 addresses the regulation of wind energy facilities by counties in Wyoming. The bill allows for counties to adopt requirements for regulating and permitting wind farms. Permits must be in compliance with all land use and zoning regulations adopted by the affected county.

Land use on private lands in the Application Area is guided by the goals, objectives, and strategies of the Carbon County Comprehensive Land Use Plan, and controlled through zoning districts. The Future Land Use Map identifies the desired future land uses of private land within the Application Area as Smaller Lot Rural, Agricultural Rural Living, and Rural Agricultural Areas. Most of the private lands within the Chokecherry site are categorized with the future land use designation of Agricultural Rural Living, which is intended to accommodate a moderate density, rural land use pattern. Industrial uses should be carefully sited to avoid conflicts with other land uses.

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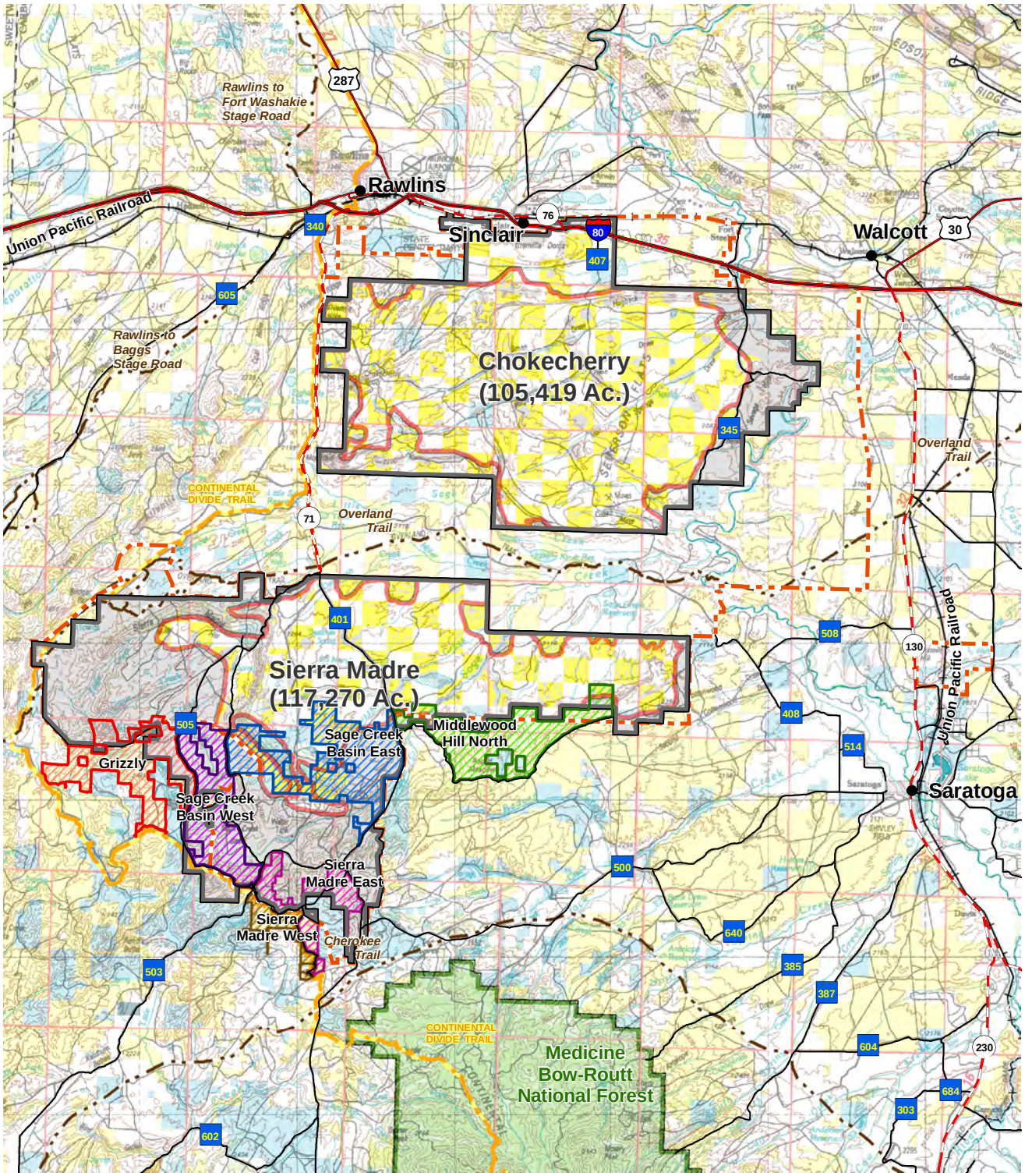

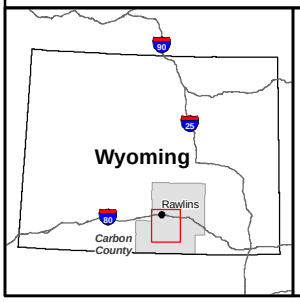

Legend

- Application Area
- **Potential Wilderness Characteristics**
  - Sage Creek Basin East
  - Sage Creek Basin West
- **No Wilderness Characteristics**
  - Grizzly
  - Middlewood Hill North
  - Sierra Madre West
  - Sierra Madre East
- No Surface Use and Applicant Committed Measures
- Likely Area of Turbine Construction
- **Land Owner**
  - Bureau of Land Management
  - Bureau of Reclamation
  - Forest Service
  - Private
  - State
  - Wyoming Game and Fish

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.4-3

Wilderness Inventory Areas

0 1 2 3 4 5 Miles
0 2 4 6 8 10 Kilometers
1:375,000
N

The land use plan also includes a wind energy overlay to identify where wind energy uses predominate in future land use planning. The overlay acknowledges the BLM wind energy ROW applications within the Application Area and that non-energy developments should be designed to minimize conflicts with energy developments.

The County will utilize the Future Land Use Map and the associated goals will be used to evaluate land use proposals and adopt an updated zoning map. The current zoning map shows private lands in the Application Area zoned as Ranching, Agriculture, and Mining (RAM) (Carbon County 2010). In the RAM zoning district, commercial wind farms are a Conditionally Permitted Use which are subject to the planning approval pursuant to Chapter V of the Carbon County Zoning Resolution of 2003 (Carbon County 2010).

Table 3.4-3 Inventory Units Crossed by the Application Area

Unit ID	Unit Name	In the Conceptual Development Area	Size (Acres)	Sufficient Size	Naturalness	Solitude	Primitive and Unconfined Recreation	Supplemental Values	Lands with Wilderness Characteristics
WYO-030-17N89W10-11	Grizzly	No	7,737	Yes	No	No	Yes	Yes	No
WYO-030-17N87W7-11	Sage Creek Basin West	Yes	6,717	Yes	TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]
WYO-030-17N88W20-11	Sage Creek Basin East	Yes	10,719	Yes	TBD[2]	TBD[2]	TBD[2]	TBD[2]	TBD[2]
WYO-030-16N88W2-11	Sierra Madre East	No	4,193	No	NA[1]	NA[1]	NA[1]	NA[1]	No
WYO-030-16N88W9-11	Sierra Madre West	No	1,743	No	NA[1]	NA[1]	NA[1]	NA[1]	No
WYO-030-17N866W6-11	Middlewood Hill North	Yes	8,373	Yes	No	No	No	Yes	No

[1] Inventory unit eliminated due to size.

[2] To be determined.

3.5 Paleontological Resources

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (P.L. 59-209; 16 USC 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on publicly administered lands. Federal protection for scientifically important paleontological resources would apply to construction or other related project impacts that would occur on publicly owned or managed lands. Another federal law regulating paleontological resources is the Archaeological and Paleontological Salvage Act (23 USC 305). The act provides for funding for mitigation of paleontological resources discovered during Federal Aid highway projects, provided that "excavated objects and information are to be used for public purposes without private gain to any individual or organization". In addition to the foregoing, the National Registry of Natural Landmarks provides protection to paleontological resources.

The BLM manages paleontological resources (fossils) on public lands under the following statutes and regulations (BLM 2010b):

- FLPMA of 1976 (P.L. 94-579);
- NEPA of 1969 (P.L. 91-190);
- Various sections of the BLM's regulations found in Title 43 CFR that address the collection of invertebrate fossils and, by administrative extension, fossil plants; and
- A recently enacted statute, the Paleontological Resources Preservation Act, was passed in March 2009. The law authorizes the BLM and USFS to manage and provide protection to fossil resources using "scientific principles and expertise" (BLM 2010b).

In addition to the statutes and regulations listed above, fossils on public lands are managed through the use of internal BLM guidance and manuals. Included among these are the BLM Manual 8270 and the BLM Handbook H-8270-1 (BLM 2010b). Various internal instructional memoranda have been issued to provide guidance to the BLM in implementing management and protection to fossil resources.

3.5.1 Potential Fossil Yield Classification

Recently, the BLM adopted the PFYC system to identify and classify fossil resources on public lands (BLM 2007c). 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 for assessing the potential for the occurrence of paleontological resources.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants and invertebrates) and their sensitivity to adverse impacts. A higher class number indicates higher potential. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur 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.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC system to be used as a guideline as opposed to rigorous definitions. Descriptions of the potential fossil yield classes and land management guidance are in **Table 3.5-1** (BLM 2007c).

Table 3.5-1 Potential Fossil Yield Classification with Management Guidance

Class	Description	Basis	Comments
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	Fossils of any kind known not to occur except in the rarest of circumstances. Igneous or metamorphic origin. Landslides and glacial deposits.	The land manager's concern for paleontological resources on Class 1 acres is negligible. Ground disturbing activities will not require mitigation except in rare circumstances.
2	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.	Vertebrate fossils known to occur very rarely or not at all. Age greater than Devonian. Age younger than 10,000 B.P. Deep marine origin. Aeolian origin. Digenetic alteration.	The land manager's concern for paleontological resources on Class 2 acres is low. Ground disturbing activities are not likely to require mitigation.
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.	Units with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	The land manager's concern for paleontological resources on Class 3 acres may extend across the entire range of management. Ground disturbing activities will require sufficient mitigation to determine whether significant paleontological resources occur in the area of a proposed action. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.

Table 3.5-1 Potential Fossil Yield Classification with Management Guidance

Class	Description	Basis	Comments
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.	Significant soil/vegetative cover; outcrop is not likely to be impacted. Areas of any exposed outcrop are smaller than 2 contiguous acres. Outcrop forms cliffs of sufficient height and slope that is out of reach by normal means. Other characteristics that lower the vulnerability of both known and unidentified fossil localities.	The land manager's concern for paleontological resources on Class 4 acres is toward management and away from unregulated access. Proposed ground disturbing activities will require assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action will impact the paleontological resources. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.
5	Highly fossiliferous geologic units that regularly and predictably produce invertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.	Vertebrate fossils and/or scientifically significant invertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. Unit is exposed; little or no soil/vegetative cover. Outcrop areas are extensive; discontinuous areas are larger than 2 contiguous acres. Outcrop erodes readily; may form badlands. Easy access to extensive outcrop in remote areas. Other characteristics that increase the sensitivity of both known and unidentified fossil localities.	The land manager's highest concern for paleontological resources should focus on Class 5 areas. Mitigation of ground disturbing activities is required and may be intense. Areas of special interest and concern should be designated and intensely managed.

Sources: BLM 2008, 2007a.

3.5.2 Fossil Potential in the Application Area

Table 3.5-2 summarizes the paleontological resource potential and sensitivity of geologic formations in the proposed Application Area. The bedrock geologic map in Section 3.3, Geology, Geologic Hazards, and Mineral Resources (**Figure 3.3-2**) shows the locations of these formations within the Application Area. The fossils listed for each geologic unit are likely to be found regionally in those units, but does not necessarily imply that such fossils would be found in the Application Area. Some of the formations listed on the table have a high potential for scientifically valuable fossils (Niobrara, Cloverly, and Morrison Formations) and fossil localities have been found within the Application Area (Uinta Paleontological Associates, Inc. 2006).

Table 3.5-2 Summary of Paleontological Resources Potential in the Application Area

Geologic Formation (Fm)/Deposit (Map Symbol)	BLM PFYC System Class/Types of Fossils[1]	Acreage within the Application Area
Alluvium (Qal), slopewash; terrace and bench deposits, playa (Qp), landslide (Qls)	Class 2[2]/types of fossils not determined	6,475
Undefined tertiary rocks (Tm)	Class 2[3]/	43,449
Lewis Shale (Kle)	Class 3/bivalves, cephalopods, gastropods, trace fossils. Less common are fish scales and shark teeth	17,373
Mesaverde Group (Kmv)	Class 3/vertebrates (dinosaurs and mammals), plants, bivalves	72,016
Steele Shale (Ks)	Class 3/invertebrates	46,673
Niobrara (Kn)	Class 5/oysters, cephalopods, fish	16,381
Steele Shale and Niobrara Formations Undivided	As above	5,471
Frontier Formation (Kf)	Class 3/fish, plants, and invertebrates (ammonites)	4,374
Frontier Formation/Mowry Shale/Thermopolis Shale undivided (Kft)	Class 3/same as above	7,130
Cloverly Formation; Morrison and Sundance Formations undivided	Class 5/dinosaurs, reptiles, and early mammals	2,793
Chugwater Formation	Class 3/invertebrates	555
Total		**222,690**

[1] Except as noted the PFYC system rank taken from BLM 2008b.

[2] Based on PFYC system criteria.

[3] Classification based on Vine and Prichard 1959. Fossils are present, but they described no specific species.

Sources: Hallberg and Case 2006a,b; Hallberg et al. 1998; Love and Christiansen 1985; Perman 1990; Slattery 2007; Vine and Prichard 1959; Watson 1980; Wilson et al.2001.

3.6 Range Resources

The entire Application Area is currently used for grazing by livestock (primarily cattle) on several grazing allotments. Grazing by big game wildlife species within the Application Area consists of mule deer, elk, and pronghorn.

3.6.1 Grazing Allotments

Range resources within the Application Area consist of intermingled private, state, and public lands administered as grazing allotments (**Figure 3.6-1**). The Chokecherry area includes portions of the Pine Grove/Bolten Allotment. The Sierra Madre area includes portions of 12 allotments, including the Pine Grove/Bolten, Cottonwood Draw, Grizzly, McCarty Canyon, Middlewood Hill, Sage Creek, Doolittle, Emigrant, Fillmore, North Savery, Platte River, and Sulphur Springs allotments. The proposed transmission line is contained within the Pine Grove/Bolten Allotment. Land ownership within the allotments is outlined in **Table 3.6-1** and the allotment permittees are listed in **Table 3.6-2**. Not all of the above-mentioned allotments will incur surface impacts. The Pine Grove/Bolten, Cottonwood Draw, Grizzly, McCarty Canyon, Middlewood Hill, and Sage Creek allotments will receive surface impacts and will be the focus of further discussion.

3.6.2 Range Management Systems

As indicated in **Table 3.6-2**, the Pine Grove/Bolten, Cottonwood Draw, Grizzly, McCarty Canyon, Middlewood Hill, and Sage Creek allotments are managed on intensive rotation systems in which grazing is rotated during the growing season among several pastures within each allotment to provide complete growing season rest for all pastures on alternate years. This has resulted in soil stabilization, decreased runoff, increased infiltration, and enhanced riparian vegetation health; all of which have improved water quality in affected streams.

3.6.3 Range Improvements

In the Application Area, considerable efforts have been made to improve rangeland conditions in the Upper Colorado River Basin and Lower North Platte Watershed. These improvements include fences, wells, developed springs, and sagebrush treatments. Discussions regarding improvements on allotments will be limited to the Pine Grove/Bolten Allotment due to the fact that this allotment makes up the vast majority of the Application Area (approximately 98 percent). Within the Pine Grove/Bolten Allotment, TOTCO has developed an intensive rotation grazing plan designed to distribute grazing pressure so as to give a full season of rest to individual pastures on alternate years. Current rangeland improvements within the overall allotment include the development of the following:

- 70 wells;
- 18 springs;
- 11 new built or repaired reservoirs;
- 9 water diversions;
- 11 canals and ditches;
- 32 miles of pipeline;
- 55 miles of new cross-fencing creating 24 new pastures;
- 15 miles of road repairs and upgrades; and
- 15,622 acres of vegetation treatments.

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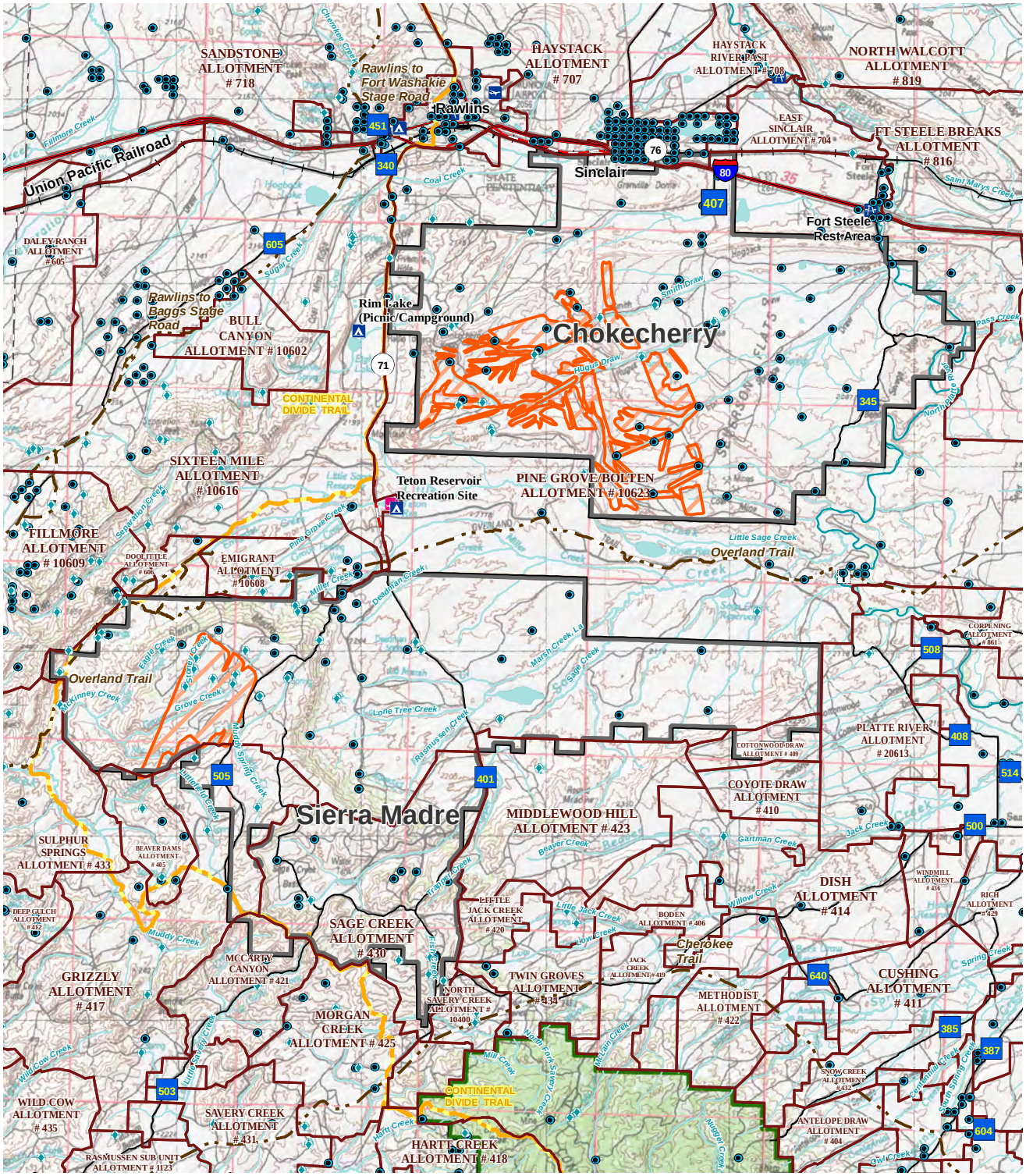

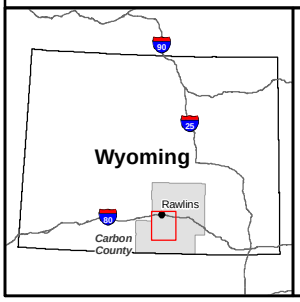

Legend

- Spring
- Water Well
- Continental Divide Trail
- Historic Trail
- Grazing Allotment Boundary
- River or Creek
- Lake or Reservoir
- Spike Treatment for Sagebrush Enhancement
- National Forest
- Application Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.6-1

Range Allotments

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.6-1 Grazing Allotments within the Application Area[1]

	Allotment #	BLM (acres) within Application Area	State (acres) within Application Area	Private (acres) within Application Area	Total Acres within Application Area	Average Acres/AUM[2]	AUMs for Application Area[3]
Chokecherry Area							
Pine Grove/Bolten	10623	48,565	1,937	54,413	104,915	10	10,492
Sierra Madre Area							
Pine Grove/Bolten	10623	36,776	3,264	41,946	82,131	6	13,689
Cottonwood Draw	00409	184	636	674	1,494	6	255
Grizzly	00417	6,682	604	104	7,390	5	1,418
McCarty Canyon	00421	1,042	121	0	1,163	7	174
Middlewood Hill	00423	491	320	8	819	5	175
Sage Creek	00430	13,383	3,288	7,308	23,979	4	5,500
Sulphur Springs	00433	0	0	5	5	6	1
Doolittle	00606	0	0	1	1	3	<1
North Savery	10400	0	0	2	2	4	1
Emigrant	10608	0	0	90	90	6	6
Fillmore	10609	0	0	18	18	5	4
Platte River	20613	5	0	9	14	5	3
Proposed Action T-Line							
Pine Grove/ Bolten	10623	11	30	135	175	6.0	29

[1] Acreage data were taken from GIS files provided by the BLM.

[2] Average acres/AUM derived from public land and federal AUMs in entire allotment.

[3] AUMs for Application Area based on dividing total acres by average acres/AUM.

Table 3.6-2 Potentially Affected Grazing Permits due to Surface Disturbances within the Application Area[1]

Allotment Name	Allotment #	Permittee	Class of Livestock	On Date	Off Date	Grazing Management System
Pine Grove/Bolten	10623	Overland Trail Cattle Company	Cattle	1-Mar	31-Dec	Rotation
Cottonwood Draw	409	TA Ranches	Cattle	1-Jun	18-Sep	Rotation
Grizzly	417	Stratton Sheep Company and others	Cattle/Sheep	1-Jun	15-Sep	Rotation
McCarty Canyon	421	McCarty Ranch Company LLC	Cattle	15-May	25-Sep	Rotation
Middlewood Hill	423	TA Ranches	Cattle	1-May	31-Oct	Rotation
Sage Creek	430	Overland Trail Cattle Company	Cattle	10-May	25-Sep	Rotation

[1] Tabular data obtained from BLM 2009e, 2008b.

These improvements and the intense rotation grazing program have created an upward trend in two of the six standards used by the BLM for evaluation; standards #2 – Riparian/Wetland Health and #4 - Wildlife/threatened and endangered (T&E). A more complete discussion of these standards for evaluation is included in Section 3.6.4. This has resulted in reduced sediment loads and improved water quality, thereby allowing the removal of Sage Creek from WDEQs list of impaired or threatened waters in 2008 (WDEQ 2010) as well as delisting of the upper portions of McKinney Creek.

3.6.4 Allotment Evaluation Status

The BLM began evaluating lands by watersheds rather than by allotments in 2001. These evaluations, called Standards and Guidelines Assessments, review land resources for more than grazing considerations and now apply to all uses and resources. As stated in the Rawlins RMP (BLM 2008b), 'The objectives of the rangeland health regulations are to "promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands."

Properly functioning conditions refers to the primary method used in evaluating this standard, which is through a qualitative assessment procedure called proper functioning condition (PFC) (BLM 1998b). This process evaluates physical functioning of riparian/wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. A properly functioning riparian /wetland area will provide the elements contained in the definition:

- Dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality;
- Filter sediment, capture bedload and aid floodplain development;
- Improve flood-water retention and ground water recharge; and
- Develop root masses that stabilize streambanks against cutting action. It is important to note that the PFC assessment provides information on whether an area is physically functioning in a manner that allows maintenance or recovery of desired values (e.g., fish habitat, neotropical bird habitat, or forage) over time. PFC assessments are used along with other existing information such as stream cross-sections, photo-points, and habitat assessments to evaluate this standard of rangeland health (BLM 1998b).

The Application Area falls within two assessment areas consisting of Upper Muddy Creek and Savery Creek watersheds in the Colorado River drainage and North Platte River-Cow Creek, Jack Creek, Sage Creek, North Platte-Iron Springs Draw, Pass Creek, and Sugar Creek watersheds in the North Platte River drainage. A Standards and Guidelines Assessment was conducted for the Colorado River drainage in 2001 and for the North Platte drainage in 2003. The standards used for evaluation are:

- #1) Watershed;
- #2) Riparian/Wetland Health;
- #3) Uplands;
- #4) Wildlife/T&E/fisheries Habitat/weeds (Wildlife/T&E);
- #5) Water Quality; and
- #6) Air Quality.

The results that apply to rangeland resources are summarized below.

3.6.4.1 Colorado River Drainage

Within the Colorado River drainage, the Sulphur Springs and Grizzly allotments are included in the Upper Muddy Creek Watershed. The McCarty Canyon, North Savery, and the southern tip of the Sage Creek Allotment are within the Savery Creek Watershed (**Figure 3.6-2**).

The 2001 Standards and Guidelines Assessment showed the overall trend of both watersheds within the basin to be moving upward. This is largely due to funding that was granted to the LSRCD. Implemented projects focused on erosion and stream channel stabilization and water quality improvement. Livestock grazing BMP's, cross fencing, more than 20 off-stream water developments, improved road and stream crossings, vegetation manipulation, and prescribed burning of over 6,000 acres were implemented to improve livestock distribution (Ellison et al. 2009). Similarly, the Muddy Creek Resource Management Group (MCRMG) along with the Natural Resource Conservation Service (NRCS) have made significant improvements by addressing issues related to water quality, road based erosion and habitat. Successful results have allowed for the reintroduction of Colorado River cutthroat trout (BLM 2002b). Stream morphology is generally improving in the basin with narrowing of stream channels and floodplain expansion. Perennial vegetation is stabilizing stream banks and preventing bank sloughing. However, the Pine Grove/Bolten Allotment is failing to meet Standard #2 – Riparian/Wetland Health, and Standard #5 – Water Quality. Efforts are being made to meet these failing standards through grazing management practices that include intensive rotations, cross fencing and additional water developments. All of which will serve to improve livestock distribution and grant riparian vegetation longer periods of rest and reduced grazing pressure.

Muddy Creek watershed is, for the most part, lacking beaver ponds and experiencing faster flow events and reduced water storage in their absence. MCRMG is experimenting with in-stream structures that provide gradient control and assist overall riparian health by reducing channelization and raising the water table along destabilized stretches. It should be noted that channel and upland gully erosion is a natural occurring process along Muddy Creek and was observed in historical accounts of the area. Vegetation treatments, such as prescribed burns and herbicide use, have been applied to improve the diversity of the vegetation structure for enhanced hydrologic function. Erosion from increased roads across the watershed has been mitigated through improved construction and management techniques. Installation of water bars and culverts and graveling of road surfaces have minimized the impacts of erosion on Muddy Creek. However, one area of concern along the county road in McCarty Canyon that follows Little Savery Creek was a source of significant erosion in 2002 (BLM 2002b). Increased recreational off-highway vehicles have been a rapidly increasing source of erosion.

Wetland and riparian systems in the Colorado River drainage include riparian grassland, willow-waterbirch shrublands, aspen woodlands (most aspen woodlands have mostly extirpated or are declining), cottonwood woodlands, aquatic vegetation, ephemeral drainages, manmade reservoirs, seeps/springs, and playa lake beds. Most (63 percent) of these areas are in PFC. Many (36 percent) are functioning at Risk and 1 percent was evaluated as non-functioning. A new Allotment Management Plan and several range improvements have been implemented to improve land conditions. Fish Creek in the Sage Creek Allotment was evaluated to be functioning at risk and one part as non-functioning. New management and grazing practices have been improving the functionality of Fish Creek. McKinney Creek in the Pine Grove/Bolten Allotment did not meet riparian health standards as of 2002. This area has highly erosive soils of heavy shale and clay that have hampered riparian restoration efforts.

The dominant vegetation communities in the Colorado River drainage are sagebrush/grassland and sagebrush-mountain shrub/grassland. More specifically, lower elevations receiving little precipitation tend to support salt desert shrub vegetation while higher elevations support sagebrush-bunch grass communities. Mesic upland sites may include aspen and some conifer species, and riparian communities are comprised primarily of sedges and willows.

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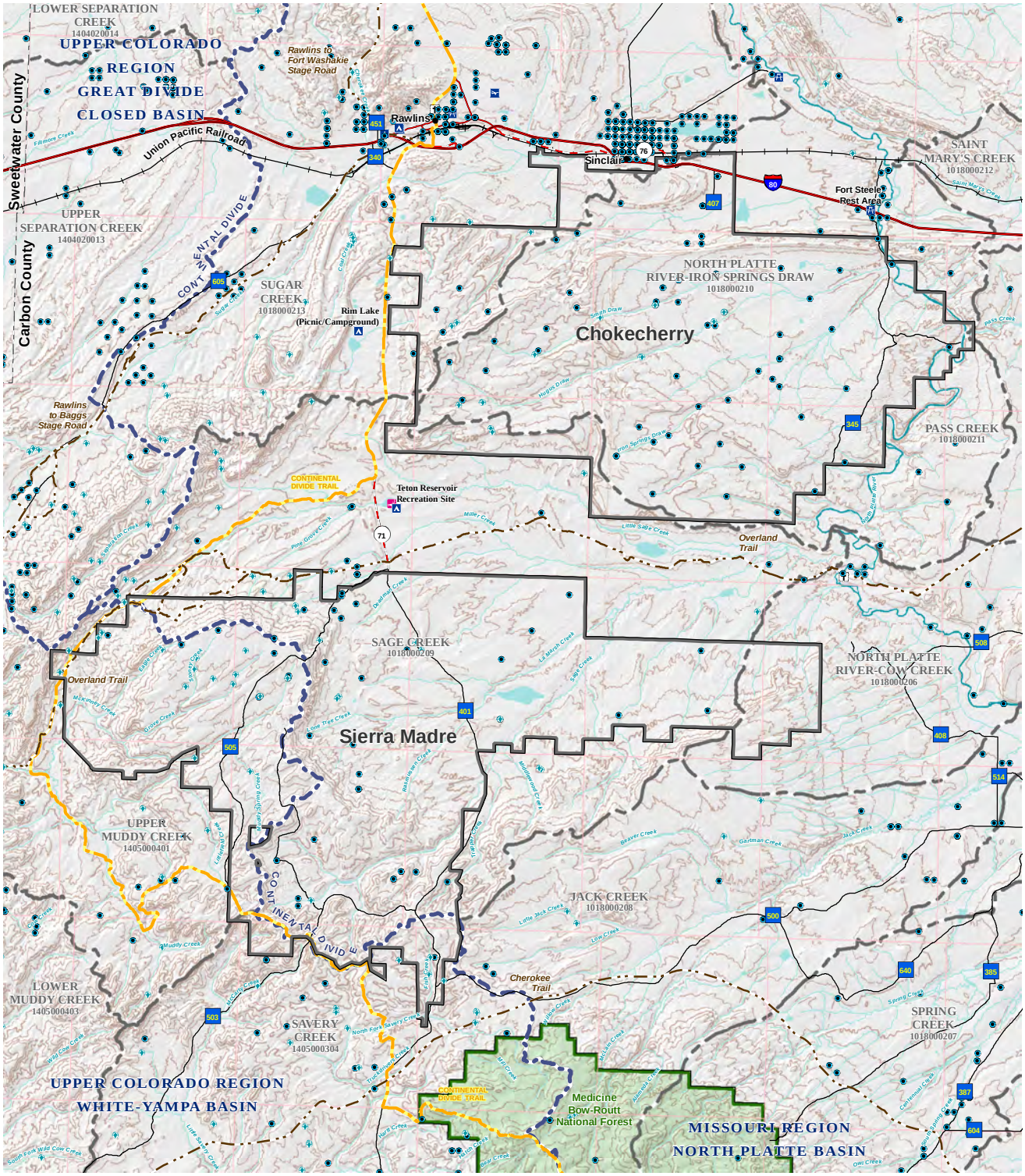
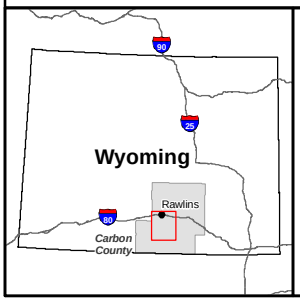




Legend

- Spring
- Water Well
- Continental Divide Trail
- Historic Trail
- Application Area
- Continental Divide
- River or Creek
- Lake or Reservoir
- Watershed Boundary
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.6-2

Application Area Hydrography

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Efforts have been made to improve the overall health of the Colorado River drainage rangelands in and around the Application Area. The LSRCD, BLM, and WGFD have spent significant time and resources on improvement projects within the Grizzly Allotment including:

- Livestock rotation plan designed for short duration grazing;
- Fencing to allow for rotational grazing;
- Water development for livestock distribution;
- Planting trees and shrubs, especially in riparian areas;
- Roadwork intended to minimize erosion that reduces water quality of nearby streams and creeks;
- In-stream support structures; and
- Aquatic monitoring.

A monitoring program that ran from 1992 to 1998 showed improvements in wildlife and riparian habitat. This was observed in the proper functioning condition of creeks, narrowing of stream channels, and increased densities in willow communities (BLM 1998c). Similar improvements and the intense rotation grazing in the Pine Grove/Bolten Allotment have created an upward trend in Standard #2 – Riparian/Wetland Health and #4 – Wildlife/T&E for the portion of the allotment within this watershed. This has resulted in improved water quality and allowed for the delisting of the upper portions of McKinney Creek (NRCS 2005).

3.6.4.2 North Platte River Drainage

Within the North Platte River drainage, the Middlewood Hill, Sage Creek, Doolittle, Emigrant, Sixteenmile, and north-central portion of the Pine Grove/Bolten Allotment are included in the Sage Creek Watershed. The Cottonwood Draw, Platte River, and the southeast corner of the Pine Grove/Bolten Allotment are within the North Platte River-Cow Creek Watershed (**Figure 3.6-2**). The 2003 Standards and Guidelines Assessment showed the overall trend of the basin to be moving upward. This is due to healthy upland vegetative cover, good overall health of upland vegetation communities, and improvement in riparian/wetland health and functionality (BLM 2004a).

Conditions within the Application Area in the North Platte River drainage are, for the most part, similar to the Colorado River drainage. Stream morphology is generally improving due to better grazing practices and range improvements. Improved stream morphology is seen in the narrowing of stream channels and floodplain expansion. Perennial vegetation is stabilizing stream banks and preventing bank sloughing. Local, state, and federal government agencies along with private individuals, livestock operators, and non-profit organizations have made significant improvements by addressing issues regarding riparian condition, erosion, wildlife habitat, and noxious weed infestation. Fifty-five miles of cross-fencing; over 14 miles of road repairs; 15,622 acres of vegetation treatments; and water development projects consisting of wells, pipelines, spring developments, reservoirs, diversions, canals, and ditches have been implemented to facilitate improved grazing management practices and achieve better livestock distribution as a tool for better land management. The results have been documented at over 30 photopoints and 20 other monitoring sites. Additionally, there has been a noticeable increase in willow communities along intermittent and ephemeral drainages due to the above mentioned grazing management techniques.

Wetland and riparian systems within the Application Area of the North Platte River drainage include desert springs and seeps and their associated streams; snow supported seeps, springs; and streams that flow from higher elevation; man-made impoundments; and man-made wetlands around artesian wells. Noxious weeds have become the most important issue affecting riparian areas in the associated watersheds. The main species of weeds that affect the watershed are leafy spurge (*Euphorbia esula*),

Canadian thistle (*Cirsium arvense*), perennial pepperweed (*Lepidium latifolium*), and Russian knapweed (*Acroptilon repens*). In the area of Kindt and Rasmussen reservoirs, salt cedar (*Tamarix* sp.) has also become widespread. These weeds can be spread naturally by disturbance from livestock and wildlife, wind, and surface water runoff or by human activities such as construction/development activities, recreational use, or by irrigation practices. Sixteenmile, Middlewood Hill, and Platte River allotments failed Standard #2 – Riparian/Wetland Health at the time of the evaluation. The Middlewood Allotment has seen modifications in livestock management and the reintroduction of fire has increased the health of Beaver Creek. The Sixteenmile Allotment failed the riparian standard in multiple areas, but these issues have been addressed through cross-fencing, prescribed burning, and numerous spring developments. The Platte River Allotment also failed this standard due to the condition of a spring in Second Cottonwood Draw. This spring has been developed and fenced and has improved tremendously.

3.7 Recreation

This section provides information concerning recreation opportunities, resources, and activities within and surrounding the Application Area.

3.7.1 Analysis Area and Methodology

Recreation is a primary land use within portions of land surrounding the Application Area. The analysis area for recreation resources (recreation analysis area) includes all federal, state, local, and private recreational resources in the general vicinity of the Application Area and that may be impacted by project alternatives. The recreation analysis area is located entirely within Carbon County, Wyoming, and includes tracts of land and facilities managed by the BLM RFO; USFS, Medicine Bow National Forest, Brush Creek/Hayden Ranger District; WGFD; and private land. This analysis includes a review of available recreation information from the BLM and USFS district offices, the state of Wyoming, Carbon County, and various cities and towns in the analysis area. Available federal, state, and local planning documents relevant to recreation also were reviewed. **Figure 3.7-1** shows the location of developed BLM recreation sites, State of Wyoming recreation sites, and land ownership throughout the project vicinity.

3.7.2 Recreation Opportunities on Public Lands

3.7.2.1 Bureau of Land Management

The primary recreation resources in the recreation analysis area are the public lands managed by the BLM. These opportunities are primarily dispersed activities including hunting, fishing, hiking, camping, off-highway vehicle (OHV) use, mountain biking, pleasure driving, and wildlife viewing. Opportunities for developed recreation in the recreation analysis area also exist to a limited degree.

<u>Developed Recreation</u>

Rim Lake Recreation Site

The Rim Lake Recreation Site is located approximately 7 miles south of Rawlins on WY 71. Rim Lake is a day use area that offers one shelter with picnic tables. The lake supports a fishery when water is available. A popular segment of the CDNST climbs from the lake to the top of the Atlantic Rim of the Continental Divide and offers 360 degree views of the surrounding area (Schneckenburger and Smith 2008). This CDNST segment also is open to motorized use, as allowed in accordance to a BLM easement. The BLM Recreation Management Information System (RMIS) data indicates a total of 3,757 visits from October 1, 2006 through September 30, 2007; and a total of 2,592 visits from October 1, 2007 through September 30, 2008 at the Rim Lake Recreation Site (RMIS 2008).

Teton Reservoir Recreation Site

The Teton Reservoir Recreation Site is located approximately 13 miles south of Rawlins off WY 71. The Teton Reservoir Recreation Site is used primarily for day use activities, including fishing and motorized and non-motorized boating. The site includes a small campground with five campsites; vault toilets; a boat ramp; and parking. Individual campsites include picnic tables, fire rings, grill, and designated parking spaces. Fish in the reservoir include rainbow and brown trout, and wildlife in the area includes pronghorn, mule deer, coyotes, grouse, rattlesnakes, and ducks (BLM 2008c). Teton Reservoir is popular as both a day use area as well as a camping destination. BLM RMIS data indicates a total of 4,076 visits from October 1, 2006 through September 30, 2007; and a total of 3,289 visits from October 1, 2007, through September 30, 2008, at Teton Reservoir Recreation Site (RMIS 2008).

Dispersed Recreation

The majority of recreation in the analysis area occurs as dispersed activities: camping, hunting, hiking, motorized and mechanized recreation (scenic driving, off-road vehicle riding, biking, picnicking, and snowmobiling), fishing and boating, and wildlife viewing activities, as described in the following sections.

Access for dispersed recreation occurs through public roads, the CDNST, the North Platte River, and across public lands. Access to public lands is limited due to the checkerboard pattern of land ownership, particularly in the Chokecherry site and the northern portion of Sierra Madre site. The southern portion of the Sierra Madre site has more open access to public lands for recreation. To legally use public lands for recreation, there must be public access to them via a public road. There are some public land parcels that have no public access. To recreate on these public lands, a person must have permission from the owner of the adjacent private land, even if there is only a small distance of private land between a public road and public lands.

Camping

Little Sage Reservoir is an undeveloped recreation site located approximately 13 miles south of Rawlins west of WY 71 and Teton Reservoir Recreation Site (BLM 2008c). Little Sage Reservoir lies along the CDNST and is used primarily for day use activities and informal, dispersed camping primarily by CDNST users. Wildlife in the area includes pronghorn, mule deer, coyotes, grouse, rattlesnakes, and ducks (BLM 2008c). BLM RMIS data is not available for Little Sage Reservoir (RMIS 2008).

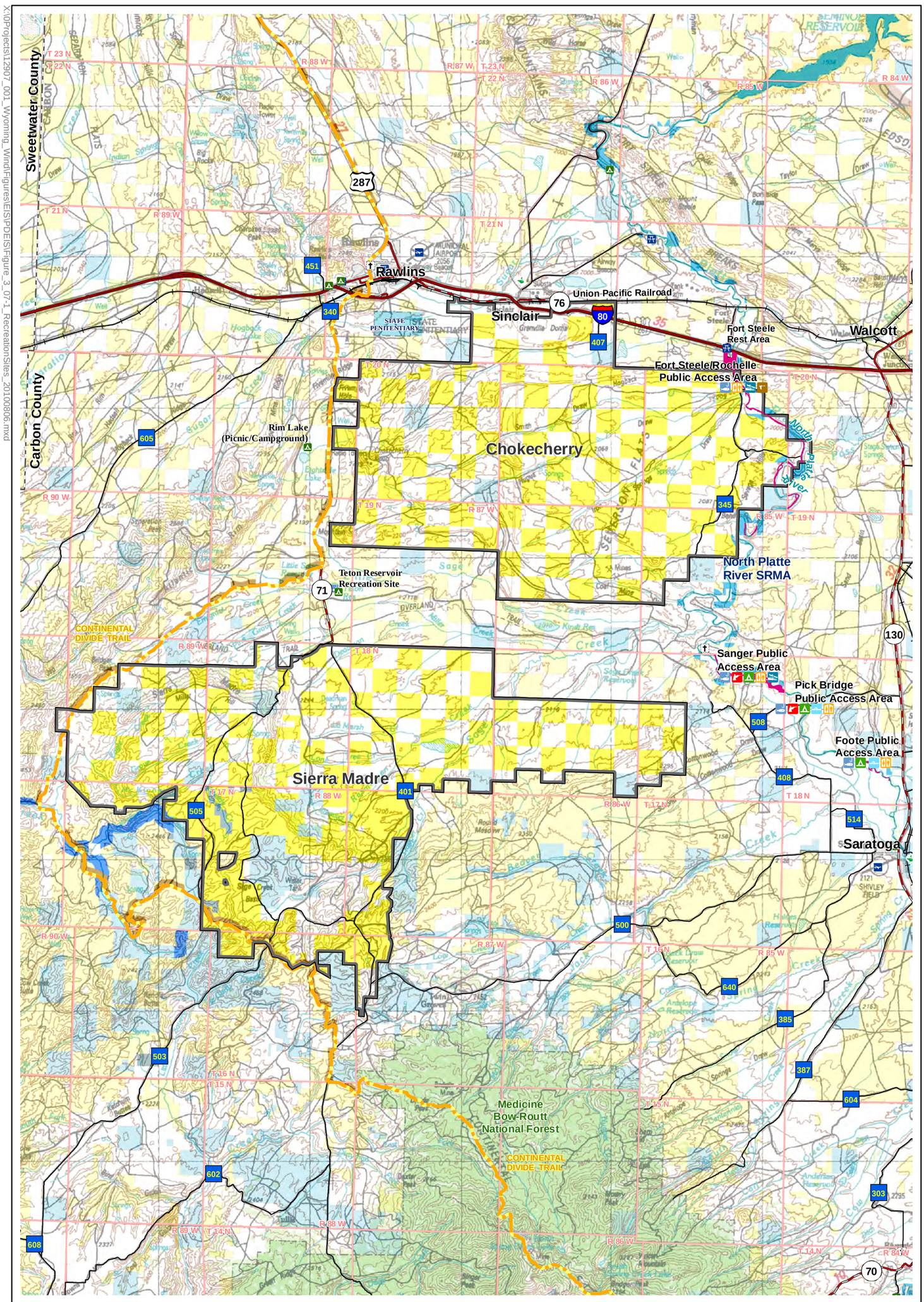
Hunting

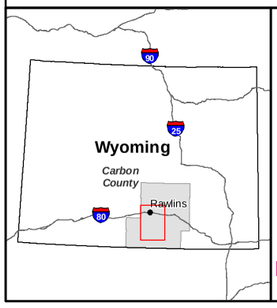
Both big and small game hunting is the most popular recreation activity in the study area and overall participation is high during the open hunting seasons. Primary big game species for hunting include deer, elk, antelope, moose, black bear and mountain lion. Primary small game species include blue grouse, greater sage-grouse, and cottontail rabbit. For each big game species in Wyoming, there are various hunt units throughout the state. Some of these hunt units are granted a limited number of quota licenses, while others are open to general hunt license holders. The WGFD tracks the number of quota licenses granted for each big game species. For each big game species there are different hunt units that overlap in the Application Area. WGFD reports that while limited quota licenses can be reported with certainty, the many hunt units in the state that are open to general licenses for residents may greatly increase use by hunters. There is no way to track the number of hunters in these general license units. **Table 3.7-1** below lists the hunt units that are partially in the Application Area for each big game species and the number of limited quota licenses granted for each.

Little Rawlins campground is an informal, dispersed area located at the intersection of CRs 503 and 401. This is a highly popular location for hunters to use as a base camp during the big game hunting season. The BLM estimates that approximately 95 percent of the use for this area occurs between the start of antelope season and the close of cow elk season. These seasons typically occur between late September and late January, with the busiest time being in October and November. At any one time during this period there typically are about 35 recreational vehicles (RV's) parked at Little Rawlins. As Little Rawlins is informal, there are no developed facilities (Smith 2008).

Continental Divide National Scenic Trail

Another popular dispersed recreation destination is the CDNST. The CDNST is approximately 3,100 miles long, from Canada to Mexico through the states of Montana, Idaho, Wyoming, Colorado, and New Mexico. South of Rawlins, the trail parallels WY 71 to the vicinity of Little Sage Reservoir, where the trail turns to the west and then southeast into the Medicine Bow-Routt National Forest. The CDNST circumvents the Chokecherry site and the majority of the Sierra Madre site. Near the southernmost portion of the Application Area, however, the trail crosses the Sierra Madre site for a distance of approximately 3 miles. Existing CDNST easements on private land provide legal access for





Legend

Public Acces and Facilities
- Boat Ramp
- Camping
- Floating/Row Boating
- General Fishing
- General Hunting
- Restroom
- Waterfowl Hunting
- Public Access Area

- Application Area
- BLM Wild and Scenic River Corridor

BLM Special Recreation Management Areas
- North Platte River

BLM Exclusion Areas
- Continental Divide National Scenic Trail

Land Owner
- Bureau of Land Management
- Bureau of Reclamation
- Forest Service
- Private
- State
- State Penitentiary
- Wyoming Game and Fish

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.7-1

Recreation Sites in the Project Vicinity

0 1 2 3 4 5 Miles
0 1 2 3 4 5 10 Kilometers
1:250,000

N

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Table 3.7-1 Hunt Units and Licenses Granted for Each Big Game Species in the Application Area

Species	Hunt Unit #	Licenses Granted[1]
Antelope	48	1,350
	62	300
	56	100
	55	75
	50	1,150
	108	250
	53	50
Mule Deer	87	200
	79	50
	84	General Licenses
	83	General Licenses
	82	20+ General Licenses
Whitetail Deer	79	25
Elk	111	190
	130	General Licenses
	108	200
	12	250+General Licenses
	21	325+General Licenses
Moose	41&38	40

[1] The number of licenses granted represents the entire unit..

Source: WGFD 2009a.

recreationists. While most use along the CDNST consists of day and thru hiking, limited mountain biking and horseback riding also occurs. For the 2007 use season, the BLM recorded approximately 189 visits along the CDNST. For the 2008 use season, the BLM recorded approximately 673 visits along the trail (RMIS 2008).

Within the RFO, the CDNST is managed as a SRMA. The 0.25 mile wide corridor of the CDNST SRMA is managed as a significant recreational resource to maintain or enhance a diversity of recreational opportunities and benefits while providing trail users opportunities to view the diverse topographic, geographic, vegetative, wildlife, and scenic phenomena that characterize the CDNST and observe human uses of natural resources (BLM 2008a).

Motorized and Mechanized Recreation

Other dispersed recreation activities in the project study area include scenic driving, biking, picnicking, OHV riding, and snowmobiling. Scenic driving is a highly popular activity from late March through November. However, there is particularly heavy participation in this activity as the aspen leaves change during the fall season. WY 71 is a primary route for scenic driving as recreationists travel south from

Rawlins to Aspen Alley in the Medicine Bow National Forest. Southbound motorists typically travel west to Baggs, or east towards Saratoga (Smith 2008).

There is moderate to heavy OHV use in the recreation analysis area, typically along established roads. Much of this use also occurs during big game hunting seasons when hunters often establish a base camp then use OHVs to access more remote hunting locations. No specific use numbers are available for OHV use (Smith 2008).

A moderate level of biking use occurs in the recreation analysis area, typically along established roads such as WY 71 and Hydrology Road. Small levels of dispersed picnicking and other day use activities also occur in the recreation analysis area. No specific use numbers are available for any of these activities (Smith 2008).

Fishing and Boating Associated with the North Platte River

The North Platte River is a major recreation resource for the area particularly with respect to fishing and non-motorized boating. Non-motorized boating is allowed from Saratoga to the State line only. From the Colorado border down to Sage Creek, the North Platte River is classified as a blue-ribbon trout fishery and largely considered some of the best wild trout fishing in the continental U.S. This section of river is managed for "wild" trout. Rainbow and brown trout are the predominant game fish, with smaller populations of brook and walleye (BLM 2008c). Also, the river section from the Colorado border downstream to Sanger Public Access Area is highly popular for canoeing, kayaking, and rafting. From Saratoga downstream to Fort Steele, which runs through the Application Area, boating and fishing use is somewhat less than the upper stretch, but it is still a popular destination. This stretch is very popular with canoeists who float the 44-mile journey in approximately 2 to 3 days. Details on each of the Public Access Areas in the recreation analysis area are described below in Section 3.7.3.

The North Platte River is listed as a SRMA in the Rawlins RMP. This 3,060-acre SRMA is managed to provide high-quality recreational opportunities.

Much of the North Platte River runs through the checkerboard land ownership pattern where public and private sections of land alternate, but the water over private land is public. The land beneath the water and the river banks are private where the river crosses private land. As such, a person must get permission from private landowners to use their private land unless there is an easement for public use. To assist in knowing whether users are on public or private land, blue or red signs have been erected along the river indicating that the river is entering public, state, or private lands with easements (blue), or if the river is entering private land (red).

Other popular fishing resources include Beaver Creek, Little Jack Creek, Low Creek, Willow Creek, Sage Creek, Middlewood Creek, Pass Creek, Fish Creek, Miller Creek, Savery Creek, Truckdrivers Creek, Little Muddy Creek, McCarty Creek, Littlefield Creek, Grover Creek, McKinney Creek, and Stoney Creek as described in Section 3.14, Wildlife and Fisheries Resources.

3.7.2.2 Medicine Bow National Forest

The northern boundary of the Medicine Bow National Forest is approximately 10 miles south of the southernmost turbines in the Application Area. Recreation in the Medicine Bow National Forest is primarily dispersed in nature and revolves heavily around hunting and scenic resources. Other popular recreation activities include OHV riding and snowmobiling. The CDNST also traverses through this portion of the forest (USFS 2008).

Recreation use in this geographic area varies, with dispersed camping and big game hunting the most common activities. Outfitter and guiding opportunities are available for both hunting and fishing. Snowmobile use occurs on several designated routes; however, use in this area is low to moderate, with

most use coming from the local communities. Cross-country skiing is another popular activity in the area. The Jack Creek Campground is a destination campground in this area of the Forest (USFS 2003).

3.7.3 State, County, and Municipal Recreation Opportunities

For most visitors, fishing and boating access to the North Platte River is provided through public easements at Public Access Areas managed by WGFD. Public easements extend from midstream of the river outward to a point 100 feet from the high water line (WGFD 2008a). The following are the Public Access Areas within the recreation analysis area:

- The Fort Steele/Rochelle Easement Public Access Area (PAA) is located along I-80, approximately 8 miles east of the Town of Sinclair. The Rochelle Easement provides for public access to approximately 11 continuous miles of the North Platte River immediately south of I-80 (BLM 2008c). Additionally, there is a put-in for non-motorized boating, as well as ample parking. There also are restrooms and picnic facilities associated with the adjoining rest area. While this PAA sits just outside of the Application Area, it is within the recreation analysis area.
- The Sanger PAA is located approximately 13 miles south of I-80 and is accessed via 130 and CR 508. In addition to fishing access, Sanger has a boat ramp, picnic facilities, restrooms, and informal camping areas. Hunting also is permitted in this area (WGFD 2008a). The Sanger PAA lies within the Application Area.
- The Pick Bridge PAA is located approximately 14 miles south of I-80 and is accessed via 130 and CR 508. In addition to fishing access, Pick Bridge has picnic facilities, restrooms, and informal camping areas. There also is primitive floating access but no vehicle access to the water. Hunting also is permitted in this area (WGFD 2008a). The Pick Bridge PAA lies within the Application Area.
- The Foote PAA is located approximately 16 miles south of I-80 and is accessed via 130 and CR 508. In addition to fishing access, Foote has picnic facilities, restrooms, and informal camping areas. There also is primitive floating access but no vehicle access to the water (WGFD 2008a). The Foote PAA lies within the Application Area.

Table 3.7.2 indicates the public use data for the Wyoming Department of Game and Fish, North Platte River PAA. Data were collected over a 3- to 4-year period using a combination of car counters and public use surveys. The highest public use for each PAA is reported in people/year.

There are no developed parks or recreation facilities operated by Carbon County in the recreation analysis area. However, there are several museums in the vicinity of the recreation analysis area including: the Wyoming Frontier Prison in Rawlins; the Carbon County Museum in Rawlins; the Parco/Sinclair Museum in Sinclair; and the Saratoga Museum in Saratoga (Carbon County 2009b). The Historic Fort Steele and Museum at the Fort Steele exit off I-80 also is located in Carbon County. Fort Steele is operated by Wyoming State Parks and is a popular destination for tourists travelling along I-80. Named in honor of Colonel Frederick Steele, Fort Steele was laid out on June 30, 1868, by Major Richard I. Dodge at the place where the Union Pacific–the westward-building portion of the nation's first transcontinental railroad–met the North Platte River. It was one of three military posts established along the railroad in Wyoming during the 1860s to provide protection for the line, the work crews, and the communities that developed along its route. Fort Steele State Historic Site offers an excellent opportunity to preserve and interpret a portion of Wyoming's diverse cultural heritage (Wyoming Parks 2009).

Other opportunities in the recreation analysis area are operated by the City of Rawlins. The City of Rawlins owns and operates an 18-hole championship level golf course located on the east-side of the city. Rawlins also owns and operates numerous municipal parks throughout the City (City of Rawlins 2009b).

Table 3.7-2 Public Use at the North Plate River PAAs in or near the Application Area

Public Access Area	People per Year
Fort Steele (north of I-80)	3,776
Rochelle (south of I-80)	812
Sanger	6,066
Pick Bridge	9,030
Foote	26,976

3.7.4 Private Recreation Opportunities

There are several private campgrounds and RV parks in the recreation analysis area. Three of these areas are in Rawlins, including the American President's Campground, the KOA Campground, and the Western Hills Campground, which are all open year round. Rawlins also is the location of the RV World Campground, which is open seasonally from April through September. In Saratoga, the Deer Haven RV Park and the Saratoga Lake Campground and RV Park are both open seasonally from May through September.

Numerous private outfitters also operate within the recreation analysis area. These outfitters offer a wide variety of services including guided trips for hunting, fishing, floating, and wildlife viewing. These activities occur primarily on public lands and waters surrounding the Application Area.

3.8 Socioeconomics

The delineation of the socioeconomic study area for the project and the characterization of local socioeconomic conditions are guided by the potential socioeconomic effects of the project. These include:

- The effects of a large temporary and transient construction work force, principally the demand for temporary housing and community services;
- The effects of a relatively small operations work force, principally the demand for long-term housing and community infrastructure and services;
- Project-related materials, equipment, and supplies transport and work force commuting on municipal streets, county roads and state highways and the demand for transportation management, maintenance, and public safety services;
- Economic and fiscal effects of project construction and operations; and
- Economic and social effects of the change in land use and visual/aesthetic character of the area.

The project is located in south-central Carbon County, Wyoming. Carbon County is Wyoming's third-largest county in terms of land area, 60 percent of which is in public ownership, but it ranks 12th (of 23) in terms of population. Except for a proposed intermodal staging area, the Application Area lies south of I-80 and the mainline of the UPRR, both of which generally bisect the county east to west. The City of Rawlins and Town of Sinclair are immediately north of the Application Area.

In addition to Rawlins and Sinclair, several other Carbon and Sweetwater county communities are within commuting distance of the project. Primary highway access to the Application Area would be via CIG Road/Carbon County Road (CCR) 407 near Sinclair, which would then link to an internal haul road. CCR 407 also crosses I-80 at Interchange 219 in this area. This access would be used by all heavy trucks, including those transporting WTG components. Two transportation scenarios for construction workers remain under consideration: 1) all commuting construction workers also would use this internal haul road; and 2) workers would be allowed to use other Wyoming State Highways and Carbon County roads. WY 71/CCR 401, known together as the Sage Creek Road, travels south from Rawlins and would provide access to the Application Area for workers under this scenario. There are a number of Carbon County roads which provide access to the Application Area from the east, west, and south. These roads are identified in Section 3.10, Transportation. **Table 3.8-1** displays communities and highway commuting distances.

From Baggs, Dixon, and Saratoga, and possibly Riverside and Encampment, commuting distances on gravel county roads to certain portions of the Application Area would be closer than indicated by the highway distances; however, travel on these roads requires slower speeds. Although each community listed in **Table 3.8-1** is theoretically within commuting distance of the Application Area, only a few are likely to be substantially affected by the project.

For this assessment, the primary study area for socioeconomic effects is southeastern Carbon County, including the communities of Rawlins, Sinclair, and Saratoga. Rawlins is the largest community near the project and offers the largest inventory of temporary housing. Sinclair has no hotels, motels or RV parks, but the intermodal transfer facility would be located along its eastern boundary. Rawlins and Sinclair are the only two communities located on primary access routes to the Application Area and the two incorporated communities from which views of the project would be relatively prominent. Saratoga has the second largest, though substantially smaller inventory of temporary housing in the county, but also has strong seasonal tourism and recreation demand for that housing, particularly during summer months. Baggs and Dixon have limited temporary housing, which is typically absorbed by workers in nearby natural gas fields and by hunters during the fall. An existing mobile home/RV park in

Walcott Junction, located at the junction of I-80, U.S. 30, and WY 130, is not currently operating but could be reopened given sufficient demand. The Sweetwater County community of Wamsutter is centered in a number of natural gas fields and most of the town's current inventory of temporary housing is absorbed by gas field workers. It is possible that some construction workers would commute from Laramie in Albany County and Rock Springs in Sweetwater County, particularly if PCW makes arrangements for temporary housing in those communities and provides busing to and from the communities to the Application Area.

Table 3.8-1 Highway and Road Distances between the Project and Selected Communities

Community	Distance to I-80 Interchange or WY 71 Project Access Points (Miles)	Distance from Project Boundary over County Roads	Estimated 2009 Population	Community	Distance to I-80 Interchange or WY 71 Project Access Points (Miles)[1]	Estimated 2009 Population
Carbon County				**Sweetwater County**		
Rawlins	7/0		8,791[1]	Wamsutter	47/40	694[2]
Sinclair	0/7		406[1]	Bairoil	47/40	173[2]
Baggs	84/77	Approx. 42	423[1]	Rock Springs/ Reliance	114/107	29,027[2]
Dixon	91/84	Approx. 35	79[1]	Superior	107/100	341
Saratoga	35/42	Approx. 15	1,777[1]	**Albany County**		
Elk Mountain	35/42		201[1]	Laramie	100/93	28,850[1]
Hanna	35/42		870[1]			
Medicine Bow	50/57		269[1]			
Riverside	52/59	Approx. 32	64[1]			
Encampment	53/60	Approx. 33	460[1]			

[1] U.S. Census Bureau 2010a.

[2] Sweetwater Economic Development Association 2009.

At the time of this assessment, the communities of Elk Mountain, Hanna, Medicine Bow, Riverside, Encampment, Bairoil, and Superior offered limited temporary housing resources, are unlikely to experience transportation effects of the project, and are outside the project's primary viewshed. Furthermore, other wind energy and a proposed coal-to-liquids project in the eastern part of the county that may overlap with the construction timetable for the project and could place demands on the limited temporary housing resources in Hannah, Medicine Bow and Elk Mountain.

The description of existing social and economic conditions within the socioeconomic study area is organized by the following major topics:

- Human geography;
- Economic conditions;
- Population and demographics;

- Housing;
- Community facilities and services;
- Local fiscal conditions;
- Public education; and
- Environmental justice.

3.8.1 Human Geography

This section describes the factors behind human settlement of the socioeconomic study area for the project and characterizes the communities potentially affected by the project.

3.8.1.1 Human Settlement

Section 3.2, Cultural Resources and Native American Concerns, of this EIS describes Native American habitation and use of the lands around the project. Settlement of the surrounding area by people of European descent was in large part a result of the same topography that makes the area attractive for wind power – a natural gap in the Rocky Mountains. Fur trappers and traders, pioneers in covered wagons, the Pony Express, and stage lines all found this gap the easiest way to traverse the Continental Divide. Major settlement of the area was triggered by development of the Union Pacific transcontinental rail line across the region, which again found the natural gap in the mountains to be the best location for a rail line. The Federal Interstate Highway Commission located I-80 across the region for the same general reason. This natural gap in the Rockies also forms a giant wind tunnel, making it attractive for the development of wind farms (Gade 2008).

Construction and operation of the UPRR, along with the coal mines that supported the railroad and later produced coal for export, promoted the expanded economic development of the region. Ranching, supported by the land grants given to the railroad to help fund construction, also developed during this period as the cattle industry now had a substantial local market and a more convenient, efficient and safe means of shipping livestock and wool to distant markets.

Ranching, the railroads, and more recently the interstate flow of commerce associated with I-80 have been long-term and relatively stable elements of the area's economic base and social fabric. Mineral and energy resource development – initially coal, but later oil, gas, and uranium – also helped shape the area's economic history. The mining, oil, and natural gas industries also have been important but volatile contributors to the regional economic base through employment, spending, and their fiscal support for local government and education.

More recently, wind energy development along the Carbon and Albany County line has been a contributor to the area economy with 440 wind turbines in operation in 2010 (AWEA 2010) and additional projects being proposed and under consideration for the area.

3.8.1.2 Communities of Place

This section describes communities near the Application Area. Rawlins and Sinclair are separated by about 6 miles and are the two communities most likely to be substantially affected by construction and operation of the project. Saratoga also may house some of the construction work force. The Carbon County towns of Baggs and Dixon and the Sweetwater County town of Wamsutter are communities near the Application Area that may house a relatively small portion of the construction work force.

<u>Rawlins</u>

Rawlins is the Carbon County seat and largest community in the county. Rawlins' historic economic base includes coal production, ranching, and the UPRR. The UPRR remains a key employer in Rawlins,

employing about 195 people in 2006. Ranching remains an important part of the region's rural economy and culture.

The Wyoming Department of Corrections has been a major employer in Rawlins for over a century, employing a staff of about 330. The original Wyoming State Penitentiary was opened in Rawlins in 1901 and operated as the state's primary prison until 1981 when a new prison was built just south of Rawlins. The old Wyoming Frontier Prison has been converted to a heritage tourist attraction.

The energy industry also has played a pivotal role in the city's growth and development. During the 1970s and early 1980s, the city's population grew as a result of a multi-faceted energy resource boom, which included coal, oil, and uranium development. During the mid-1980s, Rawlins and much of Wyoming endured an economic downturn as a result of a precipitous decline in energy prices (Ducker 2007; Moulton 1995; Worthington, Lenhart and Carpenter, Inc. 1999). From about 2005 through mid-2008, strong natural gas development in western Carbon and eastern Sweetwater counties brought about economic and population growth to Rawlins. The location of natural gas production and service companies in Rawlins and the expansion of the nearby Sinclair refinery also contributed to the growth in Rawlins, which was characterized by labor and housing shortages during that period. Today, Rawlins continues to host a mix of long-time residents, newcomers, and transient temporary workers. Many of the latter group work in the surrounding natural gas fields and highway and infrastructure construction sites, reside temporarily in the town, and are "single status," that is, either single or married but unaccompanied by a spouse or other family members.

Sinclair

Originally a stage stop, Sinclair began its contemporary history as the town of Parco during the 1920s when the Producers and Refining Corporation developed a refinery in the town. The name changed to Sinclair in 1942 when the Sinclair Refining Company purchased the refinery. The refinery has been a major employer in the area for over 70 years, employing 351 personnel in 2007. The refinery recently completed a major improvement and expansion project.

Saratoga

The Town of Saratoga, located in the Platte Valley, is the center of one of the most productive agricultural areas in Carbon County and is a popular outdoor recreation destination. Although ranching has historically been the most important contributor to the valley's economy, copper mining and lumber milling also have contributed to the area's development. In addition to serving as a commercial center for the Platte Valley ranching community, Saratoga's economy is based on fishing, hunting, natural and cultural heritage amenities, attractions and events, and an increasing number of second/vacation homes in the area surrounding the town.

Beginning with crews employed on the construction of the nearby High Savery Dam in the early 2000s, the motels and RV parks in Saratoga began to attract construction and energy workers employed in the region. More recently a few temporary workers employed on natural gas development and pipeline and wind power projects were housed locally (Crimmins 2008).

Baggs, Dixon, and the Little Snake River Valley

Settlement in the Little Snake River Valley (LSRV) was associated with cattle ranching. Mining, oil, and more recently, natural gas development, have contributed to growth and development in the LSRV; however, ranching is the enduring economic activity and ranching-related activities, such as rodeos and roping competitions, are among the important social interactions in the valley. Some of the ranches and grazing operations in the LSRV have been in the same family for several generations.

Outdoor recreation (hunting in particular) is an important economic and social activity in the LSRV. Some ranchers lease their land to hunting outfitters, or allow hunting access for a fee. Outfitters, game

processors, motels, cafés, and other businesses rely on hunting for substantial portions of their annual income. Recently, a large landowner developed a dude ranch south of Savery, near the Wyoming-Colorado state line (Corners 2007; Hicks no date; Stocks 2007; U.S. Department of Agriculture [USDA] 2003).

Wamsutter

Originally named Washakie, when the town was a rail station on the Union Pacific line, Wamsutter was incorporated in 1914 and soon became the central wool-shipping center for the entire Red Desert region (Lauritzen no date). Major growth occurred in Wamsutter in response to oil and gas development in the area and over the years has hosted drilling and well service crews and construction workers for natural gas processing plants, pipelines, and compressor stations.

In addition to its role as a field support center for a number of natural gas producers and service companies, Wamsutter is seeking to capitalize on its location on I-80 by hosting more highway-oriented businesses. Although not yet reflected in state or census statistics, recent population growth in Wamsutter has been substantial. Local officials believe the town has more than doubled its resident population in the recent years; that increase would be even higher with the inclusion of the temporary and transient workers in the natural gas fields. The town has implemented a variety of housing, planning, and infrastructure-development initiatives to accommodate current and anticipated population growth (Colson 2010).

3.8.2 Economic Conditions

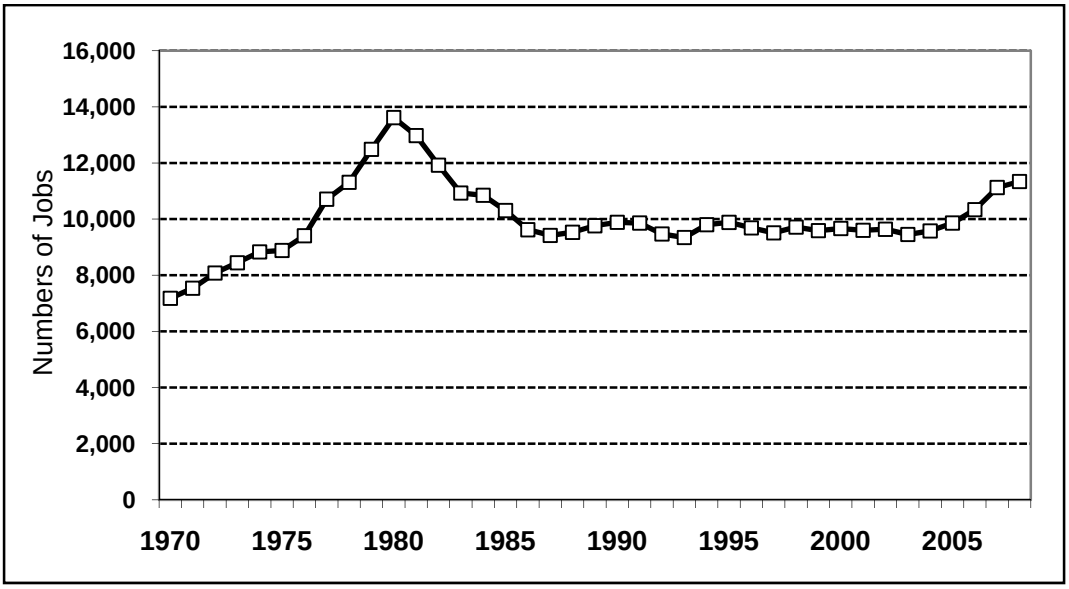
Economic conditions and trends for the Application Area were identified based on reviews of data from the Headwater Economics' Economic Profile System, available online at: http://headwatereconomics.org, the U.S. Census Bureau, the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor Statistics, and other federal, state, and local sources as cited in the text.

3.8.2.1 Employment

Carbon County employment climbed dramatically in the early 1970s, primarily due to energy resource development (coal, uranium, oil, and gas). The net gain of 6,437 jobs from 1970 to 1980 represented a 90 percent increase in total employment. Much of the gain in Carbon County was transitory. Nearly 4,200 jobs were lost during the early/mid-1980s as the local coal and uranium industries contracted in response to weak markets. From about 1985 until 2004 the local economy remained relatively stable, at least in terms of employment, fluctuating at around 9,500 jobs (**Figure 3.8-1**). More than 220 jobs were added between 2002 and 2005, and nearly an additional 1,500 jobs added over the next 3 years (U.S. Bureau of Economic Analysis 2010a).

The industrial composition of the local economy, in terms of employment covered by unemployment insurance, is summarized in **Table 3.8-2**. In addition to natural gas development, pipeline and wind energy facility construction, state government, health care, and the trade, accommodations, and food service industries also are important sectors for the economy.

Carbon County's economy was hard hit by the effects of the global economic recession which began in 2008, and the adverse effects on natural gas development in particular. Total employment in the county declined by more than 1,100 jobs between the beginning of 2008 and year-end 2009. The overwhelming majority of the job losses were in the mining and construction industries. The number of jobs in government actually increased during the period, although local government employment has since declined in the wake of budget cuts brought about by the decline in tax revenues (Wyoming Department of Employment 2010).



Source: U.S. Bureau of Economic Analysis 2010a.

Figure 3.8-1 Total Full and Part-time Employment in Carbon County, 1970–2008

Table 3.8-2 Full and Part-time Covered Employment, by Industrial Sector, Comparison of 1st Quarter 2008 to 4th Quarter 2009

Industrial Sector	Carbon County					
	Number of Jobs 2008 Q1	Number of Jobs 2009 Q4	Share of Total Jobs 2009 Q4	Change 2008 Q1 to 2009 Q4	Changes in the Number of Jobs in Sector 2008 Q1 to 2009 Q4	Share of Total Change in Jobs Loss
Private						
Agriculture, Forestry, Fishing, and Hunting	163	195	3%	20%	32	-3%
Mining	451	283	4%	-37%	-168	15%
Utilities	53	71	1%	34%	18	-2%
Construction	1,505	501	7%	-67%	-1,004	91%
Manufacturing	NA	NA	NA	NA	NA	NA
Wholesale Trade	69	59	1%	-15%	-10	1%
Retail Trade	807	742	11%	-8%	-65	6%
Transportation and Warehousing	253	241	4%	-5%	-12	1%
Information	71	78	1%	10%	7	-1%

Table 3.8-2 Full and Part-time Covered Employment, by Industrial Sector, Comparison of 1st Quarter 2008 to 4th Quarter 2009

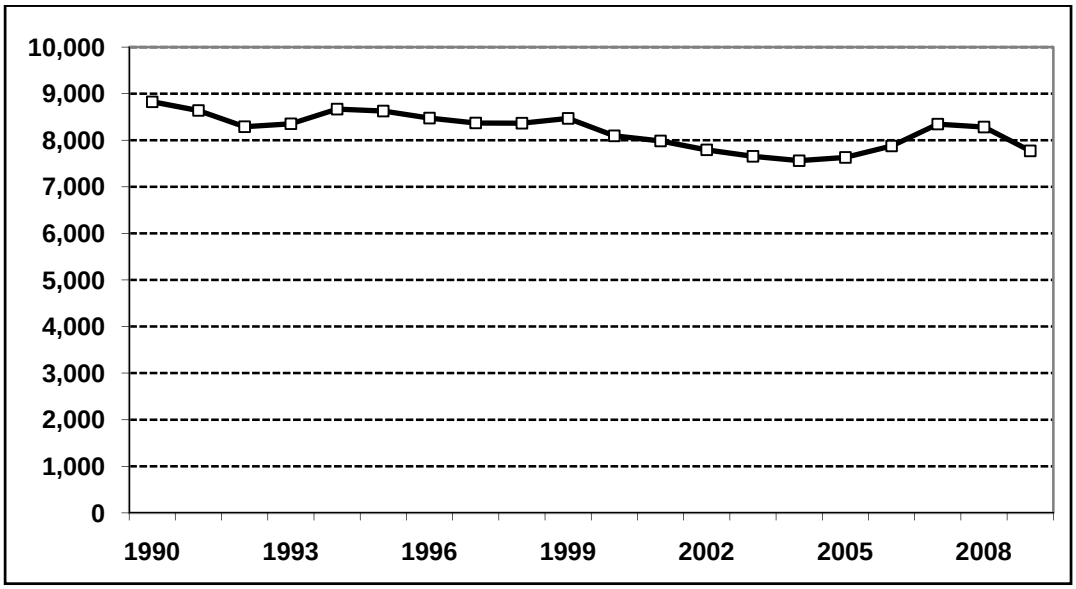
Industrial Sector	Carbon County					
	Number of Jobs 2008 Q1	Number of Jobs 2009 Q4	Share of Total Jobs 2009 Q4	Change 2008 Q1 to 2009 Q4	Changes in the Number of Jobs in Sector 2008 Q1 to 2009 Q4	Share of Total Change in Jobs Loss
Finance and Insurance	149	149	2%	0%	0	0%
Real Estate and Rental and Leasing	83	72	1%	-13%	-11	1%
Professional and Technical Services	149	115	2%	-23%	-34	3%
Management of Companies and Enterprises	18	NA	NA	NA	NA	NA
Administrative and Waste Services	115	116	2%	1%	1	0%
Educational Services	NA	NA	NA	NA	NA	NA
Health Care and Social Assistance	442	480	7%	9%	38	-3%
Arts, Entertainment, and Recreation	40	66	1%	65%	26	-2%
Accommodation and Food Services	858	775	12%	-10%	-83	7%
Other Services, Exc. Public Administration	150	147	2%	-2%	-3	0%
Subtotal Private	5,808	4,550	68%	-22%	-1,258	114%
Government	1,995	2,145	32%	8%	150	-14%
Total	**7,802**	**6,695**	**100%**	**-14%**	**-1,107**	**100%**

NA = Not reported due to confidentiality disclosure guidelines. There are a combined total of 432 (for 2008) and 460 (for 2009) jobs in these sectors, less than 7 percent of total employment. Other data sources suggest that most of these jobs are in the manufacturing sector.

Source: Wyoming Department of Employment 2010.

3.8.2.2 Labor Market Conditions

Changes in local labor conditions provide many useful insights into underlying economic and demographic conditions. The local labor force underwent a slow but protracted decline from 1990 through 2004, decreasing by nearly 1,200 individuals, or 14 percent. Steady population out-migration also characterized that period (**Figure 3.8-2**). Following several years of relative stability, the local labor force expanded by approximately 1,200 individuals from the beginning of 2006 through the end of 2007 in response to the increase in employment opportunities associated with natural gas development. Since many employers are not based in Carbon County, mining sector employment statistics do not fully reflect the importance of energy development for the local economy.

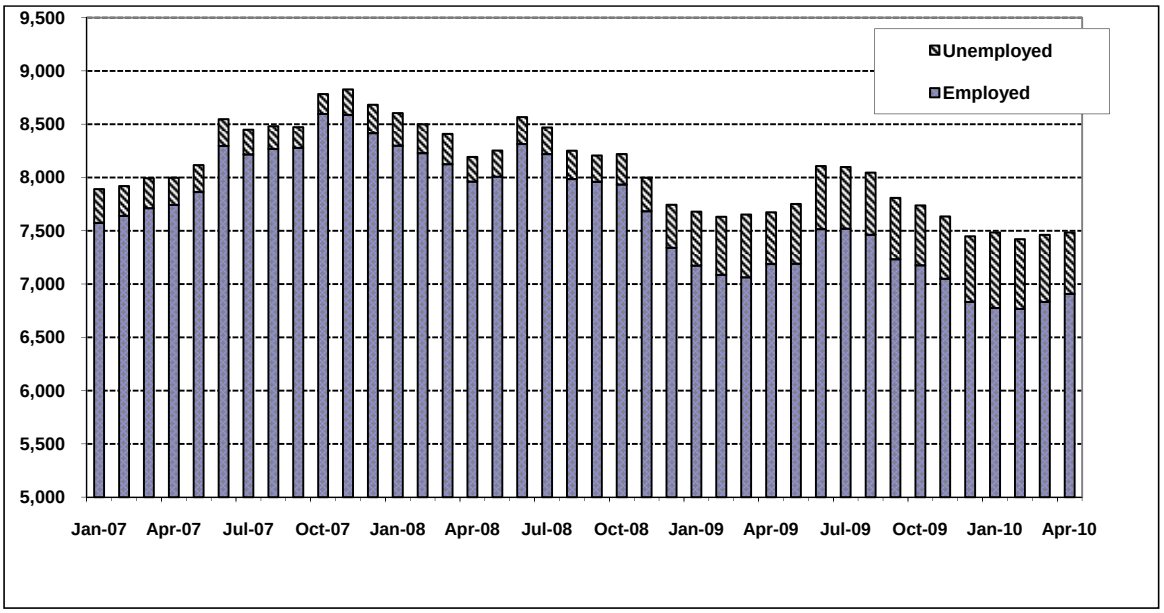


Source: U.S. Bureau of Labor Statistics 2010, 2009 (for last 3 years).

Figure 3.8-2 Carbon County Labor Force (Average Annual) – 1990 to 2009

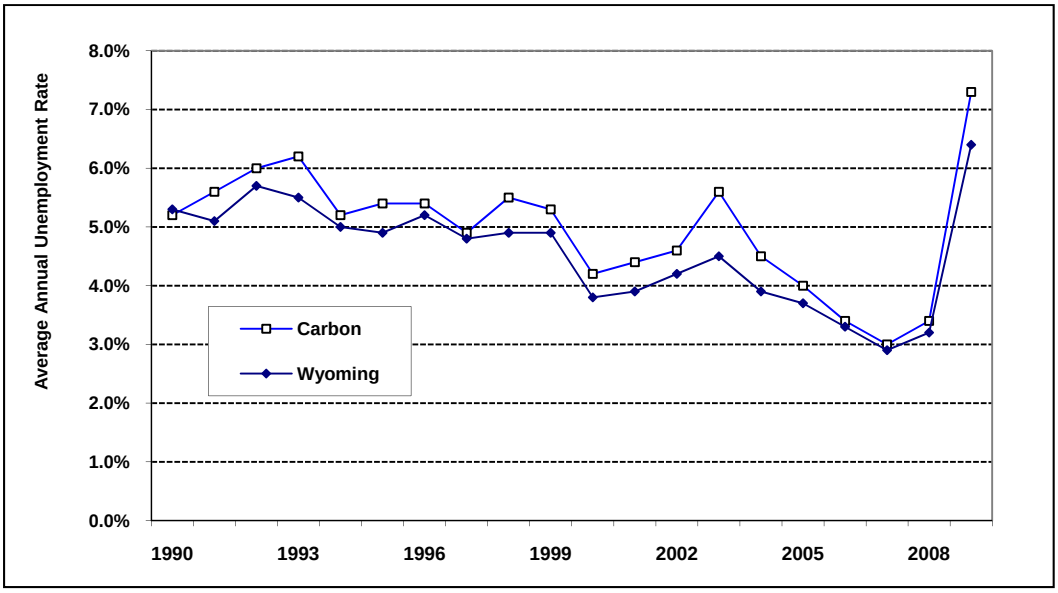
As the effects of the recession took hold and construction work at the Sinclair refinery tapered off, the labor force contracted, rapidly shedding approximately 1,000 workers through mid-2009. By year's end the annual average size of the labor force was below that for the preceding year, signaling the end of the most recent period of local economic expansion. In mid 2009, there was a brief rebound with the labor force and employment growing by 350 between March and August, reflecting the typical seasonal expansion related primarily to construction, tourism and travel. The seasonal and overall expansion of the labor force, many of whom are commuters and non-residents who work locally for an extended period but do not establish "residence" locally, is illustrated on **Figure 3.8-3**. Continuing economic weakness and normal seasonal contraction resulted in a subsequent decline in the labor force to below 7,500.

Prior to the recent resurgence in natural gas development, unemployment in the region since 1990 generally had been between 5.0 and 6.5 percent, on par or slightly above the statewide average (**Figure 3.8-4**). Migration and commuting play significant roles in moderating local unemployment rates.



Source: U.S. Bureau of Labor Statistics 2010.

Figure 3.8-3 Carbon County Monthly Employment and Unemployment – January 2007 to April 2010



Source: U.S. Bureau of Labor Statistics 2010, 2009 (for last 3 years)

Figure 3.8-4 Wyoming and Carbon County Average Annual Unemployment Rates – 1990 to 2009

In large measure, due to the high demand for labor associated with ongoing energy development, Carbon County experienced record low unemployment in 2007, just over 250 unemployed, representing 3.1 percent of the local labor force. In fact, the effective unemployment rate was likely lower because the seasonally adjusted labor force estimates that serve as the basis for calculating unemployment rates may not fully capture all non-resident laborers working in the area for an extended period but living in motels, RV parks, and other temporary housing. More recently, unemployment has increased in Wyoming and Carbon County, with average annual unemployment at 6.4 percent statewide and 7.3 percent in Carbon County (**Figure 3.8-4**). The unemployment rate among Carbon County residents peaked at 9.5 percent in January of 2010, but then declined to 6.5 percent with 525 persons looking for work in June 2010 (U.S. Bureau of Labor Statistics 2010).

The 2005 through 2008 economic expansion associated with natural gas development, pipeline construction, and related activities was characterized by tight labor markets and widespread labor shortages, affecting all sectors of the economy. The labor shortage pushed up wages, bonuses, and per diem payments in the natural gas industry. High wages in the natural gas industry resulted in job shifts and worker loss in other sectors of the economy, creating upward pressure on wages for employees across the private and public sectors. Even with wage increases, local and state government offices and private businesses experienced high employee turnover and were frequently short-staffed. To help address housing availability issues, natural gas service companies developed temporary housing for employees, many of whom are rotated in and out of the area on a temporary basis. Employers in other sectors of the economy limited business hours, in part due to their inability to attract or retain employees.

The recent downturn in the pace of energy development has eased pressures on labor demand, wages, and housing.

3.8.3 Key Economic Trends

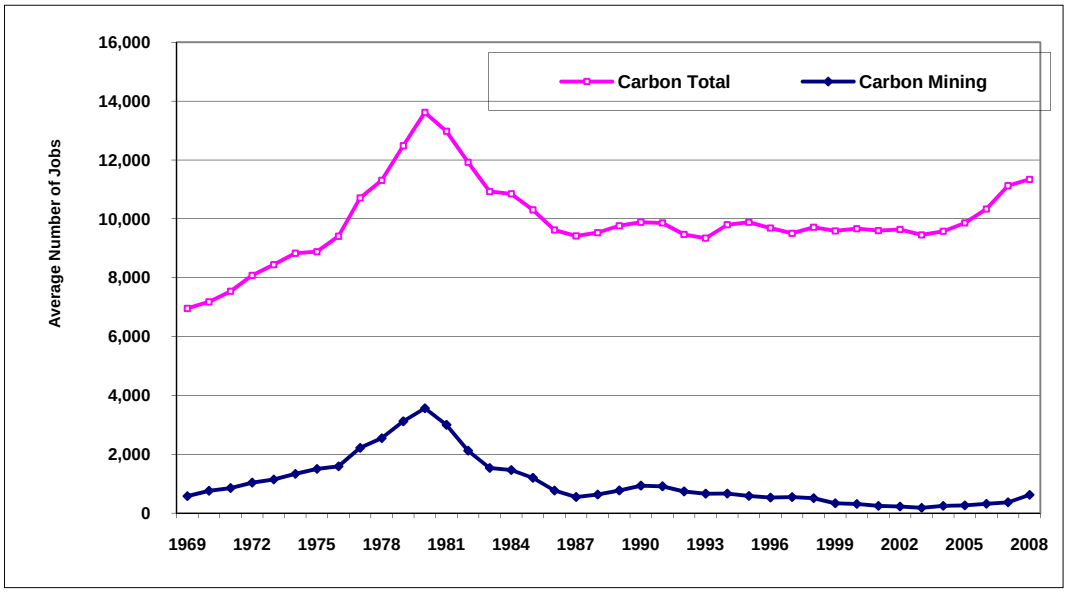
Agriculture, mining, and industries serving tourism, travel, and outdoor recreation are important sectors in the Carbon County economy. Each of these sectors is profiled below.

3.8.3.1 Agriculture

As in many areas of the West, agriculture played a critical role in the development of the local economy and it remains an important cultural and economic influence in the economy. Ranches and farms in Carbon County reported more than $48 million in marketing receipts from livestock and crop sales in 2008. Farm employment, however, has trended downward in Carbon County since 1970. Carbon County farm employment decreased from 741 in 1970 to 564 in 2000, a 23 percent decrease over the two decades (U.S. Bureau of Economic Analysis 2010b). This trend has continued since 2000, with Carbon County farm employment decreasing by 20 jobs, or about 3 percent, between 2001 and 2006. Cattle ranching is the primary agricultural enterprise in the Application Area with cattle grazing on fee and private rangelands and pastures the key land use. Ranches also grow alfalfa and other feed crops on irrigated fields and pastures.

3.8.3.2 Mining

Current and historical mining activity in Carbon County includes coal, uranium, oil, and natural gas production. Mining related employment, and total employment, in Carbon County both reflect the period of intensive energy and minerals development in the late 1970s and early 1980s and the ensuing slowdown as world energy prices fell. The decline in employment also reflects declining coal mining employment in the Hanna Basin (**Figure 3.8-5**).



Source: U.S. Bureau of Economic Analysis 2010c.

Note: Mining employment for 2005 was not reported due to disclosure restrictions. Employment was estimated at 263 using data from the Wyoming Department of Employment and U.S. Bureau of Economic Analysis.

Figure 3.8-5 Carbon County Total and Mining Sector Employment, by Place of Work – 1969 to 2008

Assessing recent mining-sector employment in the socioeconomic study area is complicated by the nature of employment practices in the natural gas industry. Acute labor and housing shortages within the study area, coupled with the mobile nature of many natural gas service company operations, hampers the reporting and tracking of natural gas industry employees. Labor shortages required natural gas service companies to recruit and import workers from other parts of the country. These workers often relocate to the study area on a temporary basis; work at locations in several counties staying in temporary lodging near the work site and return home for extended periods. Consequently, their employment may not be recorded in each county where their employment occurs, or if their employer is located outside the study area, these workers may not be recorded within the affected counties at all.

3.8.3.3 Tourism, Travel, and Outdoor Recreation

Tourism, travel, and outdoor recreation play an important role in the local economy. Outdoor recreation also contributes to the quality of life of residents. Local events and cultural heritage sites also attract visitors. Much of the tourism and travel in the region is associated with traffic passing through on I-80. However, a substantial level of local tourism also occurs, primarily outdoor recreation-oriented visits associated with hunting, fishing, boating, wildlife watching, snowmobiling, and other winter recreation, or sightseeing (recreation resources and use in and near the project are described in e Section 3.7, Recreation. Major outdoor recreation attractions include the Seminoe and Pathfinder reservoirs; the Medicine Bow National Forest; public lands open to OHV and snowmobiling use; and public and private lands open to fishing and big and small game hunting. Much of the outdoor recreation use near the project is in the latter two categories, in contrast to the key destination-type attractions that are all located some distance from the Application Area. In addition to its potential role in accessing the proposed project, WY 71/CCR 401 serves an important role in outdoor recreation in the region, providing access to public lands and to the western part of the Medicine Bow National Forest (Section 3.10, Transportation).

An economic analysis of travel in Wyoming estimated annual travel spending of $129.9 million in 2009 for Carbon County (down from $168.7 million in 2008). Travel spending supported nearly 1,600 jobs in

2007 and 1,260 jobs in 2009 in the county (Dean Runyan Associates 2010). Analysis of the seasonal variations in employment in the accommodations and food-service sectors, and the comparative growth in spending in recent years, indicate that a significant portion of those totals reflect travel on the I-80 corridor and the impacts of energy workers residing temporarily in the communities, rather than more traditional destination-type tourism.[1] For instance, the variation between peak and low monthly employment in the regional accommodations sector is much lower than it is across the state.

Between 2002 and 2005, a period corresponding to the dramatic increase in natural gas development, estimated annual traveler spending increased by 39 percent in Carbon County, as compared to 23 percent elsewhere in the state (Dean Runyan Associates 2006). These indicators point to strong demand and potential competition among and between energy workers and various segments of the travel/tourism market, which translates into consistently high nightly room rates and occupancy levels for overnight lodging and strong demand for food services. With the slowdown from the recession, these impacts on nightly room rates, occupancy rates, and demand for food services have likely diminished in recent years.

Local observations about the travel, tourism, and recreation economy in Carbon County help illuminate the findings of the Dean Runyan Associates (2006) studies. As noted above, the visitor economy in Carbon County is based on outdoor recreation and local events such as historic/cultural celebrations, competitions, and conferences, not on major tourism destinations such as Yellowstone or Grand Teton National Parks. Local tourism strategies include the promotion of outdoor recreation and events and promotion of natural features, recreation resources, and cultural heritage attractions in order to extend the stays of outdoor recreationists, event attendees, and I-80 travelers.

Prior to the current economic recession, natural gas development in the region has both beneficial and adverse effects on travel, tourism, and recreation-related businesses. The beneficial effects of the gas development expansion include increases in customers and occupancy rates during the traditional winter and spring off-seasons, which increases the year-round profitability of businesses catering to travelers. High demand also prompted growth in the number of lodging and dining establishments, which in turn increased the lodging and dining base for tourism and recreation visitors. High occupancy rates for lodging establishments also has resulted in a dramatic increase in lodging tax revenues. Lodging and other travel related tax receipts increased in Carbon County from $1.5 million to $2.7 million between 2002 and 2007. Local tourism and recreation organizations used some of these revenues to develop promotional materials and to promote events that bring visitors to the area and increase the average length of stay.

Since the recession, and with the decline of jobs in the mining and construction industries, occupancy rates and travel spending and local tax revenues have declined. Direct travel spending declined 23 percent between 2008 and 2009, and travel related tax receipts fell from $2.7 million in 2008 to $2.3 million in 2009 (a 15 percent decline) (Dean Runyan Associates 2010). Local lodging tax receipts suggest further declines in travel and tourism spending occurred in 2010, registering a 13 percent decline in Carbon County as compared to 2009. That decline was coupled with a 37 percent decline in general sales tax receipts, although such receipts are not tied specifically to tourism and travel spending. Rather, they are more reflective of overall economic conditions (Wyoming Department of Revenue 2010a).

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[1] "Travel" for the purposes of that analysis includes both business and pleasure travel by residents and non-residents that was more than 50 miles from the traveler's home. In the study area this would include spending by all travelers on I-80, as well as by non-resident workers employed in the area on an extended basis but staying in local motels, hotels, and campgrounds.

Travel and tourism businesses, like most business establishments in the study area, experienced difficulty recruiting and retaining employees during the recent Sinclair Refinery construction and natural gas development expansion. Wages in the travel and tourism industry are typically below those of the natural gas industry, so it was difficult for travel/tourism businesses to compete for employees. As with most businesses in other sectors, the lower wages made competition for housing resources difficult, limiting the amount of non-local workers who could relocate to the area to accept employment in the travel and tourism industries during this period (Radar 2007).

In recent years, concern has risen regarding the potential that energy resource development may diminish the amenity values of public lands, thereby adversely affecting local tourism and recreation. Data on the contributions of such activity is unavailable on a consistent basis across all counties. Consequently, a simple proxy for tourism and recreation employment, based on total retail trade employment, combined with total services employment in 1990 and employment in accommodations and food services in 2005, was developed for this analysis. As shown in **Table 3.8-3** below, employment in the designated sectors has grown more rapidly in Carbon County than in a peer group of 198 "rural" counties in Colorado, Idaho, Montana, Utah, New Mexico, and Wyoming. Demands associated with the energy industry, as well as pass-through travel on I-80 likely account for much of the change. While these results do not preclude the potential that energy resource development has had some adverse impacts on tourism and outdoor recreation, it does suggest that the local gains in most businesses that serve travel, tourism, and recreation visitors exceed those that might have been expected without energy resource development.

Table 3.8-3 Changes in Total Private and Retail Trade and Service Employment, Carbon County Compared to A "Peer" Group of Rural Counties

	Rural "Peer" Group[1]	Carbon
Private Employment (Percent of Total)		
1990	69.3%	72.8%
2005	74.2%	74.0%
Retail and Services (Percent of All Private) [2]		
1990	23.8%	23.4%
2005	24.5%	28.5%

[1] The "peer" group consists of 198 rural counties in Colorado, Idaho, Montana, Utah, New Mexico, and Wyoming; rural being defined as having fewer than 50,000 residents or not one of 8 winter resort communities (e.g., Pitkin County, Colorado [Aspen]).

[2] The retail and services shares included all services in 1990, but only the accommodations and food services in 2005. The change in accounting was necessitated by the switch in industrial data reporting by the federal government.

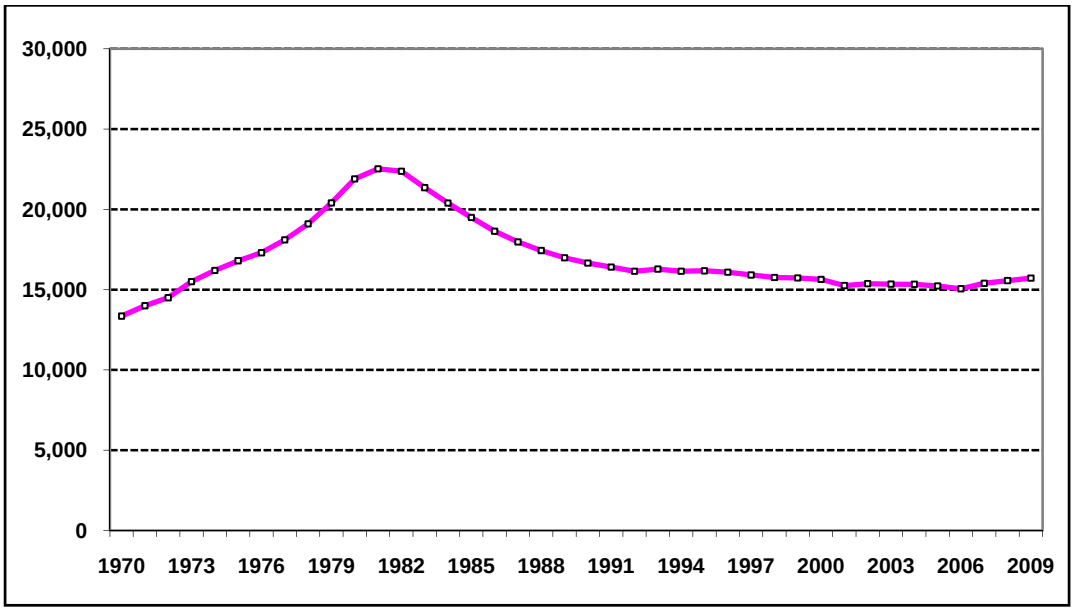
On a statewide basis, there is growing interest among tourism officials and the tourism industry concerning potential effects of the pace and level of energy development on vital tourism and recreation resources. These include natural resources such as wildlife, air quality, and viewsheds and the ability of tourism-related businesses to deliver basic services. To date the subject has not been addressed systematically on a statewide basis yet 2009 was a record year for summer visitors to Yellowstone National Park and visitation in 2010 is on pace to set another record (National Park Service [NPS] 2010). Despite record visitation, tourism officials are concerned about the potential long-term adverse effects of the combined loss of wildlife habitat and encroachment of energy development on viewsheds near tourist destinations and along routes to those destinations. They also are concerned about the ability of travelers to major tourism destinations to find lodging in communities along routes to those destinations (Bryan 2008).

3.8.4 Population and Demographics

Population statistics in communities affected by energy development are often viewed locally with a degree of skepticism because of the dynamic nature of energy development employment. Such statistics seldom capture fully the temporary and transient work force that accompany drilling, field development and construction projects, even though the work force associated with such projects may reside in a community for months or years. This is because: 1) there is an inability of traditional methods of population estimation to capture workers residing in motels, RVs, and other temporary housing on a long-term basis; 2) seasonal fluctuations in work force; and 3) the delays in estimation and reporting are three of the factors frequently identified as sources of discrepancies. Consequently, the following statistics and discussion reflects the major trends, but not necessarily all of the factors affecting the underlying population conditions in Carbon County and the affected communities.

Figure 3.8-6 displays Carbon County population statistics between 1970 and 2009, illustrating the population effects of the mining and energy expansion, which began in the early 1970s, peaked in the early 1980s, and then began a protracted decline; in sum, Carbon County population increased by 69 percent between 1970 and 1982. Following that increase it continued its downward trend for much of the 1990s, then stabilized between 15,000 and 15,800 beginning in 2000 (**Table 3.8-4**). But for reasons outlined above, Carbon County officials believe that U.S. Census population estimates only partially capture the natural gas and pipeline and refinery-related growth which began in 2005 and decreased in 2008, thereby masking many of the socioeconomic effects and challenges faced by communities dealing with energy resource development.

Table 3.8-5 displays recent resident population estimates for selected communities in Carbon and Sweetwater counties. In Carbon County, the population loss reflected in the statistics occurred in Rawlins and Sinclair; other areas of the county remained relatively stable with modest gains. Based on electrical hookups, Wamsutter experienced a 166 percent increase in population over the period.



Source: U.S. Bureau of Economic Analysis 2010a; U.S. Census Bureau 2010b.

Figure 3.8-6 Carbon County Resident Population – 1970 to 2009

Table 3.8-4 Carbon County Estimated Population – Selected Years

	2000	2006	2007	2008	2009	Absolute Change (2000-2009)	Change (2000-2009)
Wyoming	493,782	512,573	523,414	532,981	544,270	50,488	10.2%
Carbon County	15,639	15,056	15,397	15,564	15,720	81	0.5%

Source: U.S. Census Bureau 2010b, 2009a.

Table 3.8-5 Estimated Population for Carbon and Sweetwater County Communities – Selected Years

	2000	2005	2006	2007	2008	2009	Absolute Change (2000-2009)	Absolute Change (2000-2009)
Rawlins	8,969	8,503	8,435	8,620	8,740	8,791	-178	-1.9%
Sinclair	421	399	398	405	405	406	-15	-3.5%
Saratoga	1,726	1,683	1,700	1,737	1,759	1,777	51	2.9%
Baggs	348	347	362	386	400	423	75	21.5%
Dixon	79	79	79	80	81	82	3	3.7%
Wamsutter[1]	261	261	261	267	269	272 [694][1]	11 [433][1]	4.2% [166%][1]

[1] Some local officials believe recent U.S. Census Bureau estimates underestimate population in several communities, based on increases in utility hook-ups and building permits. The local estimates for Wamsutter, based on the number of residential electric hook-ups in the town are shown in [brackets].

Source: Sweetwater Economic Development Association 2009; U.S. Census Bureau 2010a, 2009b.

The components of population change data in **Table 3.8-6** show net out-migration of population in Carbon County between 2000 and 2009, although population increases occurred each year since 2006. Again these statistics do not capture the large temporary population that has accompanied the recent surge in natural gas development and are generally not considered to accurately reflect the growth and decline cycle that has occurred since 2005.

The U.S. Census Bureau estimates the age and racial characteristics of population in counties (**Table 3.8-7**). Based on the estimates for 2007, residents of Carbon County tend to be older than those of the state and the U.S. as a whole. In Carbon County, about one of eight residents is 65 years or older, comparable to the relative shares that persons 65 and over represent across the state and nation. The median age of local residents has increased slightly in the past 6 years.

Table 3.8-6 Components of Population Change for Wyoming and Carbon County – April 1, 2000 to July 1, 2009

	Total Population Change	Natural Increase			Net Migration		
		Total	Births	Deaths	Total	Net International Migration	Net Domestic Migration
Wyoming	50,487	27,356	65,633	38,277	25,660	3,278	22,382
Carbon County	81	557	1,828	1,271	-407	24	-431

Source: U.S. Census Bureau 2010c.

Table 3.8-7 Age Distribution and Median Age of Resident Population in 2007 – Carbon County, Wyoming, and U.S.

	Under 18	18 to 64	65 and Over	Median Age 2000	Median Age 2007
U.S.	24.5%	62.9%	12.6%	34.4	36.7
Wyoming	24.0%	63.8%	12.2%	35.3	37.0
Carbon	22.3%	65.2%	12.5%	38.9	40.8

Source: U.S. Census Bureau 2009c.

Individuals of working age, commonly defined as those 18 to 64 years, account for more than 65 percent of all residents, higher than the corresponding values for the state and nation. Furthermore, the number of residents in that age group has increased since 2000, while the number of residents under 18 has declined. Increases in the number of working age persons in the county can be attributed in part to recent increases in jobs, particularly in the mining sector, which attracts a high portion of working adults, including younger male workers who are unmarried or married, but not accompanied by spouses or school-age children.

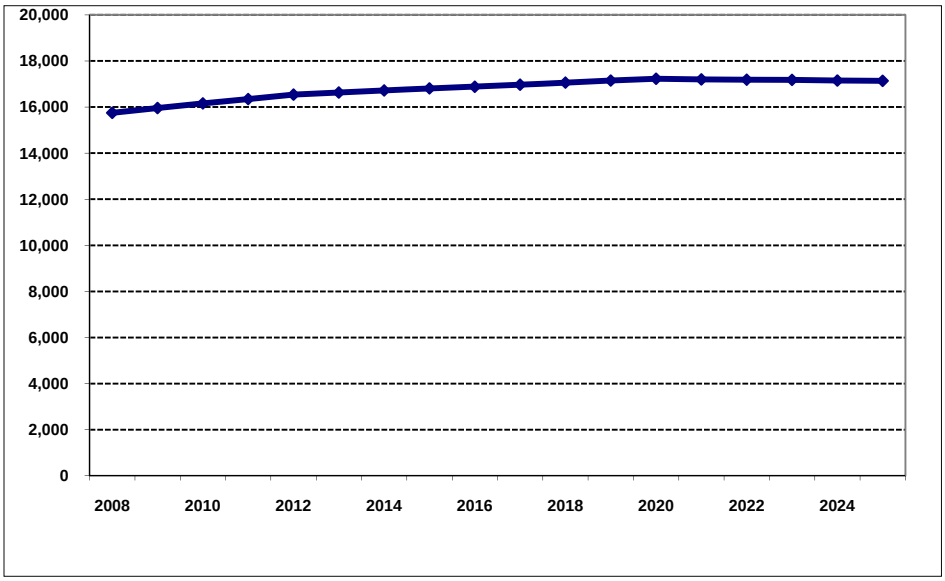
The racial and ethnic compositions of the local populations reflect the influences of migration, historical settlement patterns, and economic factors. At the time of the 2000 Census, Carbon County's resident population was 82.4 percent white and not Hispanic or Latino, with 17.6 percent of the population being made up of persons of other races, multiple races, and/or of Hispanic or Latino ethnicity. Although the percentage share of racial and ethnic minorities in Carbon County is higher than for the State of Wyoming as a whole, the percentage share of racial and ethnic minorities in the county is much lower than that for the U.S. The largest racial and ethnic minority group in Carbon County is Hispanic and Latino, making up 13.8 percent of the county population (**Table 3.8-8**).

The Wyoming Department of Administration and Information (2008b) prepares population forecasts for Wyoming and its counties and municipalities. The most recent forecasts (**Figure 3.8-7**) show Carbon County population growing steadily to over 17,200 over the next decade. Thereafter, the county's population is anticipated to decline slightly and then stabilize for several years. These projections were developed prior to the current economic recession and were predicated on continued energy development in the county. Given the recent downturn in activity, future growth will be contingent upon the timing and pace of future resource development, combined with the influences of other sources of economic growth or contraction.

Table 3.8-8 Racial and Ethnic Population Composition as a Percent of Total Population in 2000 – Carbon County, Wyoming, and U.S.

	White and not Hispanic or Latino	American Indian and Alaska Native and not Hispanic or Latino	Other Races, Two or More Races, and not Hispanic or Latino	Hispanic or Latino Ethnicity
United States	69.1%	0.7%	17.6%	12.5%
Wyoming	88.9%	2.1%	2.6%	6.4%
Carbon County	82.4%	1.1%	2.6%	13.8%

Source: U.S. Census Bureau 2000 Census, Summary File 1, 2001.



Note: 2008 to 2025 state and county population forecasts were developed based on trends of demographic and economic variables.

Source: Wyoming Department of Administration and Information 2008a.

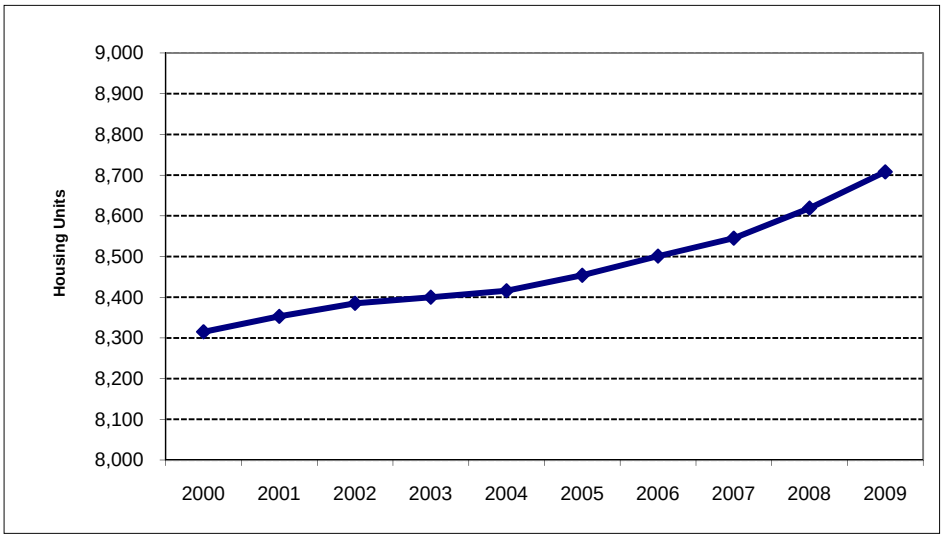
Figure 3.8-7 Carbon County Population Forecasts – 2008 to 2025

3.8.5 Housing

This section provides information about conventional and temporary housing resources in the socioeconomic study area. Temporary and long-term housing resources are characterized for Rawlins and Sinclair and temporary housing resources are characterized for all communities in Carbon County and the Sweetwater County Town of Wamsutter. Conventional or long-term housing includes single and multifamily residences and mobile homes. Temporary housing includes motels, hotels, recreational vehicle parks, and temporary living facilities. Most housing in Carbon County is located within communities. Although some rural subdivisions exist, the county discourages rural residential subdivisions of substantial size or density (Carbon County 2010).

Prior to 2009, several temporary living facilities were operating in Carbon County along WY 789 near Dad and in Sweetwater County near Wamsutter to house gas field workers. Three camps were located near Dad, but only one, operated for Neighbors drilling, remains open. A 250-bed modular facility, with permitted capacity for 500 beds, was developed and operated by ESS Services for BP near Wamsutter. That facility also has closed and the above ground improvements disassembled and moved to a storage location elsewhere in the county (Carnes 2010; Fox 2010a; Rowan 20110).

There were an estimated 8,708 housing units in Carbon County in 2009, a net increase of just over 400 units more than reported in the 2000 Census (**Figure 3.8-8**) (U.S. Census Bureau 2010d). Most of this building has occurred since 2004; however, the number of building permits for residential units dropped from 96 in 2007 to 24 in 2009 (**Table 3.8-9**).



Source: U.S. Census Bureau 2010d.

Figure 3.8-8 Housing Trends in Carbon County: Total Units: 2000 to 2009

Table 3.8-9 Annual Housing Units Authorized by Building Permits – 2006 to 2009

	2006	2007	2008	2009
Total Residential Building Permits				
Wyoming	3,846	4,584	2,669	2,294
Carbon	78	96	55	24
Single Family Homes Permitted				
Wyoming	3,349	3,735	2,178	1,574
Carbon	72	94	55	24

Source: Wyoming Department of Administration and Information 2010a.

Temporary housing resources comprise a critical element of a community's capacity to meet and absorb the short-term demands associated with natural resource development and construction projects. **Table 3.8-10** summarizes existing temporary housing resources in Carbon County communities and Wamsutter in 2010.

Table 3.8-10 Temporary Housing Resources in Carbon County and Wamsutter – Summer 2010

Community	Motel Rooms	Campground/RV Spaces	Total
Baggs	14	23	37
Dixon	8	0	8
Elk Mountain	13	0	13
Encampment	33	0	33
Hanna	10	10	20
Medicine Bow	64	0	64
Rawlins	1,252	303	1,555
Riverside	20	33	53
Saratoga	174	30	204
Sinclair	0	0	0
Wamsutter	23	160[1]	183
Walcott Junction	0	50[2]	50

[1] Wamsutter RV spaces include mobile home parks, which also allow RVs.

[2] Walcott Junction is located at the junction of I-80, U.S. 30, and WY 130. The mobile home/RV park is currently not operating. However, its infrastructure systems are functional and it could be reopened on short notice given sufficient demand.

Sources: Carbon County Visitors Council 2009; CH2M Hill 2009; Colson 2010; Howell 2010.

3.8.5.1 City of Rawlins

A comprehensive assessment of existing housing conditions and future housing needs was completed for Rawlins in 2007 (Kirkham & Associates LLC 2007). The housing assessment was intended to assist city officials, community leaders, and developers in planning for infrastructure and housing development in response to current and future growth. That assessment, combined with more current information from other primary and secondary sources provides the basis for the following description of existing conditions.

The 2000 Census tallied 3,860 housing units in the City of Rawlins, 86 percent of which were occupied and 14 percent which were vacant. Eighty percent of the city's housing stock is at least 30 years old. Houses vacant for seasonal use total just over 1 percent of total housing. Some of the remaining vacancies were homes in substandard condition. Of the occupied units, 68 percent were owner-occupied and 32 percent were renter-occupied (**Table 3.8-11**).

Figure 3.8-9 displays the number of residential building permits and mobile home set-up permits within the City of Rawlins for 2001 through 2009. Residential building permits increased from 2 in 2001 to 47 in 2007, then decreased to 3 in 2009. Mobile home set-ups increased from 7 to 82, then decreased to 11

during those years. The increase in mobile home placements during the 2006-2007 period was associated with the expansion of two mobile home parks (Golnar 2010a; Rawlins Daily Times 2007).

Table 3.8-11 2000 Census – Rawlins Housing Profile

Total Housing Units	Total Occupied	Total Vacant	Vacant for Seasonal Use	Home-owner Vacancy Rate	Rental Vacancy Rate	Home-owner Occupied Units	Renter Occupied Units
3,860	3,320	540	50	4.1%	17.3%	2,247	1,073

Source: U.S. Census Bureau 2000.

Recent subdivision activity within Rawlins has included the approval of the 99-lot Stone Ridge Village Planned Unit Development in March 2009 and the conditional approval of the three-phase, 47-lot Post and Rail subdivision, pending execution of a subdivision agreement. The city also is exploring a possible development on 50 acres of city-owned property through a contract with a private company to develop transitional housing, including apartments, town homes, and entry level single family houses (Golnar 2010a). In 2008, there were about 30 vacant infill lots in some previously approved subdivisions and as many as 50 substandard homes that could be redeveloped (Mika 2008).

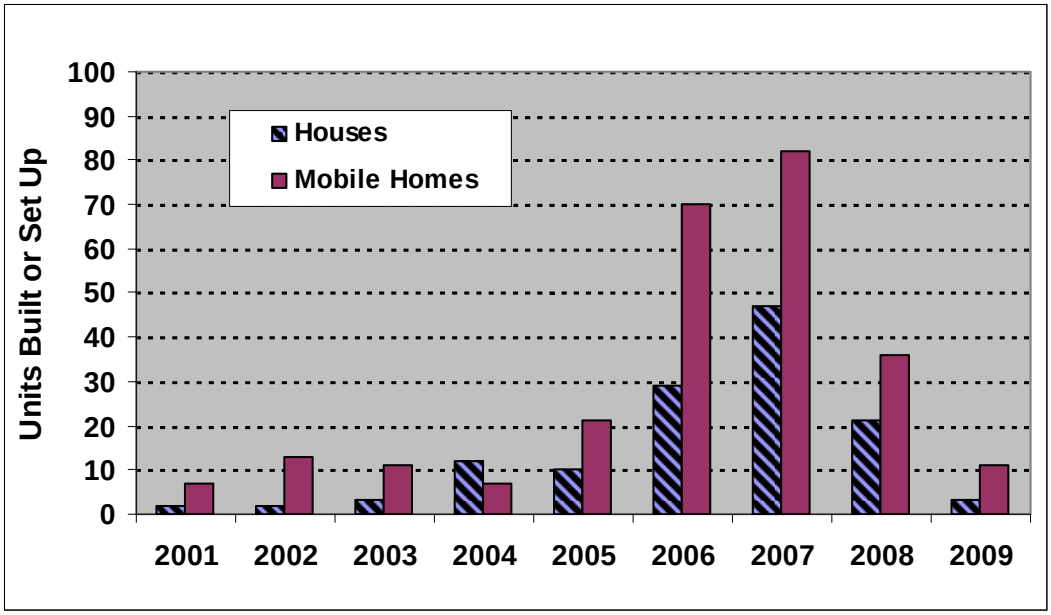
There are 11 apartment complexes with a total of 439 units in Rawlins. The newest of these is an 85-unit complex built in 1997, although the Bitter Creek low-income rent-assisted apartments were rehabilitated in 2003.

The 2007 Housing Assessment estimated rental housing vacancies at less than 1 percent in December 2006. According to that assessment, there were virtually no apartment vacancies in mid 2007 and most complexes had waiting lists. Rental housing and apartment vacancies increased during 2008 and early 2009 due in part to the reduction in construction work force at the Sinclair refinery (Mika 2009). The Wyoming Housing Database Partnership estimated overall vacancy rates at 16 percent during the second half of 2009 (WCDA 2010).

The 2007 Housing Assessment reported monthly rental rates for apartments ranged from $358 (subsidized) to $1,800. Average rental rates for apartments were estimated at $676 during the second half of 2009 (WCDA 2010).

Rawlins has 16 mobile home parks with 639 pads (MHPS 2010). In recent years, three mobile home parks with a combined total of 146 pads were converted from a rental basis to lot ownership where the mobile home owner also owns the lot. RVs are allowed in some mobile home parks, at the discretion of the mobile home park operator.

Rawlins has 23 motels with a total of over 1,252 rooms (Carbon County Visitors Council [CCVC] 2010). Some motels offer weekly or monthly rates and typically host energy industry and construction workers. Rawlins also has 3 recreational vehicle (RV) parks with a total of 303 pads, although one RV park is not winterized (Stolns 2010). The CCVC conducted an informal motel and RV park occupancy survey by telephone during August 2010. The CCVC reported that newer motels in Rawlins that are affiliated with national chains averaged 95 to 98 percent occupancy, while the older and smaller motels, which were more likely to accommodate construction and gas field workers on a weekly or monthly basis averaged 75 to 80 percent occupancy, and RV parks averaged 80 to 85 percent occupancy (CCVC 2010).



Source: Golnar 2010a; Rawlins Daily Times 2007.

Figure 3.8-9 Rawlins Residential Building Permits and Mobile Home Set-ups – 2001 to 2007

Rawlins has no housing dedicated for seniors or for the homeless.

The 2007 Rawlins Housing Assessment estimated the following near-term housing needs in Rawlins:

- 72 new single family homes per year;
- 170 additional multi-family units, of which 100 should be rent-assisted; and
- Three new mobile home parks.

3.8.5.2 Sinclair

The 2000 Census counted 211 total housing units in the Town of Sinclair, 80 percent of which were occupied. Houses vacant for seasonal use totaled 1 percent of total housing. Of the occupied units, 87 percent were owner-occupied (**Table 3.8-12**).

Except for existing houses and businesses, most land in Sinclair is owned either by the refinery or the railroad. The relatively few rental properties in Sinclair are rarely vacant. There are no motels, mobile home parks or RV parks in the town (McWhorter 2008).

Table 3.8-12 2000 Census, Sinclair Housing Profile

Total Housing Units	Total Occupied	Total Vacant	Vacant for Seasonal Use	Home-owner Vacancy Rate	Rental Vacancy Rate	Home-owner Occupied Units	Renter Occupied Units
211	168	43	3	3.3%	12.0%	146	22

Source: U.S. Census Bureau 2001b.

3.8.5.3 Saratoga and the Platte River Valley

There are a total of 344 rooms in hotels, motels, bed and breakfast establishments, and rustic cabins in the Platte Valley. Saratoga has a total of 174 rooms, including 122 rooms in the town's three largest motels. There is one private RV park in Saratoga with 30 spaces that typically hosts energy and construction workers and longer term recreation visitors. The town operates a 25-space campground at Saratoga Lake, but it typically caters to tourists, as does a 33-space campground in Riverside.

Competition for motel rooms and RV spaces from recreation visitors is strong during summer months (Crimmins 2008). The August 2010 CCVC survey found that motels in Saratoga averaged 75 to 80 percent occupancy and the RV parks averaged 95 to 100 percent occupancy (CCVC 2010). Saratoga has two mobile home parks with 102 pads, 40 of which were vacant in August of 2010.

3.8.5.4 Baggs and Dixon

In the Baggs area, temporary housing resources include one motel with 14 rooms. Two RV parks with a total of 23 pads are located just north of Baggs (CCVC 2010; Corners 2008). Dixon has one recently constructed eight-room motel.

3.8.5.5 Wamsutter

Temporary housing resources in Wamsutter include seven mobile home/RV parks with a total of 160 spaces. Some drilling and gas service contractors have put dormitory units in these mobile home parks. Wamsutter also has one motel with 28 rooms and a 60-room motel is planned for development in the next 2 years. (Carnes 2010; Colson 2010).

3.8.5.6 Other Carbon County Communities

The Carbon County communities of Elk Mountain, Encampment, Hanna, Medicine Bow, Riverside, and Walcott Junction have a total of 140 motel rooms and 93 RV/mobile home spaces. There also is a small RV park located at the unincorporated community of Arlington. In Encampment and Riverside, these facilities are typically occupied by tourism and recreation visitors during summer months. In Elk Mountain, Hanna, Medicine Bow, and Arlington, these facilities are heavily used by construction workers and maintenance contractors for area energy facilities including wind energy projects. An existing 50-unit mobile home/RV park in Walcott Junction originally built to exploit its location at the junction of I-80, U.S. 30, and Wyoming 130, serving highway travelers and construction and energy workers, is currently not operating. However, its infrastructure systems are functional and it could be reopened on short notice given sufficient demand, as it did in 2009.

3.8.5.7 Temporary Housing Outside of Carbon County

Seasonal demand for temporary housing increases during the summer across southern Wyoming, due to the concurrent demands associated with summer time travel, tourism, construction and energy development. While benefitting local lodging, eating and drinking, and retail establishments economically, that demand represents competition for the available supply. High occupancy rates for lodging in Carbon County and Wamsutter can displace demand to other locations, be it associated with travelers or temporary nonlocal workers in Carbon County. Such displacement typically occurs along the "path of least resistance" in terms of highway accessibility. I-80 serves that function across southern Wyoming, reflecting the predominant east-west traffic flow pattern. Laramie (100 miles) and Rock Springs (108 miles) are the next major cities east and west of Rawlins, respectively. Casper (117 miles) to the north is farther. Recent tallies identified the following inventories of motel rooms in these three communities: 1,638, 1,556, and 2,679, respectively (CH2M Hill 2010, 2009).

3.8.6 Community Infrastructure and Services

This section describes the current condition of community infrastructure and services likely to be directly affected by the project. The full range of community infrastructure and services is characterized for Carbon County and Rawlins, where the bulk of the construction and operations work force is anticipated to reside. Community services likely to be affected by transportation issues or by an influx of temporary workers (i.e., law enforcement, emergency response, and medical services) are summarized for Sinclair, Saratoga, Baggs, Dixon, and Wamsutter.

3.8.6.1 Carbon County

Carbon County provides law enforcement, emergency management, and road and bridge construction and maintenance services to the unincorporated portion of the county including the Application Area, and provides a variety of other services to all county residents. Carbon County services generally are headquartered in Rawlins, in the Carbon County Court House, the Carbon Building, the County Road and Bridge Office and Shop, and the National Guard Armory.

Carbon County Sheriff

The Carbon County Sheriff's Office provides law enforcement services throughout Carbon County, including certain services in incorporated municipalities. In and near the Application Area, the Sheriff's Office provides patrol services, civil service, traffic enforcement, response to accidents and emergencies, criminal investigation, coordination of local search and rescue, and responds to calls for other law enforcement-related services. The Sheriff's Office provides dispatch services for most of the county, including the Application Area, and operates the Carbon County Jail, which provides detention services for the entire county. The Sheriff's Office, jail, and dispatch facilities are located in Rawlins.

During the summer of 2009, the Carbon County Sheriff's Office staff included the Sheriff, 16 additional sworn officers, 20 detention deputies, and 7 dispatchers, as well as a number of civilian administrative staff. Most of the sheriff's deputies are based in Rawlins, but deputies also are stationed in Baggs, Hanna, McFadden, and Saratoga. New sheriff's office employees who relocated to the area during 2007 and 2008 often had difficulty finding affordable housing. Attendance at the state law enforcement academy and on-the-job training required to prepare a new officer for duty generally takes 6 months.

The Carbon County detention facility, completed in 2004, has 78 beds, including some dedicated for female inmates. Adolescent detainees are transported to a facility in Casper. The jail has been in operation for about 5 years. Occupancy in the detention facility averaged 52 in 2007and 65 in 2008. The design capacity was exceeded periodically during the summer of 2009 (Colson 2009). The Sheriff's Office is concerned that the facility will routinely exceed capacity sooner than its intended design life of 10 to15 years.

The Sheriff's Office generally experiences an increase in industrial accident calls, vehicle accidents, traffic infractions and crime in unincorporated areas of the county as a result of energy development. The increase in calls reflects, in large part, the increase in industrial and human activity in remote rural areas (Colson 2009; Morris 2010).

Emergency Management and Response

Carbon County Emergency Management coordinates emergency response services within the county. Emergency response services in western Carbon County, including the Application Area, are provided by fire departments and ambulance services from Rawlins, Saratoga, Baggs, and Wamsutter. These services are described in the sections dealing with each community (Zeiger 2010).

The Rawlins Interagency Dispatch Center provides a central location for reporting all wild land fires in southern Wyoming. Additionally, the BLM RFO also maintains trained and equipped fire crews that

respond to wild land fires on BLM surface and, if needed, will support other agencies on other public, state, and private lands.

Carbon County Fire Department

The Carbon County Fire Department operates 10 divisions or stations located in Baggs, Elk Mountain, Encampment, Hanna, Medicine Bow, Muddy Gap, Rawlins, Rock Creek, Ryan Park, and Saratoga. A county fire truck also is stationed at the Sinclair Fire Department. The department maintains approximately 170 volunteers who are paid on a per call basis. The department operates 64 pieces of equipment; 3 to 5 are stationed at each division, and 10, including the county's hazardous material response vehicle, are stationed in Rawlins. Each division has a rescue truck with "jaws of life" vehicle extraction equipment. Funding for the County Fire Department is provided by the Carbon County Commissioners and by each division's fund raising activities. To date, the department has responded to few calls related to wind energy project construction or operations (Trapp 2010).

Ambulance/Emergency Medical Response

Ambulance and emergency medical response services are provided by three organizations in Carbon County, some of which serve multiple communities.

Memorial Hospital of Carbon County (MHHC) operates the Carbon County Emergency Medical Service (CCEMS), providing ambulance and emergency medical services in the northern and most of the western part of Carbon County, including part of the Application Area. CCEMS, a full-time Emergency Medical Service (EMS), currently operates three ambulances and is staffed with 12 full-time Emergency Medical Technician positions and 8 per-diem staff positions. CCEMS operates 24 hours a day, 7 days a week. The ambulance service averaged 75 runs per month during 2007 (Carter 2007; Shulze 2009).

South Central Wyoming Emergency Medical Services (SCWEMS) operates under the auspices of a joint powers board comprised of Carbon County and the municipalities of Elk Mountain, Medicine Bow, Saratoga, Encampment and Riverside. SCWEMS provides services to Hanna under a contract basis. The agency operates eight ambulances and has 87 on-call employees, who are paid on a per call basis (Zeiger 2010).

The Little Snake River Emergency Medical Services (EMS), based in Baggs, has 10 volunteer Emergency Medical Technicians who staff two county-owned ambulances. The ambulances respond to accidents in the southwestern part of the county and about 30 miles north along WY 789 (Jones 2007). Seriously injured patients are transported to Craig, Colorado, or Rawlins, depending on the location of the accident. Casper-based Flight-for-Life also is available if needed.

Ambulance and emergency medical response services in Wamsutter and portions of western Carbon County are provided by the ambulance service department of Wamsutter Health Care, Inc. The Wamsutter Ambulance Service has about 10 volunteers. Patients are typically transported to MHCC. The service does not bill for transport and is supported primarily through fundraising and donations. The gas and oil industry has provided substantial financial support for the service. Medical direction, EMS training, and continuing education are provided by MHCC (SafeTech Solutions, LLP 2008).

Memorial Hospital of Carbon County

MHCC is a 35-bed acute-care facility (including 10 beds dedicated for obstetrics or births and other specialty needs), designated by the state as a Level 3 Community Trauma Hospital, one requirement is that it has a surgeon on staff. MHCC's emergency room is staffed 24 hours per day, 7 days per week with an emergency-care physician, a registered nurse, and emergency medical technicians. Currently the hospital has adequate staffing and facility capacity to serve substantially more patients than are currently treated. During the summer of 2010, MHCC had eight active medical staff physicians, over

35 courtesy (visiting) physicians, and five locum tenems physicians who are hired on a temporary, short-term basis to fill in when active medical staff are on leave (Jessop 2010).

The MHCC-operated Wagon Circle Health Clinic in Rawlins is staffed by a family-practice doctor and an orthopedic surgeon. MHCC's Outpatient Clinic also is staffed by visiting specialists who travel to Rawlins periodically depending on their specialty and need. An urgent care facility is located across the street from MHCC.

3.8.6.2 Rawlins

The City of Rawlins is the Carbon County seat and the largest community in the county. The city's municipal staff includes about 95 employees, a reduction of approximately 20 positions from 2008, due to budget cuts reflecting declines in sales taxes and other revenues (Golnar 2010b; Izzo 2010).

Rawlins Public Works

The Rawlins Public Works Department includes eight divisions: central shop (maintenance of city vehicles and rolling stock), facilities maintenance, grounds maintenance, solid waste, streets, water and wastewater treatment, and utilities (water distribution and wastewater collection).

Rawlins Water System

The Rawlins water system, which also supplies treated water for the Town of Sinclair, was developed in the 1970s with a target capacity to serve about 17,000 residents. The system includes an 8-million-gallon-per-day (MGD) treatment plant, which registered a 2006 peak daily usage of 4.45 MGD. Consequently the water treatment plant could accommodate a service population almost double the current population at current usage rates. There are four storage tanks, with a combined capacity of 6 million gallons for the City of Rawlins and a 0.8-million-gallon tank for Sinclair. There also is a raw-water storage reservoir that feeds the treatment plant. Rawlins has ample water rights in the North Platte River and in springs and wells, to serve both current and anticipated future water needs (Stolns 2010).

Rawlins Wastewater System

The wastewater system for Rawlins also was designed for a population of about 17,000. The system has three aerated lagoons, two settling lagoons, and two storage lagoons. The maximum capacity of the treatment plant is 342.2 million gallons annually; current usage is 171.1 million gallons, about half of the maximum capacity. In order to achieve maximum capacity, several lagoons would need to be cleaned and restructured. There are currently over 65 miles of wastewater collection lines within the city and recent expansions have extended the collection system to serve additional land along I-80 (Stolns 2010).

Rawlins Solid Waste Disposal

The City of Rawlins operates its own landfill, which has a remaining life of several years at current fill rates. It is currently seeking to obtain an additional section of land from the BLM to expand the landfill. Rawlins, along with Casper, Douglas, and other east-central Wyoming communities, is participating in the Wyoming Integrated Solid Waste Management process as a member of the East Central Solid Waste Management Area. In June of 2009, the Rawlins City Council approved the development of a transfer station and transportation of household solid waste to the Casper landfill. Construction waste will still be disposed in the Rawlins landfill. Disposal fees are designed to cover costs and some construction waste is recycled (Stolns 2010).

Rawlins Police Department

Law enforcement services for the City of Rawlins are provided by the Rawlins Police Department (RPD), which also operates the Rawlins Dispatch Center. Individuals taken into custody by the RPD are booked into the Carbon County jail. As of August 2010, the RPD had a staffing level of 29.5 positions, including

13 patrol officers, 3 investigators, 3 administrative staff, 2 animal control officers, 7 dispatch/records staff, and one full-time and one half-time victim advocates. The 2010 staffing was 5.5 staff below what the department had in 2008. Staff reductions occurred as a result of the decline in sales and use tax and other revenues experienced during the national recession.

The Police Chief observed a transition in the most common types of offenses during the mid 2006 to mid 2008 boom years, from traffic offenses to fights and domestic violence. The level of violence increased during that period, according to the Chief, and drug abuse also has become a serious issue. Dispatched calls for service were over 5 percent lower in 2009 than 2008, but larceny, motor vehicle theft, and fraud were all higher in 2009 than 2008, which may be a reflection of the recession.

RPD facilities are adequate for current needs, but there is a need for improved training facilities for follow-up and advanced training (Reed 2010).

Rawlins Fire Department

The Rawlins Fire Department (RFD) provides fire suppression and rescue services within the city and within a 60-mile radius of the city, including incidents along I-80 and WY 789. RFD responds to Level A hazardous material incidents throughout the county. The RFD has two fire stations in Rawlins, both of which are staffed on an around-the-clock (24/7/365) basis. The department has mutual-aid agreements with other municipalities in the county and provides training and conducts joint exercises with companies at some natural gas facilities. RFD personnel conduct semi-annual fire safety inspections and plan reviews for subdivisions and all public-access structures within the city.

RFD currently has 20 volunteers but recently cut 2 of its 10 paid staff due to city budget constraints. The department may be able to reinstate these positions during the fall of 2010. During periods of major construction and gas field development, staff recruitment and retention has been difficult as a result of the high wages and salaries paid in those industries. Volunteer recruiting and retention also is difficult because many Rawlins residents spend long hours working and traveling to job sites and correspondingly have less time to spend on community work, including volunteering for the fire department. Remote energy industry job sites also increase response times. Volunteers respond to Station #1 for fire calls outside of the city; for calls within the city, the paid staff takes the equipment to the incident location and the volunteers respond directly to the incident location in their own vehicles.

RFD currently has four pumpers, a wild land response unit, a ladder truck, a fully equipped rescue unit, a combination utility vehicle/crew transport for extrications/wild land response, an incident command trailer, a HAZMAT response trailer, and a motor home outfitted as a safety house, which is used for public education, primarily in schools (Hannum 2010).

3.8.6.3 Sinclair

The Town of Sinclair is the closest community to the project, the intermodal transfer facility, and the primary project access. The town has a staff of five full-time and several part-time employees. Sinclair has one full time police chief and four to five part-time officers. Detainees are taken to the Carbon County jail in Rawlins. Sinclair has a volunteer Fire Department which currently has about 10 volunteers. The Sinclair Refinery operates a highly trained and equipped fire brigade and maintains one fire station with approximately 35 volunteers (McWhorter 2008).

3.8.6.4 Saratoga

Saratoga is located east of the project, on WY 130. Saratoga maintains its own water and wastewater treatment systems.

The Saratoga Volunteer Fire Department, a division of the Carbon County Fire Department, maintains about 30 volunteers and provides fire suppression services to the town and the surrounding area,

including assistance on range and forest fires. Saratoga has a police department that responds to law enforcement issues within the town and provides emergency dispatch services. The Saratoga Ambulance, which is affiliated with SCWEMS, provides emergency medical care and transport for patients throughout the Upper Platte River Valley from the Colorado state line to I- 80 in south central Carbon County. The Saratoga Platte Valley Medical Clinic, which operates a community trauma center, also is located in the Town (Town of Saratoga 2010).

3.8.6.5 Baggs and Dixon

Baggs provides water and wastewater services, which are sized to accommodate some growth. The Town of Baggs has one police chief and positions for two police officers, who provide law enforcement services within the towns of Baggs and Dixon. Baggs Fire and Rescue provides fire suppression services within the communities of Baggs and Dixon and the surrounding area. The Noyes Clinic, a rural health clinic located in Baggs is staffed by a physician's assistant, supervised by a doctor and supported by five full-time and one part-time staff, most of whom perform both medical and administrative duties. The clinic is funded by a recently formed rural health-care district (Corners 2008; Jones 2007).

The Dixon water system is sized to accommodate some growth but the wastewater system occasionally exceeds its permitted capacity (O'Neil 2007). Law enforcement, emergency response, and fire suppression services in Dixon are provided by the agencies described above for Baggs.

3.8.6.6 Wamsutter

The Sweetwater County Town of Wamsutter is located east of the Application Area. Wamsutter has recently upgraded its water and wastewater systems and paved a number of town streets. The town's utility systems are designed to accommodate a population of 1,200 residents, about twice the town's current population, although at times the temporary population in the community is much higher. Wamsutter no longer has a town police department; law enforcement services are provided by two resident Sweetwater County Sheriff's deputies and four resident Wyoming State Highway Patrol troopers. Wamsutter has volunteer fire and ambulance/emergency medical service, each staffed by about 10 volunteers. Wamsutter also has a community health clinic staffed by a physician's assistant and number of visiting physicians (Carnes 2010; Colson 2010).

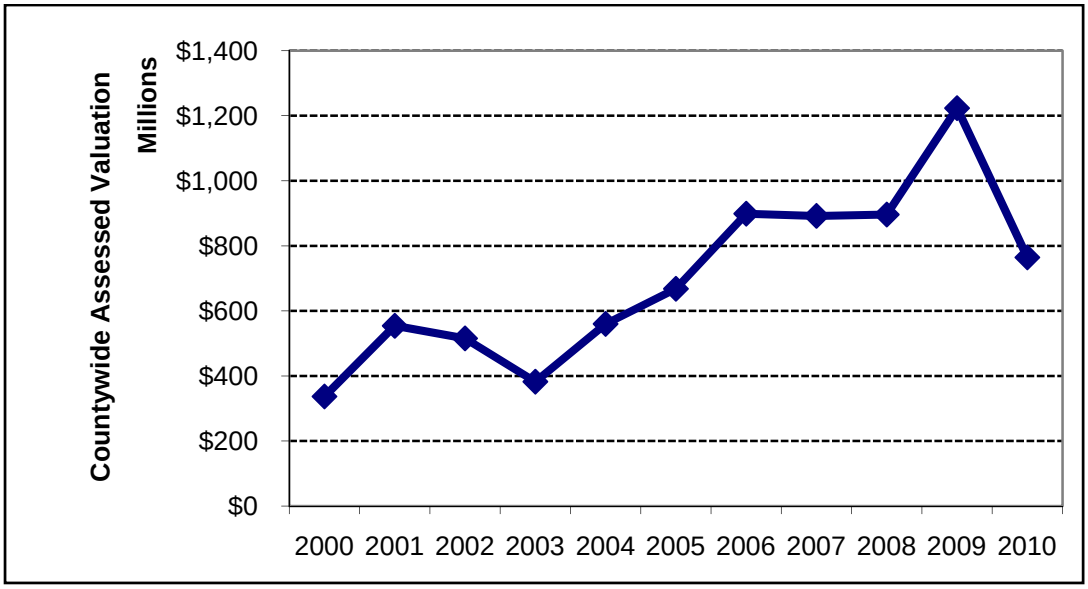
3.8.7 Local Government Fiscal Conditions

Development of the proposed project would affect certain local and state government revenues and expenditures. Affected revenues would include ad valorem property tax revenues of Carbon County, Carbon County School District (CCSD) #1, and certain special districts and sales and use tax revenues of the State of Wyoming, Carbon County, and its municipalities. The two counties and the affected school districts, special districts, and municipalities also would see increases in expenditures to serve development and associated population growth. This section describes existing conditions and trends in the local government jurisdictions that are likely to be affected by the proposed project.

3.8.7.1 County Fiscal Conditions and Trends

<u>Property Taxes</u>

Property taxes, assessed on the taxable value of real and personal property, utilities and mineral production are a vital element of Carbon County's revenue base. Due to the presence of significant energy resource production in Carbon County and generally rising prices, assessed valuation has climbed dramatically in recent years, from $337 million in fiscal year 2000 to over $1.2 billion in fiscal year 2009, including increases of more than $200 million from 2005 to 2006 and of more than $300 million from 2008 to 2009 (**Figure 3.8-10**). The increase includes a quadrupling of assessed value on oil and gas production.



Sources: Wyoming Department of Revenue, various; Wyoming State Board of Equalization 2010, 2009.

Figure 3.8-10 Total Assessed Value, Carbon County – 2000 to 2009

The high dependency on mineral valuation, however, also exposes local budgets to volatility associated with rapid declines in energy commodity prices, as was demonstrated between 2001 and 2003 when assessed valuation declined by approximately $180 million, and more dramatically by the $459 million (38 percent) drop in countywide valuation between 2009 and 2010. Approximately 90 percent of the latter was due to a 50 percent decline in the total valuations on natural gas and other mineral production, which in turn, reflected sharply declining natural gas prices. Decreases in industrial property valuation, some of which also is related to lower energy prices, accounted for most of the remaining decline.

Due to past growth in mineral production and prices, the assessed value of minerals increased from 64.5 percent to 71.2 percent of the tax base in Carbon County between 2000 and 2009, exceeding $870 million in 2009. The value of mineral production as a share of the total valuation declined in the past 2 years, due in part to lower prices. However, rising industrial property valuations, including energy related equipment and natural gas pipelines, as well as higher valuations on residential property reflecting rising home prices, both of which are indirectly related to recent energy development, also factored into the declining lower share from minerals. **Table 3.8-13** shows recent trends in assessed value, by type of property.

Sales and Use Tax Trends

Rivaling property taxes in importance to county government is the sales and use taxes imposed by the state and, when approved by the local electorate, the counties themselves. Counties can elect to impose a 1.0 percent optional general purpose local tax and a 1.0 percent specific-purpose tax for capital improvements. Carbon County currently imposes the 1 percent general purpose tax and Carbon County voters approved a renewal of the specific purpose tax in November of 2008.

The state sales and use tax of 4.0 percent is collected based on the point of sale, but the share returned to counties and incorporated municipalities (a statutorily established amount, currently 31 percent of the statewide total receipts) is on a population-based formula, irrespective of where the sales were generated. The state collects these taxes and distributes the local share based on the above-referenced formula.

Table 3.8-13 Carbon County Assessed Value by Class – Selected Fiscal Years

	For Taxes in the Following Fiscal Year				Change 2009-2010
	2000	2008	2009	2010	
Real Property					
Agriculture	$6,269,760	$8,404,925	$8,689,968	$9,491,329	9%
Commercial	$9,995,472	$14,365,703	$17,647,309	$18,859,877	7%
Residential	$34,336,241	$77,381,140	$80,585,537	$79,638,056	-1%
Subtotal	$50,601,473	$100,151,768	$106,922,814	$107,989,262	1%
Minerals					
Coal	$40,784,620	$3,811,351	$6,749,862	$6,987,193	4%
Gas	$159,074,447	$530,169,868	$744,469,866	$368,885,934	-50%
Oil	$16,939,926	$89,901,463	$117,613,768	$81,478,110	-31%
Other	$366,717	$1,653,617	$ 1,978,534	$2,236,137	13%
Subtotal	$217,165,710	$625,536,299	$870,812,030	$459,587,374	-47%
Utilities	$37,017,889	$69,383,475	$91,276,378	$84,309,578	-8%
Industrial and Personal property	$31,988,670	$101,144,447	$154,219,097	$112,309,465	-27%
Total	**$336,773,742**	**$896,215,989**	**$1,223,230,319**	**$764,195,679**	**-38%**
% Minerals	64.5	69.8	71.2	60.1	-16%

Note: Mineral detail is for state assessed value only. Valuation is based on production for previous year.

Sources: Wyoming Department of Revenue, Annual Reports, various; Wyoming State Board of Equalization 2010, 2009 (for minerals detail for 2010, 2009, and 2008).

Table 3.8-14 summarizes the amount of sales, use, and lodging taxes distributed to Carbon County by the state in recent years. The distributions include both the full distribution of local option taxes and the county's proportional share of the state taxes. As shown, total sales and use tax revenues generated within Carbon County approached $41 million in 2007, more than double the total of just 5 years earlier. The resurgence of natural gas development activity and pipeline construction is evident in the substantial total sales and use taxes generated on sales in the county and the receipts from the local specific-purpose sales tax.

Sales and use tax distributions to the county declined to just over $34 million in fiscal year 2008 as a 1.0 percent specific purpose local option tax, which requires voter approval and is enacted for a defined term, expired in June 2008 and declines in use tax as the pace of oil and gas development declined. The significance of the local option tax is readily apparent, having generated more than $13.0 million in sales and use tax revenues in fiscal year 2007, but declining below $7.0 million in fiscal year 2008. Local voters subsequently reinstated the specific purpose local option tax in the November 2008 general election. However, the additional taxes generated were more than offset by declines associated with the economic recession and declines in construction and mineral resource development activity, as the total distribution to Carbon County fell by more than $13 million between 2007 and 2010.

Table 3.8-14 Annual Sales and Use Tax Distributions, Carbon County, Fiscal Years 2006 to 2010

Source of Distributions	Fiscal Year				
	2006	2007	2008	2009	2010
General purpose local sales	$4,481,031	$5,466,724	$5,625,450	$6,293,772	$3,955,550
General purpose local use	$409,374	$1,368,627	$1,077,816	$717,474	$ 596,977
Specific purpose local sales	$4,450,047	$4,879,915	$50,200	$454,429	$3,924,130
Specific purpose local use	$407,808	$1,306,446	-$ 21,491	$87,900	$598,009
State sales	$17,924,890	$21,867,275	$22,502,258	$25,175,135	$15,822,251
State use	$1,637,544	$5,475,415	$4,311,431	$2,871,311	$2,387,907
Lodging	$307,846	$405,083	$472,174	$432,060	$377,233
Total Distributed	**$29,618,540**	**$40,769,485**	**$34,017,838**	**$36,032,081**	**$27,662,057**

Sources: Wyoming Department of Administration and Information, Lodging Tax Reports, various years; Wyoming Department of Revenue 2010b, 2009.

Table 3.8-15 shows total fund revenues and expenditures in several broad categories for Carbon County's general fund over the past three fiscal years. As shown, property tax receipts increased by $2.7 million from 2009 to 2010 in response to increases in assessed valuation, driven primarily by mineral valuation. Budgeted expenditures for selected departments that tend to be particularly sensitive to growth increased from 2008 to 2009 and were budgeted to increase again in 2010. However, as described elsewhere, the economic downturn and reduction in the pace of development had significant adverse effects on revenues; actual revenues from sources other than property taxes were 40 percent below the budgeted sums. Consequently, the county's total general fund revenue was 22 percent below budget, requiring substantial reductions in operating outlays, deferral of planned capital outlays, and use of some reserve funds. Part of the reductions reflected savings due to lower service demand; however, the cutbacks also resulted in diminished levels of services for county residents.

Table 3.8-15 Annual General Fund Revenues and Expenditures, Carbon County

	Fiscal Years				Change: 2010 Original vs. Adjusted
	2008	2009	2010 Original	2010 Adjusted Actual	
General Fund Revenue					
Property tax revenue	$9,603,868	$9,700,506	$12,472,882	$12,472,882	0%
Other revenue	$11,999,836	$12,156,935	$15,976,118	$9,593,391	-40%
Total revenue	**$21,603,704**	**$21,857,441**	**$28,449,000**	**$22,066,273**	**-22%**

Table 3.8-15 Annual General Fund Revenues and Expenditures, Carbon County

	Fiscal Years				Change: 2010 Original vs. Adjusted
	2008	2009	2010 Original	2010 Adjusted Actual	
General Fund Expenditures					
Select Departments					
Criminal justice	$1,507,178	$1,674,792	$1,743,346	$1,691,878	-3%
Sheriff	$1,467,007	$1,704,024	$2,139,065	$1,654,892	-23%
Jail	$1,749,921	$1,913,701	$3,032,959	$2,583,053	-15%
Road and bridge	$2,310,140	$3,393,772	$3,253,057	$2,015,528	-38%
Select departments subtotal	$7,034,246	$8,686,289	$10,168,427	$7,945,351	-22%
Other[1]	$13,414,088	$13,277,770	$31,176,149	$12,826,271	-59%
Total Expenditures	**$20,448,334**	**$21,964,059**	**$41,344,576**	**$ 20,771,622**	**-50%**

[1] Other includes all other departments, budgeted capital outlays and closing balances/reserves. The 2010 original budgeted expenditures included anticipated receipts of a $10 million grant.

Source: Carbon County, County Budgets, Fiscal Year 2008-2010.

3.8.7.2 Municipal Fiscal Conditions and Trends

Assessed Valuation

Most mineral development occurs in unincorporated areas. Consequently, local municipal valuations are more heavily dependent on residential and commercial valuations, than are the counties. Furthermore, residential and commercial property is assessed at 9.5 percent of the market value, whereas minerals are assessed at 100 percent of market value. As a result, property taxes are a relatively less significant revenue source for municipalities than for counties and generally a function of the size of community and local economic growth.

As shown in **Table 3.8-16**, the resurgence in oil and gas development resulted in increases in the municipal assessed valuations in the region during the period leading up to the recession. Rawlins and Sinclair each have an ad valorem tax base in excess of $50 million, while those for Saratoga, Baggs, and Wamsutter were each substantially lower. The most significant change disclosed by these data is that Sinclair's tax base more than quintupled between 2006 and 2009, primarily due to a major upgrade and modernization at the refinery located within the town's boundaries. Although less pronounced than the fluctuations associated with mineral prices, assessed valuation in Baggs and Wamsutter has fluctuated in response to the level of oil and gas development and oil and gas equipment and facilities that are located in the communities on a temporary basis. The decline in the pace of natural gas development and pipeline and refinery construction activities resulted in reductions in assessed valuation in Rawlins, Sinclair, Baggs, and Wamsutter between 2009 and 2010.

Table 3.8-16 Total Assessed Value, Potentially Affected Cities and Towns

City/Town	Fiscal Year					Change 2009-2010
	2006	2007	2008	2009	2010	
Rawlins	$31,466,624	$40,026,026	$46,593,587	$51,449,273	$50,599,959	-2%
Sinclair	$18,951,493	$34,022,194	$56,951,801	$101,559,335	$58,908,547	-42%
Saratoga	$10,176,335	$11,169,625	$13,836,362	$14,003,982	$14,327,425	2%
Baggs	$1,253,046	$1,740,673	$2,061,521	$3,363,378	$2,733,582	-19%
Wamsutter	$5,438,372	$1,804,230	$2,791,829	$3,988,816	$3,942,481	-1%

Source: Wyoming Taxpayers Association, various years and Wyoming State Board of Equalization 2010, 2009.

Local municipal governments in Wyoming assess a standard 8.0 mils for property taxes. Estimated revenues generated by that levy on the 2010 assessed values presented in **Table 3.8-16** would range from $471,268 for the Town of Sinclair to $21,869 for the Town of Baggs.

Sales and Use Tax Distributions

Sales and use taxes are typically the single largest sources of general fund revenue for municipalities. That pattern applies to the affected municipalities in the Application Area. **Table 3.8-17** shows the annual sales and use tax distributions reported by the state for the past 6 years to the potentially affected communities. The comparative distributions among the communities generally reflect their relative sizes, but also differences in the level of economic activity and growth associated with natural gas industry and other construction activities. As evidenced by the $3.1 million reduction in sales and use tax distributions received by Rawlins, the general economic downturn and slower pace of oil and gas development has dramatically affected local sales and use tax receipts in the region. The sudden and precipitous reductions in revenues have posed fiscal challenges for local governments striving to maintain public facilities and services, while at the same time completing major capital improvements programs initiated prior to the decline.

City of Rawlins General Fund Revenue and Expenditures

Table 3.8-18 summarizes general fund budget data (most recent actual plus 2 years of budgets) for the City of Rawlins. General fund revenues and expenses will effectively equalize over the long term, but there may be variances in any one year due to inter-fund transfers, contributions to or from reserves, and varying year-end cash balances. In Rawlins, budgeted revenue was anticipated to increase modestly over the 3-year period, with increased tax receipts accounting for more than half of the total change. On the expenditure side, the largest single category – both in terms of absolute size and increase over the 3-year period – is public safety.

The budget data shown in **Table 3.8-18** represented local expectations prior to realizing the full import of the recession and declining energy prices on revenues. In fact, the city has been forced to undertake dramatic cost-saving measures, including laying off many staff, to cope with the revenue shortfalls. The city's budget for the current year is austere, anticipating little, if any, significant improvement in its revenue outlook. The city's adopted budget for fiscal year 2010-2011 reflected a $4.7 million (31 percent) reduction in total budgeted expenditures, as compared to the original budget adopted for 2009-2010. Although cutbacks in capital spending accounted for the majority of the reduction, nearly $1.8 million came from the operating budget (Izzo 2010).

Table 3.8-17 Total Sales and Use Tax Distributions, Cities and Towns – Fiscal Years 2005 to 2010

	Fiscal Year						Change 2009-2010
	2005	2006	2007	2008	2009	2010	
Rawlins	$5,252,016	$6,336,901	$8,594,271	$8,417,212	$8,808,209	$5,695,922	-35%
Sinclair	$240,852	$287,600	$403,662	$395,345	$413,710	$267,530	-35%
Saratoga	$982,768	$1,173,515	$1,647,092	$1,613,159	$1,688,093	$1,091,624	-35%
Baggs	$205,710	$245,475	$332,090	$325,249	$340,357	$220,096	-35%
Dixon	$110,613	$53,712	$75,388	$73,835	$77,265	$49,964	-35%
Wamsutter	$228,118	$282,659	$338,173	$337,136	$341,689	$259,250	-24%

Source: Wyoming Department of Revenue 2010c.

Table 3.8-18 General Fund Revenue and Expenditures, City of Rawlins

	2007-2008 Actual	2008-2009 Budget	2009-2010 Budget	Change 2007-2008 to 2009-202010
General Fund Revenue				
Taxes	$7,454,450	$7,468,667	$8,348,500	12.0%
Franchises	359,000	394,000	430,000	19.8%
Intergovernmental	2,969,635	2,547,347	2,380,139	-19.9%
Charges for Services	1,053,513	1,077,050	1,030,200	-2.2%
Police and Court	354,700	387,400	390,900	10.2%
Other Revenue	119,500	82,900	71,140	-40.5%
Transfers In	425,850	483,610	687,497	61.4%
Beginning Balance	2,638,736	3,820,237	3,593,656	36.2%
Total Revenue	**$15,375,384**	**$16,261,211**	**$16,932,032**	**10.1%**
General Fund Expenditures				
Administration	2,511,368	2,652,215	3,097,286	23.3%
Courts	287,597	289,915	284,631	-1.0%
Public Safety	4,666,059	5,059,741	5,234,031	12.2%
Public Works	2,482,836	2,426,548	2,937,439	18.3%
Parks & Recreation	1,623,278	1,291,187	1,314,228	-19.0%
Miscellaneous	617,235	842,476	1,037,273	68.1%
Capital Improvements	1,060,242	1,473,192	274,349	-74.1%
Ending Balance	2,026,769	2,225,937	2,752,795	35.8%
Total Expenditures	**$15,275,384**	**$16,261,211**	**$16,932,032**	**10.8%**

Note: Taxes include state-rebated sales and use tax.

Source: City of Rawlins 2010.

3.8.8 Public Education

Two public school districts serve Carbon County: CCSDs #1 and #2. CCSD #1 serves Rawlins; Sinclair; the LSRV, including the communities of Baggs and Dixon; and the remainder of western Carbon County. Additionally, the district serves students in the Sweetwater County community of Bairoil and high school students in the Sweetwater County community of Wamsutter. CCSD #2 serves eastern Carbon County, including the communities of Saratoga, Encampment, and Riverside, south of I-80, and the communities of Hanna and Medicine Bow north of I-80 along US 30/287.

Virtually all of the project's facilities and infrastructure would be located with CCSD #1 boundaries. Furthermore, most of the project's work force is likely to reside in and near the Town of Rawlins. However, only limited enrollment effects are expected because of the relatively small number of operations jobs, the potential to fill at least a portion of operations jobs locally, the seasonal nature of construction (April to November) and, as demonstrated by recent wind energy construction projects, the fact that most construction workers are unlikely to be accompanied by households or school children.

3.8.8.1 Enrollment

Until recently, CCSD #1 had experienced a long-term decline in overall enrollment, losing 756 students between fall 1991 and fall 2004, a 31 percent reduction in total enrollment. Renewed energy development triggered enrollment gains totaling 150 students, or 9 percent, over the ensuing 3 years (**Figure 3.8-11**). Total fall enrollment has been fairly stable the last 3 years, declining by 28 students from 2007 to 2008 and increasing by 16 between 2008 and 2009 (a 1 percent to 2 percent variance). There have been substantial increases in kindergarten and first grades in recent years, which is more of a demographic phenomenon than a result of migration. The district typically sees attendance decline over the course of the year, but reports no extraordinary decline due to the current economic recession. There is uncertainty regarding the extent to which household relocations will occur during the summer, with changes first becoming apparent next fall.

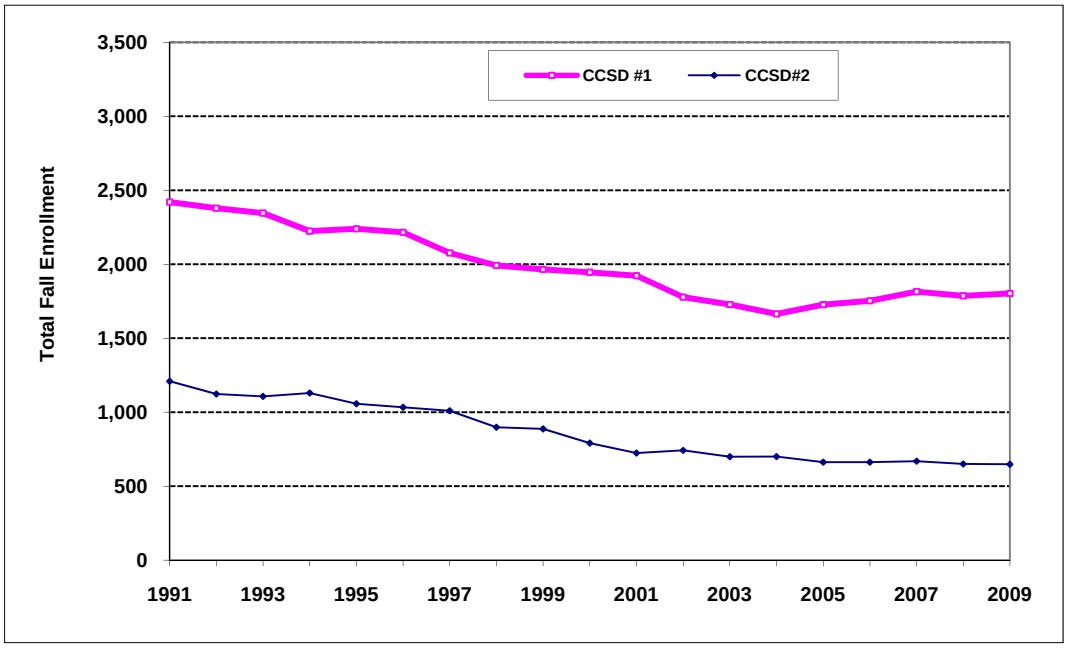
CCSD #2 also has experienced long-term declines in student enrollment, as fall enrollment dropped from 1,209 in the fall of 1991 to 662 in the fall of 2005. The district's total enrollment has been relatively stable since as energy resource development in northeastern Carbon County and "lifestyle" migration growth in the Saratoga area have generated some population growth to eastern Carbon County. Fall 2009 enrollment was 648 students.

3.8.8.2 Facilities

Currently CCSD #1 operates three elementary schools, a middle school, a high school, and a cooperative high school in Rawlins. Additionally, the district operates a fine-arts center, swimming pool, and a sports complex. It also operates elementary schools in Sinclair and Bairoil, and a K–12 comprehensive school in Baggs, which serves the entire LSRV.

The district's three elementary schools in Rawlins are at capacity and the district is using modular classroom buildings to accommodate elementary students. To remedy this problem, CCSD #1 is constructing a new elementary school to replace the existing three elementary schools and consolidate all Rawlins elementary students in one facility. The new elementary school is under construction and is scheduled to open in 2011. The Rawlins middle and high schools can both accommodate higher enrollments; enrollment at the high school is less than half of the design capacity (Rawlins Daily Times 2009; Sanders 2007).

Declining enrollments across CCSD #2 necessitated the closure/consolidation of four schools in recent years. The district presently operates seven schools: four elementary, two middle/high schools, and a K-12 school, including the Saratoga Elementary School and Saratoga middle/high school. Both can accommodate additional students.



Source: Wyoming Department of Education 2010a, 2009a.

Figure 3.8-11 1991–2008 Fall Enrollment in CCSDs #1 and #2

3.8.8.3 School District Fiscal Conditions

Financing for school operations and maintenance is governed by the provisions of the Wyoming School Foundation Program and the Wyoming School Facilities Commission. A statewide school finance system, the Wyoming School Foundation Program (WSFP) (W.S. Title 21, Chapter 13), regulates operating revenues and expenditures for public education services delivered at the local level. The WSFP provides a guaranteed level of funding to every school district in the state, with funding based on numbers of students, classrooms, and other factors such as adjustments for small schools, transportation, special programs, and the cost of living. The system is structured to achieve equalization in educational opportunities across the state, irrespective of differences in the local revenue-generating capacities of individual districts. Carbon and other mineral-rich counties play an important role in funding the school finance system because of their combined energy and minerals-related tax base. Revenues for school funding come from taxes on minerals production, real estate and taxable personal property, and various other local, state, and federal program funds and grants.

To fund public education, all districts are statutorily required to levy an ad valorem property tax of 43 mills, of which 31 mills are deemed local resources. A “mill” is one-tenth of a cent ($0.001) and typically denotes the rate of taxation per $1 of assessed valuation as it relates to property taxes. The remaining 12 mills represent a statewide levy used to fund the guaranteed revenue for districts with fewer local resources. If local property tax revenues fail to meet a district’s guaranteed funding level, the WSFP makes up the difference. If the district’s revenues exceed the guaranteed level, the excess is transferred to the state to aid in the funding of other districts under “recapture” provisions of the WSFP.

Like the county, CCSD #1 has experienced substantial increases in assessed value in recent years. As illustrated on **Figure 3.8-12**, CCSD #1 had a 403 percent increase in assessed value over the 9 years, reaching nearly $1.27 billion for fiscal year 2009. Increases in the level and value of oil and gas production accounted for virtually all of the increase. The volatility of mineral related valuation due to fluctuating prices also is evident on **Figure 3.8-12** as the district’s assessed value for 2010 dropped by

approximately $500 million. Increases in CCSD #2 assessed valuation were more modest, growing by 40 percent since 2000. As described above, the districts do not experience a corresponding increase in operating revenues associated with the increase in assessed valuation due to the provisions of the WSFP.

Table 3.8-19 shows the annual revenues derived by CCSD #1 from various sources. Total annual revenues for CCSD #1 have climbed by 63 percent. As noted, most of the revenue comes from local property taxes, which are included in the category of general revenue. As described above, locally derived property tax revenues in excess of certain limits are remitted to the WSFP for redistribution to other districts. CCSD #1 consistently makes such transfers. The Special Revenue Fund consists primarily of state and federal grants. State funds to support capital construction are included in the "Other" category.

Staffing levels for CCSD #1 also increased between 2006 and 2009, in part to respond to higher enrollments. The increases allowed the district to maintain an average student/teacher ratio below 12.0.

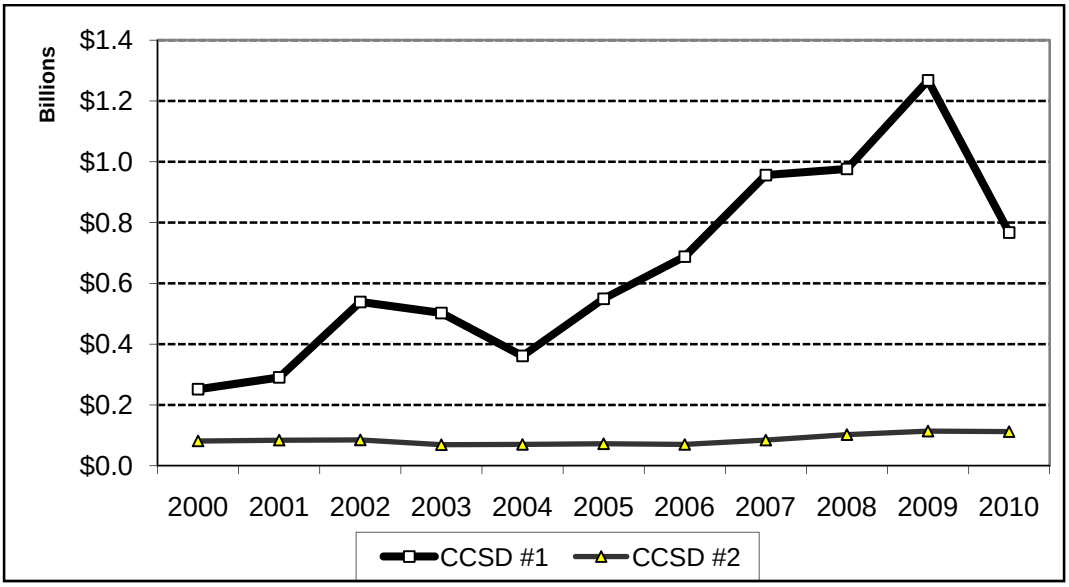
Table 3.8-20 shows the annual revenues derived by CCSD #2 from various sources. Total annual revenues for CCSD #2 climbed by about 37 percent between 2006 and 2009. As noted, most of the revenue came from local property taxes, which are included in the category of general revenue. Likely tax revenues in excess of certain limits are remitted to the WSFP for redistribution to other districts. CCSD #2 has made such transfers in recent years, although of much smaller magnitude than those made by CCSD #1.

Staffing levels for CCSD #2 fluctuated between 2006 and 2009, due in part to changes associated with the closure/consolidation of several schools. The teaching faculty grew. The increases allowed the district to maintain its average student/teacher ratio below 9.0.

Funding for school facilities functions under the rules, policies, and procedures of the Wyoming School Facilities Commission (WSFC) [Title 21, Chapter 15, of Wyoming Statutes]. The WSFC was established during the 2002 Legislative session to oversee all aspects of construction and maintenance of school facilities and physical plant. Its mission is to provide adequate educational facilities for all children in Wyoming, mirroring the mission of the WSFP that focuses on operations. Districts are required to formulate 5-year capital plans, which must then be approved by the WSFC. The WSFC also is responsible for funding the improvements using legislatively appropriated funds, most of which are derived from taxes imposed on energy and mineral resource production.

3.8.9 Non-Market Benefits and Values

Residents of, and visitors to, the Rawlins area derive a diverse array of economic, recreational, environmental, social well-being/quality of life, and other benefits from the area's public and private lands. Rawlins tied for third place in Outdoor Life Magazines' annual ranking of Top 200 Town's for Sportsmen (Outdoor Life 2009). Many economic benefits accrue to individuals, businesses, and other entities directly from activities and uses supported by the lands; for example, grazing, timber production, mineral and energy resource production, and commercial outfitting. These activities support local employment, both directly and indirectly for other individuals, enterprises, and governmental entities, through expenditures that occur within the local and regional economies in conjunction with these activities. Other benefits arise in conjunction with individual non-commercial use, such as hunting or fishing, as other individuals, firms and governmental entities supported by expenditures for lodging, equipment, licenses, food, travel, and other activity-related goods and services. However, while the jobs and expenditures associated with the activities can be estimated from various economic data, the satisfaction, potential improved health, and other quality-of-life benefits associated with recreation is more subjective.



Source: Wyoming Department of Education 2010b, 2009b.

Figure 3.8-12 Total Assessed Valuation, CCSDs #1 and #2: 2000–2009

Table 3.8-19 Carbon County School District #1, Revenue, Staffing, and Enrollment Trends

	Fiscal Year			
	2006	**2007**	**2008**	**2009**
Revenue by Fund				
General	$17,517,449	$22,139,242	$23,688,317	$25,142,289
Special	$1,599,625	$3,047,323	$2,899,926	$5,263,491
Other (Capital projects, debt service and enterprise	$500,695	$1,045,628	$3,430,914	$1,696,362
Total	**$19,717,769**	**$26,232,193**	**$30,028,597**	**$32,102,143**
Staff (Full-time Equivalent [FTE])				
Teachers	137.9	134.7	147.8	152.8
Others	139.6	168.4	153.5	150.5
Total	277.5	303.1	301.3	303.3
Enrollment	1,727	1,753	1,815	1,787
Student/Teacher Ratio	12.5	13.0	12.3	11.7

Source: Wyoming Department of Education 2010c, 2009b.

Table 3.8-20 Carbon County School District #2, Revenue, Staffing, and Enrollment Trends

	Fiscal Year			
	2006	**2007**	**2008**	**2009**
Revenue by Fund				
General	$10,597,371	$13,138,335	$13,921,123	$13,639,935
Special	$936,804	$1,500,589	$1,533,118	$1,529,015
Other (Capital projects, debt service and enterprise	$1,734,355	$1,761,733	$1,121,460	$2,971,712
Total	**$13,268,530**	**$16,400,657**	**$16,825,289**	**$18,140,661**
Staff (FTE)				
Teachers	80.7	77.1	83.3	85.3
Others	100.5	94.0	96.9	96.7
Total	180.2	171.1	180.2	182
Enrollment	662	662	669	650
Student/Teacher Ratio	8.1	8.6	8.0	7.6

Source: Wyoming Department of Education 2010c, 2009b.

Individuals and society as a whole also realize benefits from various environmental functions and processes that take place within a landscape and ecosystem associated with these lands, for example, supporting groundwater recharge, providing cleaner water, or providing wildlife habitat. However, once again the values assigned to these benefits, or the dis-benefit or costs associated with degradation of these processes, does not occur within a traditional market framework involving monetary transactions to help establish values. Economists refer to such benefits, as well as analogous costs, which do not involve monetary transactions to help establish values, as non-market goods. A concept related to that of non-market goods is that of externalities. Externalities refers to the effects of resource use decisions by one party on others who did not have a choice in the decision and whose interests were not taken into account in the decision. An example of a negative externality would be noise from a highway or airport that detracts from the value of nearby property or diminishes the quality of life of residents living nearby. Externalities can be positive or beneficial as well.

Economists have developed a variety of non-market valuation techniques to estimate the monetary value people associate with public lands and the benefits they provide. Around the country, on-site use values have been calculated for public goods like recreation and water quality. Passive use values have been calculated for rare species and environments such as wilderness. Valuation studies of recreation use are common nationally and many studies of this type are available for the intermountain area (Rosenberger and Loomis 2001). **Table 3.8-21** presents an example of such estimates, displaying the average on-site use values for selected recreation activities that resemble public use near the Application Area. These values represent the economic value received by users that is over and above what they received for their direct expenditures.

Individuals, groups, and society also may value lands and landscapes for their non-use, or “passive”, attributes and characteristics that do not involve active on-site use. Examples of passive, or non-use, values include the pleasure associated with viewing a scenic open vista or a ranching landscape with cattle grazing in an irrigated pasture; individual actions to support establishment of wilderness and the

Table 3.8-21 Non-market Use Value of Recreation on Public Lands in the Intermountain Area[1]

Recreational Activity	Value per Person per Activity Day (2006 dollars)[2]
Biking	$69
Camping	$28
General Recreation[3]	$16
Hiking	$35
Picnicking	$28
Sightseeing	$14
Wildlife Viewing	$38

[1] Intermountain Area is USDA Forest Service Regions 1 through 4.

[2] Original data in 1996 dollars. Adjusted to 2006 dollars using Gross Domestic Product Inflation Index.

[3] General recreation is a composite of recreation opportunities at a site with a measure for the site, not a specific activity.

Source: Rosenberger and Loomis 2001.

opportunities for solitude thereby provided, whether one ever intends to recreate in a wilderness or not; or, satisfaction from the knowledge that efforts are being taken to protect critical habitat for an endangered species.

Use values and passive or non-use values associated with public lands are very much a matter of individual preference, lifestyle, and social and economic circumstances. Non-market values can vary over time or in response to changing levels of availability, jeopardy, or scarcity of a resource or condition. Thus, for instance, while individuals may not assign much value to protecting mosquito habitat and the mosquito species itself, they would assign higher values to efforts to protect and restore the bald eagle. On the other hand, where one group of individuals might view improved access onto public lands as a benefit by supporting motorized recreation and easier access to fishing, others would view it negatively because it may increase pressures on wildlife.

Perhaps more so than other industrial and quasi-industrial development, the installation of wind turbines in open spaces presents challenges in terms of assessing non-market values. To date, research on the effects of having wind farms present on the landscape in terms of non-market values has been limited. The lack of research on the topic may reflect the relative “newness” of commercial scale wind farm deployment, the fact that wind farms had enjoyed relatively broad acceptance based on their status as renewable energy sources, and that some individuals find wind turbines aesthetically pleasing. Concerns regarding potential adverse effects of wind farms have risen over time as the scientific community and public at large gained more experience and exposure to the development and operation of wind farms. Included among the concerns are the following:

- The visual effects of larger-scale wind farm development, particularly ones that are located within the “foreground” setting of a larger vista;
- Adverse effects on avian species, including migration, and adverse effects on habitat fragmentation;

- Potential or perceived effects on human health and quality of life due to the flicker effect created by the rotating blades during certain lighting conditions, low frequency pulsating sound during operations, and the strobe effects of aviation avoidance lights;
- Potential conflicts with established traditional uses, including agriculture, hunting, grazing, and other outdoor recreation on public lands, or diminishment of the level of enjoyment/pleasure gained from such use; and
- Potential or perceived adverse effects on property values, particularly to nearby/adjacent property on which wind farm development may preempt other uses, including additional wind farm development and private flight operations.

Proximity and spatial orientation between a wind farm and nearby development plays a role in the potential effects of a wind farm project. For example, the flicker effects tend to be more prominent when an adjacent property is located north of one or more turbines, while awareness of the sound is somewhat less directionally sensitive. The flicker effects and adverse effects on human health associated with low frequency sounds, increasingly referred to as the wind turbine syndrome, decrease with distance. The latter has given rise to recommendations to increase the horizontal separation between residential development and wind turbines from 500 feet when such developments were new, to as much as 1.25 miles now (CAWT 2010). While some of these effects have a market value dimension to them (e.g., property value effects) others are decidedly non-market in nature.

The increasing public awareness of the potential linkages between wind farm development and public goods has become part of the community dialogue in Rawlins. Although the foundation of non-market values is rooted in economic terms, the local dialogue regarding impacts, compatibility with other uses and other effects is subjective and qualitative in nature, often using personal perspectives and frames of reference and terms that are more “social” in character than they are “economic”. The fact that the dialogue is occurring is an indication of a shift in public attitudes towards wind farm development among some members of the public.

3.8.10 Social Conditions and Trends

This section was developed based on scoping comments, interviews with local officials and residents, articles and editorials appearing in local and regional newspapers, and other secondary sources as cited. As noted previously, Carbon County has experienced several cycles of energy and mineral growth and decline in recent decades, the most recent a spike in natural gas and energy infrastructure development from mid 2005 through mid 2008. Consequently, residents of the socioeconomic study area are familiar with the social change that accompanies large-scale energy development.

Most study area residents are familiar with wind energy development. Several wind energy projects are in operation along the eastern border of the county, immediately adjacent to and visible from I-80. The first of these became operational in 1999. Other projects have been developed in the Hanna/Medicine Bow area. Moreover, several additional such projects are under construction or proposed in the county, and yet others are located west of Carbon County along the I-80 corridor that many residents travel. Long-time residents of the region were introduced to the potential for commercial scale wind energy generation in the mid 1970s when the USDOE and National Aeronautics and Space Administration (NASA) sponsored a wind energy research and development program just east of Carbon County near Medicine Bow. Although wind energy development became the subject of local skepticism due to technological problems experienced with this early project, the program provided an important foundation for today’s technologies.

Many Carbon County residents value clean air and water, wildlife, wildlife habitat, and access to and the health of public lands (Carbon County Board of Commissioners and Carbon County Planning Commission 1998; Markert 2008; USDA 2003). A key concern for many residents is the compatibility of energy development of any type with other uses on public lands, particularly those lands seen as having

high resource values. Lands in the Sierra Madre site and near the Application Area as a whole provide recreation opportunities for local residents, many of whom value the relatively wild nature of these lands, the abundance of wildlife, and the opportunities for solitude.

Some Rawlins officials, staff, and community leaders have expressed increased interest in economic diversification, community sustainability, and quality of life. Based in part on the experience of the recent construction and energy development boom, Rawlins has embarked on an effort to improve its infrastructure and image, with the intent of enhancing the city's competitive position to recruit new industry and attract new residents. Some public officials, community leaders, and residents have expressed concern about the problems associated with the recurring boom and bust cycle and have begun to plan and implement measures to enhance community livability, sustainability, and quality of life. Institutional actions resulting from this initiative have included revisions to municipal ordinances regarding parking RVs on streets, prohibiting the placement of additional RVs in mobile home parks, strengthening nuisance enforcement capabilities, and developing economic and community development plans. Rawlins recently volunteered to be among the first communities to develop a plan under the Wyoming's "Building the Wyoming We Want" program (Golnar 2010a, 2009).

3.8.10.1 Affected Publics

Affected publics for the proposed project would include:

- Residents of Rawlins, Sinclair, and nearby unincorporated areas – where almost 60 percent of Carbon County residents live – would experience project-related changes in the familiar landscape and seasonal changes in community social conditions during construction. As a result of housing shortage issues in the Rawlins area, workers may be forced to travel further in search of housing. So even though Saratoga, Baggs/Dixon and Wamsutter are located further from the Application Area, the residents in these communities could be affected by substantially smaller seasonal changes in community social conditions during the 4-year construction period.
- Users of public lands in and near the Application Area, including livestock grazing permittees, outdoor sportsmen/recreationists/backcountry travelers, and oil and gas field personnel who would be affected by the change in the visual and recreation setting and higher volumes of industrial traffic during construction.
- Individuals and organizations that place high values or priority on resource protection, including those concerned with species and habitat protection, clean air and water, and preservation of scenic vistas and open space.
- Individuals and organizations that place high values or priority on development of renewable energy resources, reductions in GHG emissions, and other efforts to address global climate change.

With the exception of the first group, affected publics can include people who live elsewhere in Wyoming or the nation, as well as local residents. Moreover, these affected public orientations are not mutually exclusive; an individual can be affiliated with two or more of these groups. For example, a Rawlins resident may be a user of the backcountry near the Application Area and place a high priority on both resource protection and the development of renewable energy resources. In fact, many individuals interviewed for this assessment commonly expressed their support for development of renewable energy alternatives while also expressing concern for protection of sensitive environmental and wildlife resources and community quality of life.

3.8.10.2 Attitudes and Opinions

Carbon County officials and residents – along with officials and residents in other areas of Wyoming and the nation – are engaged in an ongoing dialogue about the relative benefits and costs of wind energy development. This discourse is evolving as officials and residents have become more aware of the

potential scale and pace of development that could occur within the county, the potential for such development to occur near communities and within areas with high resource values, and growing concern regarding potential indirect effects of wind energy projects on property values, public health, land use and other factors based on a decade of operational experience.

Many Carbon County officials and residents have voiced support for the development of wind energy projects but also expressed concern about the scale, pace, and location of such projects. Support is commonly based on the value of the county's contribution to the regional and national renewable energy development effort, recognition of the "quality" of wind resources in the area, and the economic potential associated with a new and technologically expanding industry. Officials and residents also have expressed concerns about the effect of wind energy development on wildlife, particularly avian and bat species, sensitive wildlife habitat areas, such as greater sage-grouse breeding areas, and fisheries. Additionally, there are those who have expressed uneasiness regarding the potential effects on watersheds and air quality during construction and the long-term effects on recreation and cultural areas and scenic vistas. Concerns also have been expressed that wind energy development in certain locations within the county could adversely impact local tourism, outdoor recreation, ranching/grazing, and other forms of energy development.

Local officials also voiced concern that the state's tax structure for wind energy development did not provide ongoing production revenues similar to other energy development, and might not generate adequate tax revenues to offset the costs of providing public services to wind energy development.

Institutional responses to concerns associated with wind energy development are occurring at both the local and state level. The Carbon County Commissioners are developing a new land use plan that will contain an element on wind energy development, and the Wyoming State legislature chose not to renew a sales tax exemption for wind energy projects that will expire at the end of 2011 and approved a $1.00 per megawatt hour tax on power produced by wind projects, which will take effect in 2012.

3.8.11 Environmental Justice

EO 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the Federal Register (59 FR 7629) on February 11, 1994. EO 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level).

The assessment of potential environmental justice impacts is guided by the Council on Environmental Quality's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). Determination of environmental justice impacts requires three steps: 1) determining the geographic distribution of low-income and minority populations in the affected area; 2) assessing whether the action under consideration would produce impacts that are high and adverse; and 3) if impacts are high and adverse, a determination as to whether these impacts would disproportionately affect minority and low-income populations. This section of the assessment describes the distribution of minority and low-income populations in areas potentially affected by the project.

3.8.11.1 Racial and Ethnic Minority Populations in Potentially Affected Areas

The immediate Application Area is extremely rural, due to the "checkerboard" pattern of alternating sections of public and private land and the fact that the private land is operated as a ranch primarily under a single owner. There are few or no full time residents living within the Application Area, although some structures are occupied temporarily by ranch hands and there are a few seasonally occupied recreation cabins in the southern part of the Sierra Madre portion of the Application Area. The entire Sierra Madre site and virtually the entire Chokecherry site are located in census block 2 of census

track 9676 in Carbon County. That census tract generally encompasses the southwest quadrant of Carbon County south of the I-80 corridor.

The City of Rawlins, adjacent areas of unincorporated development, and the Town of Sinclair are located near the northern boundary of the Chokecherry site; therefore, within the potentially affected area. There are no communities within immediate proximity to the Sierra Madre site. Rawlins, the largest city in the immediately surrounding region, is located about 3 miles north of the northern boundary of the Chokecherry site. Sinclair, about 1 mile north of the project boundary is essentially a one industry town where most residents are employed by the Sinclair Refinery.

The towns of Baggs, Dixon, Saratoga, Encampment, and Wamsutter are further from the Sierra Madre portion of the project than is Rawlins, separated visually from the project by topography, much smaller in size, not along the primary access routes to the Application Area, and with resident populations that are predominately white and not low-income. Consequently, these communities are not considered to be potentially affected from an environmental justice perspective.

Data from the 2000 Census, presented in **Table 3.8-22**, are used to characterize the racial, ethnic, and poverty characteristics of the potentially affected populations identified above.

- Minorities comprised a higher share of the population in Carbon County than across Wyoming as a whole, but still substantially below the national average of 30.9 percent.
- The resident Hispanic and Latino population is concentrated in and around Rawlins: 2,171 of the countywide total 2,747 racial and ethnic minority residents. Racial and ethnic minorities comprise 25.4 percent of the resident population of Rawlins.
- The Wyoming State Penitentiary, a high security prison for men, is located south of I-80 near Rawlins and about 1.5 miles north of the northern boundary of the Chokecherry site. In 2000, the inmate population included a higher percentage of racial minorities than the general populations of either the state or county.
- The Town of Sinclair had a population of 423, with a 5.4 percent minority population.
- American Indians, Hispanics, and Latinos represent the most predominate segments of the racial and ethnic minorities in the local population, with relatively fewer blacks, African Americans, and multiracial individuals.

3.8.11.2 Persons in Poverty

Table 3.8-23 summarizes the incidence of poverty in the socioeconomic study area using data from the 2000 Census. In general, the incidence of poverty in Carbon County, Rawlins, and the nearby areas was slightly higher than the statewide or national averages. Persons with incomes below the poverty level in census block 2 of tract 9676 represent 14.1 percent of the population; 2.7 percent higher than the 11.4 percent rate of poverty across the state. Many of those residents live in and near the smaller towns in the southern portions of the county. The incidence of poverty in Rawlins, 13.7 percent of the population, also is slightly higher than the countywide and statewide averages. The low-income population in the city is relatively more concentrated in an older residential neighborhood that also is home to many racial and ethnic minority residents. That neighborhood is located south of the UPRR rail line but north of I-80, the latter of which separates it from both the Chokecherry site and the Wyoming State Penitentiary.

Table 3.8-22 Racial and Ethnic Minority Populations Near the Application Area, Census 2000

Geographic Area	Total Population	Population Which is White and not Hispanic nor Latino	Population Which is a Racial and Ethnic Minority	Percent of Population Which is a Racial or Ethnic Minority
Wyoming	493,782	438,799	54,983	11.1
Carbon County	15,639	12,892	2,747	17.6
Communities near the Application Area				
Rawlins	8,538	6,367	2,171	25.4
Sinclair	423	400	23	5.4
Census Block 2 of Census Tract 9676	1,796	1,471	325	18.1
Application Area	17	17	0	0.0

Note: Racial minorities include all persons identifying themselves in the census as a non-white race, including "Black or African American," "American Indian and Alaska Native," "Asian," "Native Hawaiian and Other Pacific Islander," "Some other race alone," and "Two or more races." Ethnic minorities include persons who identify themselves as Hispanic or Latino. Persons of Hispanic or Latino origin can identify themselves as part of any race (including white) and as persons of Hispanic or Latino origin are an ethnic minority; the racial group of White alone does not include persons of Hispanic or Latino origin.

Source: U.S. Census Bureau 2001b.

Table 3.8-23 Persons in Poverty Near the Application Area – 2000

Geographic Areas	Proportion of Population Below Poverty Level	Number of Persons with Incomes Below Poverty Level
U.S.	12.4%	33,899,812
Wyoming	11.4%	54,777
Carbon County	12.9%	1,879
Communities near the Application Area		
Rawlins	13.7%	1,114
Sinclair	4.7%	19
Census Block Group 2, Census Tract 9676	14.1%	130

Note: Racial minorities include all persons identifying themselves in the census as a non-white race, including "Black or African American," "American Indian and Alaska Native," "Asian," "Native Hawaiian and Other Pacific Islander," "Some other race alone," and "Two or more races." Ethnic minorities include persons who identify themselves as Hispanic or Latino. Persons of Hispanic or Latino origin can identify themselves as part of any race (including white) and as persons of Hispanic or Latino origin are an ethnic minority; the racial group of White alone does not include persons of Hispanic or Latino origin.

Source: U.S. Census Bureau 2000.

3.9 Soils

This section provides context for the evaluation of potential project-induced environmental consequences to soil resources occurring within the Application Area. The BLM RFO has a completed Order 3 soil survey for BLM lands in Carbon County, Wyoming. Baseline information used to characterize soils was derived from the BLM Order 3 soil survey data review and analyses (Texas Resource Consultants 1981; Soil and Land Use Technology, Inc. 1981). In addition, the NRCS is updating the Order 3 soil survey on BLM lands. Where available, NRCS data was used in conjunction with BLM data or in areas where BLM data was not available. Soil survey mapping was extrapolated to a small percentage of the Application Area (less than 5 percent) that had no existing mapping data.

In addition to the Order 3 soil survey data, a soil verification study has been completed to further identify soil characteristics and constraints. These data have been incorporated into the analysis and provide further detail on project related affected environment and environmental consequences and will determine if applicant committed mitigation measures are adequate or if additional mitigation measures will be required.

3.9.1 Regional Overview

Soil resources within the Application Area have formed within the Cool Central Desertic Basins, Mountains, and Plateaus, Major Land Resource Area 34A (NRCS 2006). The physiography of the area is characterized by alluvial fans, piedmont plains, and pediments slopes from the surrounding mountains that form broad intermountain basins. The topography ranges from nearly level to steep and slopes are commonly dissected. Most of the soils formed in alluvium, slope alluvium, or residuum derived from sedimentary materials. Many of the soils are shallow or moderately deep to shale or sandstone bedrock.

The dominant soils are Orthents, which are shallow to very deep and medium to fine textured and have a frigid temperature regime, an aridic moisture regime, and mixed or montmorillonitic mineralogy. Torriorthents (Patent and Garsid series) and Haplargids (Diamondville series) are on piedmont plains, alluvial fans, and pediments. Torrifluvents are on floodplains. Shallow Torriorthents (Blazon and Haterton series) are on rough, broken slopes. Some Torriorthents and Torrifluvents have a high content of exchangeable sodium.

3.9.2 Application Area Soils

3.9.2.1 Data Summary

A variety of soils occur across the Application Area. The soil variability stems primarily from a variety of parent materials as influenced by topography, aspect, elevation, vegetation, and differential rates of mineral weathering. The soils in the Chokecherry portion of the Application Area formed from alluvium, colluvium, residuum, and eolian parent materials primarily derived from sedimentary rocks. Shallow to moderately deep (20 to 40 inches deep) soils are common in the Chokecherry area. Soil depths range from shallow (less than 20 inches) on ridges and hillslopes to very deep (greater than 60 inches) in valley bottoms with slopes ranging from 0 to 70 percent. The soils in the Sierra Madre portion of the Application Area formed from alluvium, colluvium, and residuum parent materials primarily derived from shale and sandstone. Soil depths range from shallow to deep (40 to 60 inches deep) with slopes ranging from 0 to 50 percent.

Several revegetation limitations are listed for the soil map units overlying the Application Area. These limitations include high clay content, alkalinity, salinity, sodicity, and (lack of) precipitation, water holding capacity, hydric soils, soil depth, rock fragment content, erosion potential, and flooding potential. Unsurfaced road ratings consider low soil strength, depth to bedrock, sand content, shrink-swell potential, slope, wetness, flooding potential, and potential for road dust. **Figures 3.9-1** through **3.9-5** illustrate the potential limitations in the Application Area. Acres of pertinent limitations of the soils located within the Application Area boundaries are presented in **Table 3.9-1**.

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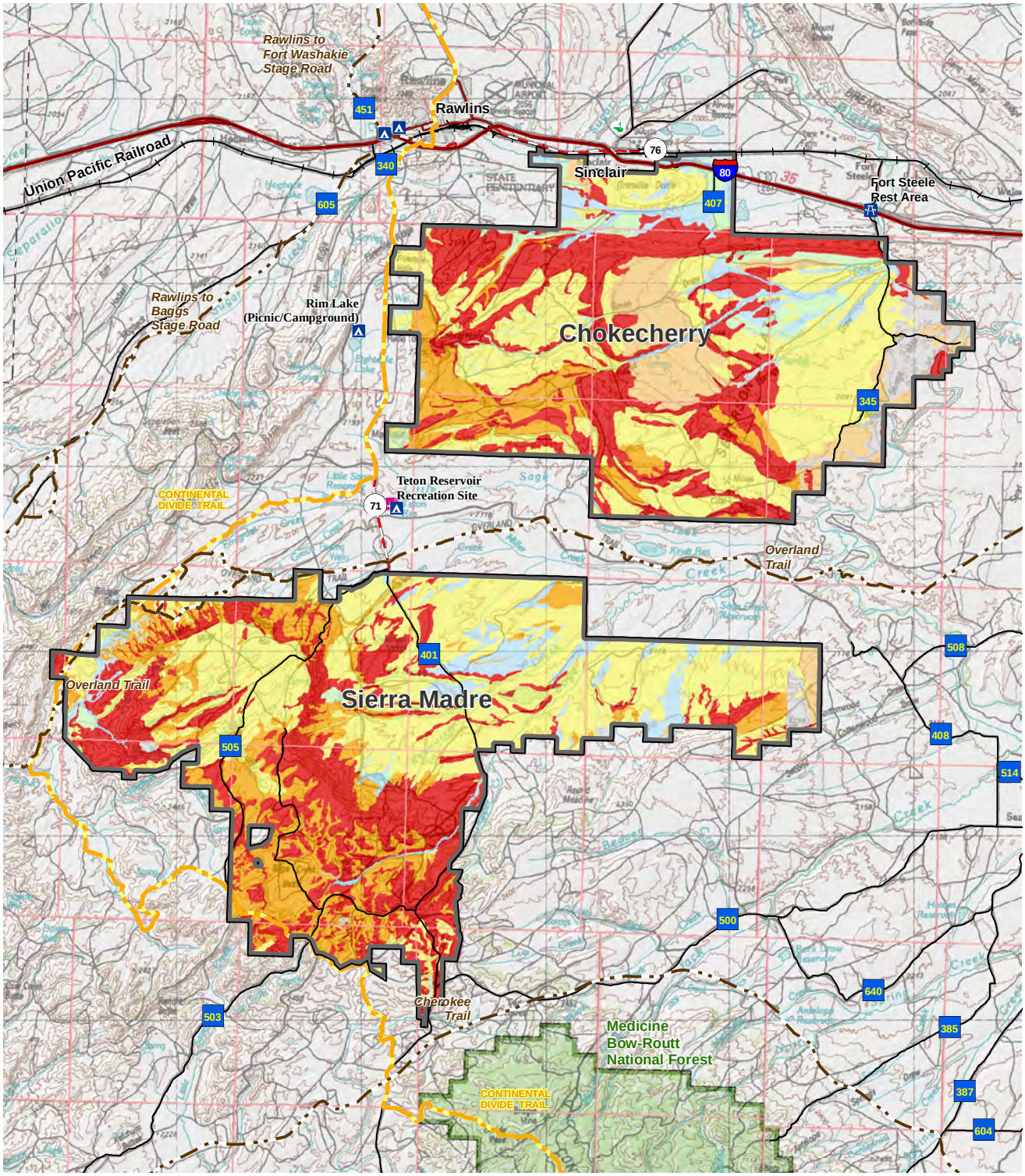

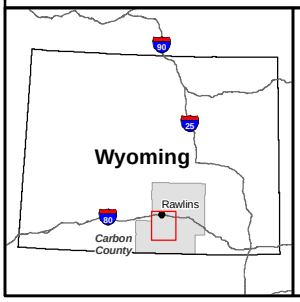

Legend

Water Erosion Hazard
- Slight
- Slight to Moderate
- Slight to Severe
- Moderate
- Moderate to Severe
- Severe
- No Data

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-1

Water Erosion Hazard

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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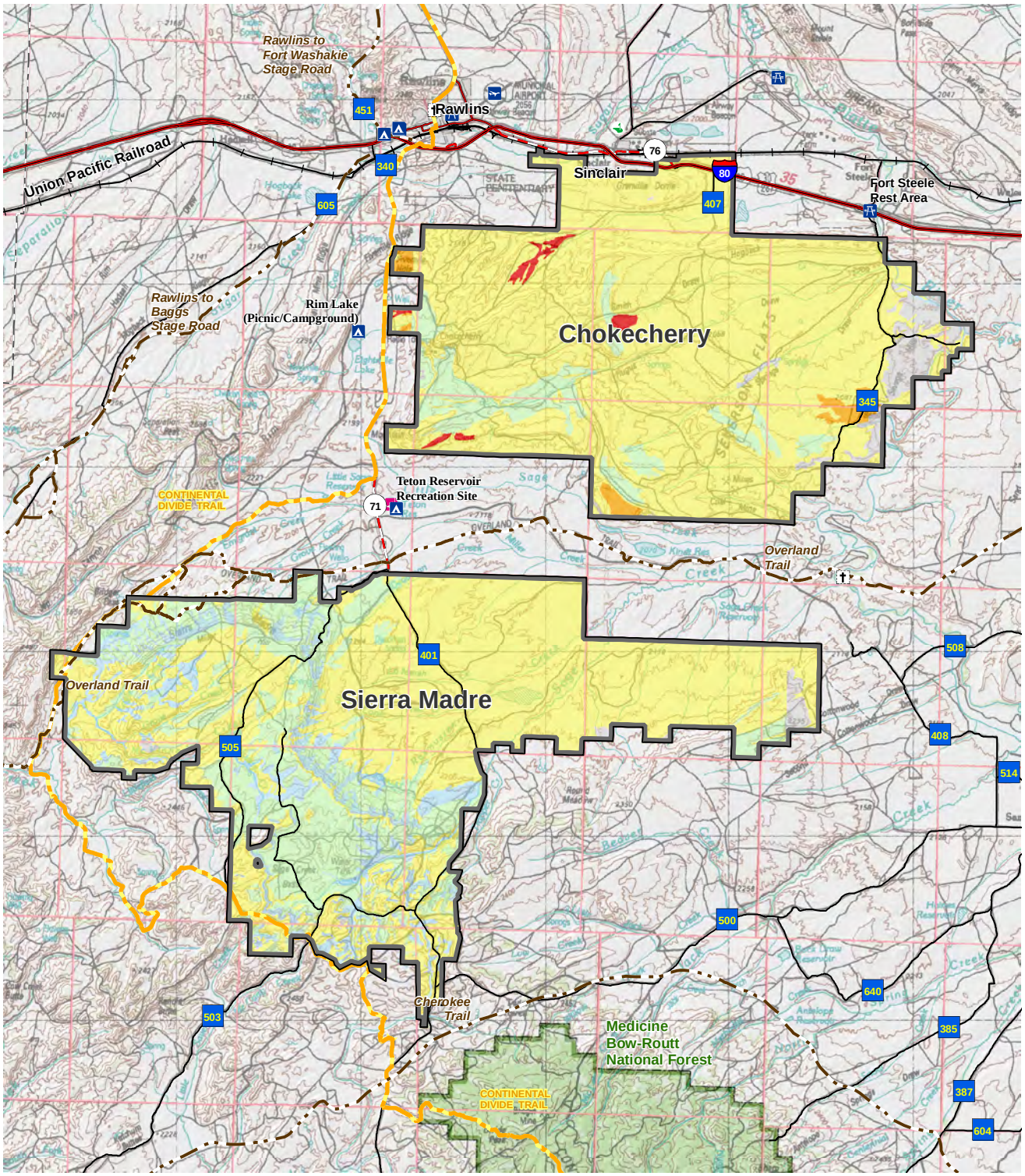

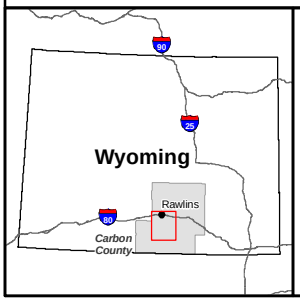

Legend

Wind Erosion Hazard

- Slight
- Slight to Moderate
- Moderate
- Moderate to Severe
- Severe
- No Data

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-2

Wind Erosion Hazard

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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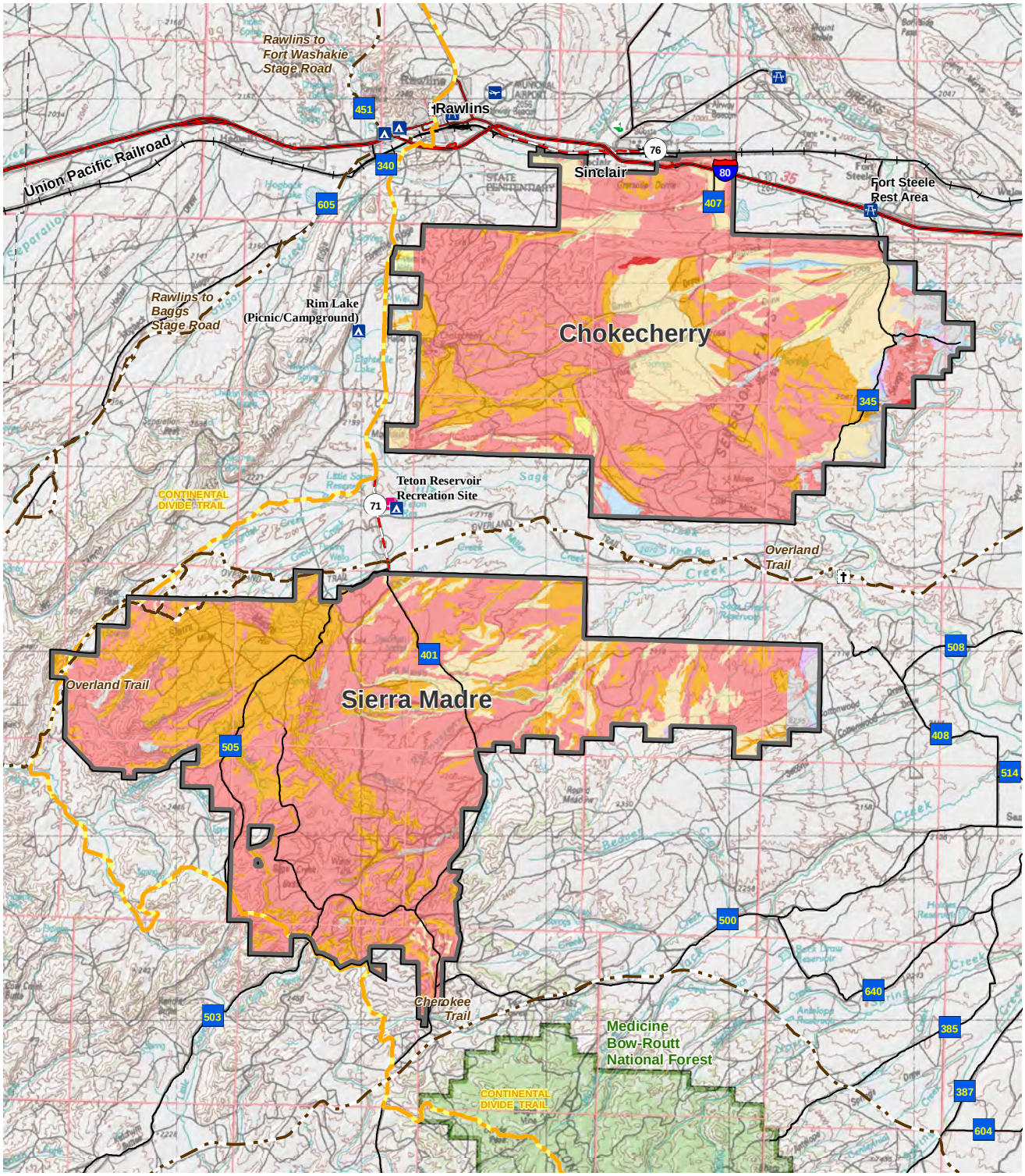

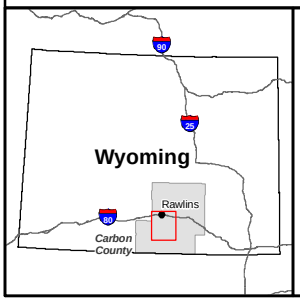

Legend

Surface Runoff Potential

- Very Low
- Low
- Low to Moderate
- Low to High
- Moderate
- Moderate to High
- High
- Very High
- No Data

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-3

Surface Runoff Potential

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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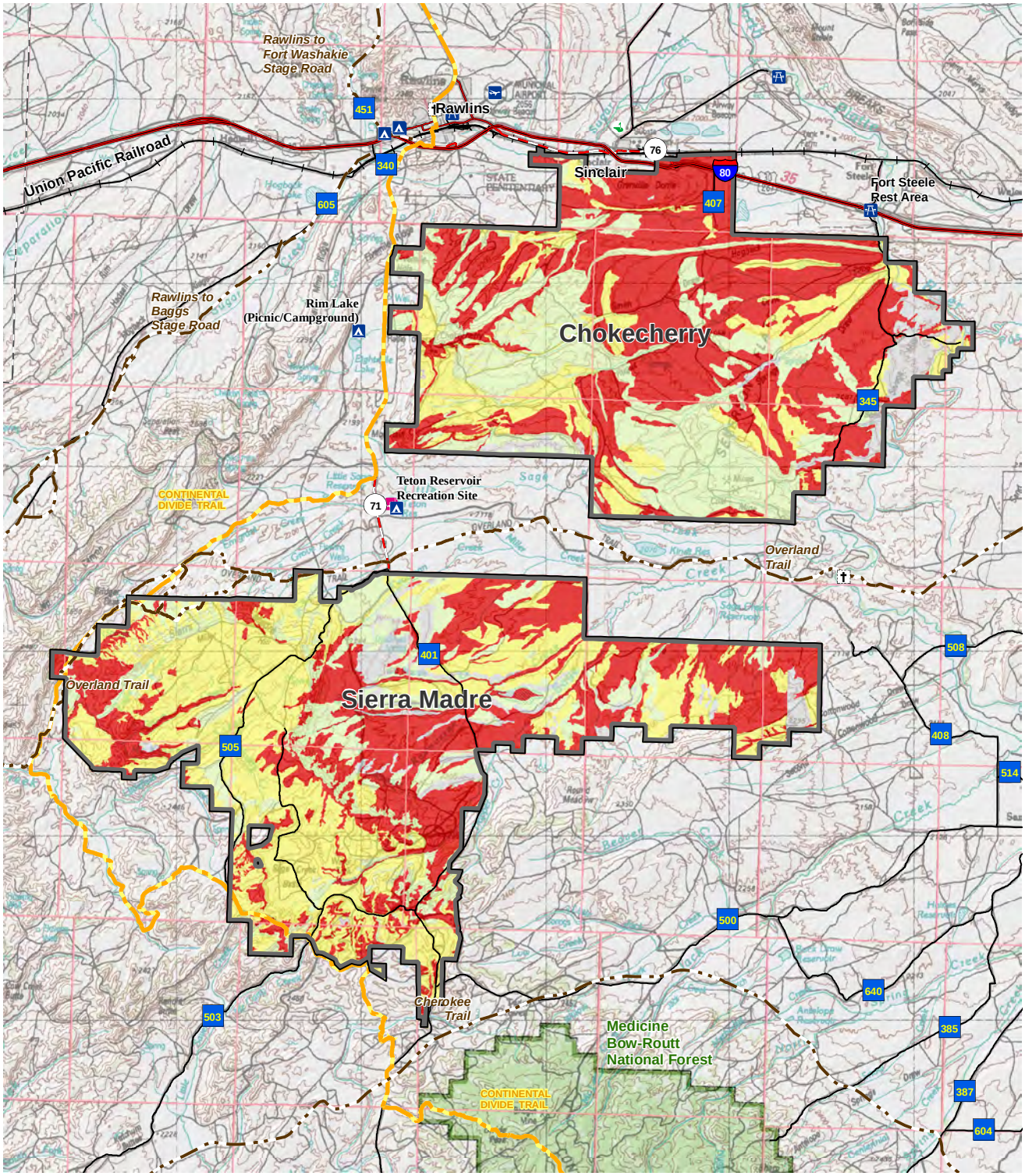

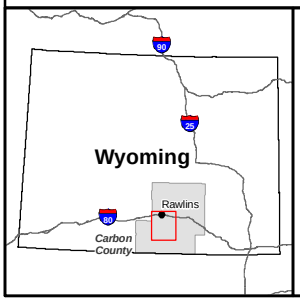

Legend

Topsoil Rating
- Good
- Fair
- Poor
- No Data

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-4

Topsoil Rating

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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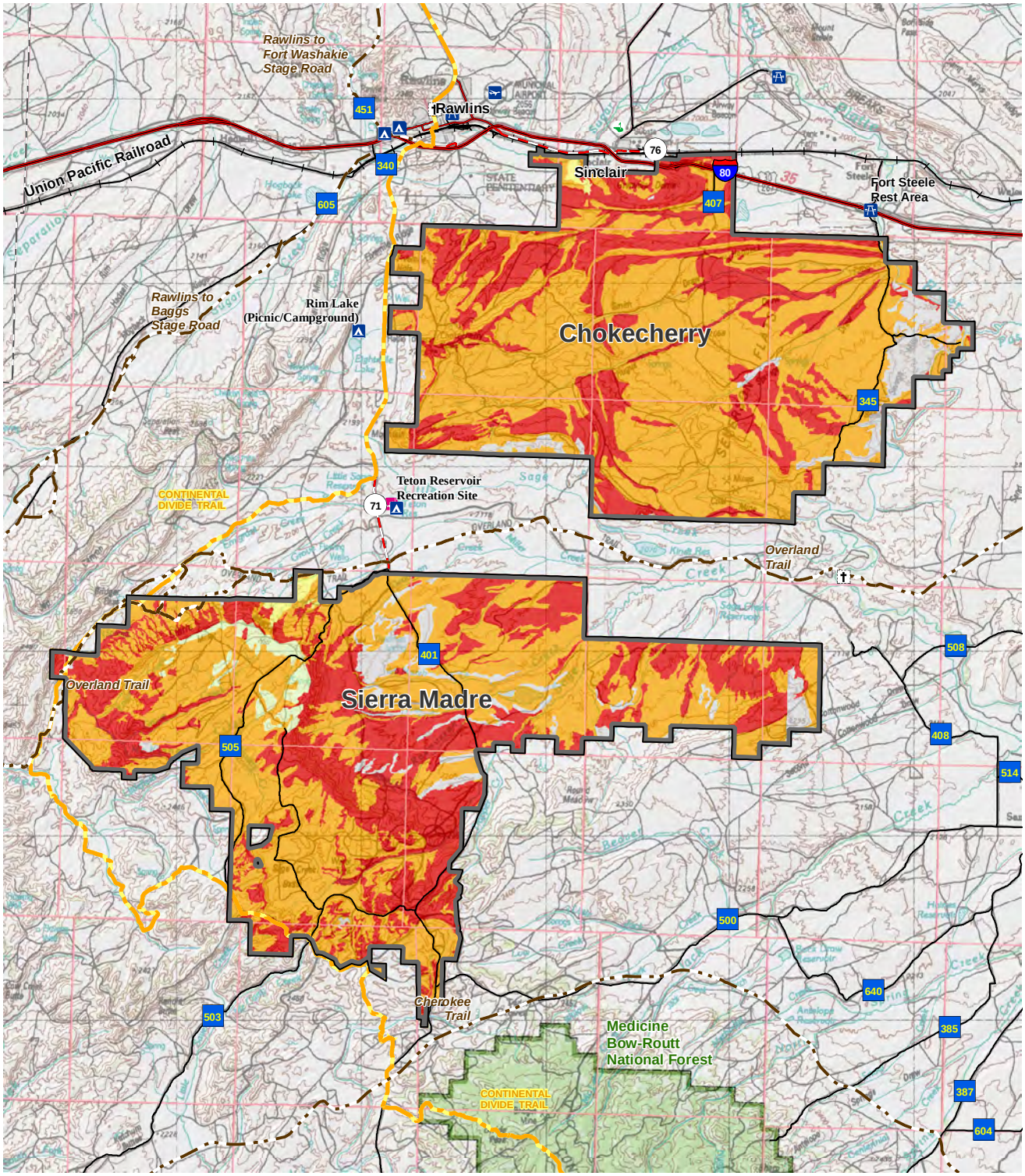

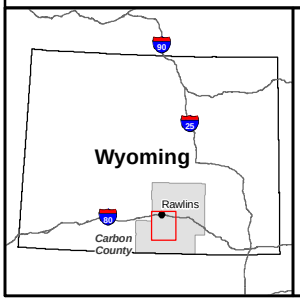

Legend

Road Limitations

- Slight
- Slight to Moderate
- Moderate
- Severe
- No Data

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- Application Area
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.9-5

Road Limitations

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.9-1 Total Acres of Soil Factors Within the Application Area

Water Erosion Potential	Acres	Topsoil Rating	Acres
Slight	13,805	Good	52,667
Slight/Moderate	6,780	Fair	67,386
Slight/Severe	85,206	Poor	91,174
Moderate	12,754	No Data	11,432
Moderate/Severe	33,464		
Severe	64,688	**Road Rating**	**Acres**
No Data	5,962	Slight	2,389
		Slight/Moderate	1,010
Wind Erosion Potential	**Acres**	Moderate	134,692
Slight	11,767	Severe	73,135
Slight/Moderate	38,484	No Data	11,432
Moderate	163,531		
Moderate/Severe	1,945		
Severe	979		
No Data	5,952		
Runoff Potential	**Acres**		
Very Low	1,021		
Low	2,086		
Low to Moderate	369		
Low to High	643		
Moderate	32,060		
Moderate to High	51,336		
High	128,685		
Very High	323		
No Data	6,136		

The most commonly encountered soils in the Chokecherry area include the Rentsac, Blazon, and Diamondville series. The Rentsac series occurs on mountains, escarpments, bedrock-floored plains, and hills. Slopes range from 10 to 70 percent. Rentsac soils are shallow to calcareous sandstone with loamy-skeletal textures. Water erosion potential is high and wind erosion potential is moderate. Topsoil suitability is poor due to large stones. The Blazon series is shallow to shale bedrock and occurs on pediments, hillslopes, plateaus and ridges. Slopes range from 6 to 40 percent. The Blazon series is calcareous and is also compaction prone when moist or saturated. Water erosion potential is high and wind erosion potential is moderate. Topsoil suitability is good. The Diamondville series consists of moderately deep, well drained soils that formed in alluvium and residuum weathered from calcareous loamstone and sandstone. Diamondville soils are on fan remnants, plateaus, hills and ridges of cold

intermountain basins. Slopes range from 3 to 70 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to high clay.

The most commonly encountered soils in the Sierra Madre area include the Wellsville, Echemoor, and Lupinto series. The Wellsville series formed in thick, calcareous, gravelly locally transported materials derived from limestone and other sedimentary rocks. Wellsville soils are deep and occur on alluvial fans and valley side slopes. Slopes range from 2 to 20 percent. Topsoil suitability is fair due to large stones. The Echemoor series has a dark thick surface layer rich in organic matter overlaying channery subsoil. The soil is moderately deep to paralithic bedrock and formed in residuum and colluvial materials derived from sedimentary rock. Echemoor soils are on mountain slopes and hillslopes contiguous to mountain fronts. Slopes range from 3 to 10 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to high clay. The Lupinto series consists of deep, well drained soils on relict fan aprons, terraces, and valley fill positions. These soils formed in calcareous gravelly alluvium from mixed sources. Slopes range from 6 to 20 percent. Water erosion potential is severe and wind erosion potential is slight. Topsoil suitability is fair due to large stones and high clay.

3.9.2.2 Observations

The Application Area was visited during the summer months of 2010 in an attempt to further review and define the soils and their limitations and constraints in regards to project conceptual layouts. Soils were examined only where accessible by existing roads. Soils were compared to BLM and NRCS soil survey data. In some cases the data was noted as correct, further refined, or noted as inconsistent and the differences recorded. Photos were taken to display areas of concern or other notable features. The mapbook, with records on soil map units that were further refined or inconsistent, can be found in **Appendix F**. Photos referred to in the subsequent text are located in **Appendix F**. In general, the soils in the Application Area are highly influenced by parent materials, wind, and water. Soils in the Application Area are primarily derived from mixed sedimentary rock formations. Marine shales are prevalent in the Application Area and weather to form highly clayey, saline-sodic, occasionally seleniferous soils, as shown in **Photos 091**, **159**, **249**, and **259**. In general, these soils were noted along drainageways, flats, and valley bottoms. These soils are difficult to reclaim and are prone to gully erosion and piping, as displayed in **Photos 098**, **217**, **250,** and **321**. These soils are also prone to puddling (**Photo 112**) due to their fine texture and low permeability.

Shale outcrops and soils shallow to shale are common within the Chokecherry area and the lower Sierra Madre area below the rim. Soils with steep slopes that are shallow to shale are prone to slumping and mass wasting, as shown in **Photos 58**, **160**, **189**, and **204**. Many of the mass wasting events are fairly recent, notably due to the lack of vegetative cover. These soils are difficult to reclaim and stabilize.

Spotty areas of vegetated sand dunes were noted within soil map units along the rims of both Severson Flats in the Chokecherry area and Miller Hill in the Sierra Madre area. These eolian sands are highly erodible by wind if the protective vegetative cover is disturbed or denuded (**Photos 067** and **070**).

Aquolls or wet soils were commonly observed but not well documented in the current soil survey in the Sierra Madre area. These soils were commonly found at the base of Miller Hill (**Photos 180** and **183**) and in swales and valleys (**Photos 164**, **242**, and **260**) on Miller Hill, as shown in the mapbook in **Appendix F**. These soils were generally fine-textured and would be especially prone to rutting, displacement, and mixing due to their moisture content and clay content. Pachic (thick organic) soils vegetated with aspen, were observed in association with areas of wet soils fingering down from Miller Hill (**Photos 261** and **338**).

Gullied and eroded soils (**Photos 253** and **332**) were common in both Application Areas primarily on steep slopes or associated with fine-textured soils. Rilling and gully erosion was commonly observed on native surface roads in the Application Area, such as in **Photos 055** and **163**. Wind scour (**Photos 081**

and **126**) was noted on medium to coarse textured soils throughout the Application Area specifically on windswept ridges where grass or sedge cover was not prevalent.

Desert pavement was noted throughout the Application Area (**Photos 214** and **297**). In these areas the fine soil particles have been removed by wind. Often all that is left behind are pebbles or gravels on the soil surface or unvegetated scoured areas between existing vegetation displaying pedestaling.

3.10 Transportation

This section describes the local and regional transportation network that provides access to and within the Application Area.

3.10.1 Air Access

Rawlins Municipal Airport/Harvey Field offers general aviation capability for Rawlins and Carbon County. Located approximately 2 miles northeast of downtown Rawlins, the airport can support commercial air service, although no such service is presently offered. The airport is operated by the Carbon County Airport Joint Powers Board, which is currently updating its Airport Master Plan. When completed that plan is expected to identify improvements to meet existing and future needs for the airport. There are 16 aircraft based at Harvey Field (FAA 2009). Public general aviation airports also are located in Saratoga (18 based aircraft) and Dixon (6 based aircraft) (WYDOT 2008a).

3.10.2 Rail Access

One of the UPRR transcontinental mainline routes traverses Carbon County, generally along an east-west alignment, and a crew change terminal, switching yard, intermodal transfer station and related facilities are located in Rawlins. A major freight siding is located in Sinclair, serving the Sinclair Refinery. The northern boundary of the Chokecherry portion of the project lies just south of the UPRR mainline corridor.

3.10.3 Vehicular Access

According to PCW's August 2010 Preliminary Transportation Management Plan (PTMP), access to the Application Area for all equipment, materials and supplies traffic, including WTG component deliveries, will use the WY 76 overpass of I-80 at Exit 221, just east of Sinclair, connecting to CCR 407 (CIG Road), which will connect to an internal haul road at the Application Area boundary. The PTMP identifies two scenarios for workforce commuting to and from the Application Area; the first would require all workforce traffic to use the same internal haul road and access routes as the heavy truck deliveries, the second assumes that a portion of the workforce would use WY 71/CR 401 (Sage Creek Road), to access the Application Area (PCW 2010a). Access points from these highways and roads to the CCSM sites are shown on **Figure 3.10-1** and discussed in Section 2.3.3.3.

It is possible to reach the Application Area from WY 789 on the west side, WY 70 on the south side, and WY 130 on the east. The access routes from these highways are gravel and native material, BLM and undesignated roads and two tracks; conditions which necessitate slower travel speeds. Some construction workers residing in Saratoga or the LSRV may use county roads to access the Application Area from those communities, but this use would likely be minimal.

Access within the Application Area is currently provided by a variety of Carbon County, BLM, and private roads. There also are a number of unimproved and non-maintained undesignated roads and two-tracks within the Application Area.

3.10.4 Highway Access to the Application Area

I-80, WY 76, and WY 71 are the three highways that currently provide highway access to the Application Area.

Over the past decade I-80 traffic increased from 16 to 37 percent at points along this segment with somewhat lower increases in truck traffic. Traffic volumes on this segment of I-80 showed both increases and decreases between 2007 and 2008; decreases reflecting a combination of a slowdown in natural gas drilling activity and completion of several major construction projects, the increases attributed to the initiation of other construction projects.

3.10.4.1 Interstate 80

I-80 is a transcontinental highway linking New Jersey and New York on the east to California on the west, passing through 10 other states along its route. It is one of the nation's major interstate commercial truck-haul routes. Recent traffic volumes on the Rawlins to Fort Steele segment of I-80 and comparison of those volumes to the corresponding 1998 traffic volumes are shown in **Table 3.10-1**. During 2008, traffic on this segment of I-80 averaged approximately 12,000 to 15,000 vehicles daily, on an annual average daily traffic (AADT) basis. Trucks accounted for over half of the total traffic.

Table 3.10-1 Recent and Historic Traffic Volumes on I-80

Route/ Direction of Travel	Section Description	2008 AADT		Change from 2007		Change from 1998	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
I-80 Eastbound	Johnson Road	6,450	3,440	0%	-4%	19%	13%
	Rawlins - W. Urban Limits	6,450	3,440	0%	-4%	19%	13%
	Junction Route 54 (Spruce Street)	6,190	3,430	-1%	2%	28%	22%
	Junction Route 4573 (Thayer)	6,580	3,380	3%	-2%	32%	20%
	Junction Route 54 (Cedar Street)	7,390	3,110	7%	-16%	30%	-9%
	Rawlins – E. Urban Limits	7,390	3,110	7%	-16%	30%	6%
	Junction Route 411 (W. Sinclair)	6,230	3,010	-4%	-16%	26%	7%
	Junction Route 411 (E. Sinclair)	5,930	3,000	-1%	-7%	17%	5%
	Fort Steele	5,880	3,000	-1%	-7%	16%	8%
I-80 Westbound	Johnson Road	6,570	3,520	-1%	-4%	21%	16%
	Rawlins – W. Urban Limits	6,570	3,520	-1%	-4%	21%	16%
	Junction Route 54 (Spruce Street)	6,300	3,480	-3%	-1%	30%	24%
	Junction Route 4573 (Thayer)	6,820	3,550	2%	-2%	37%	27%
	Junction Route 54 (Cedar Street)	7,530	3,270	-1%	-20%	33%	-5%
	Rawlins – E. Urban Limits	7,530	3,270	-1%	-20%	33%	12%
	Junction Route 411 (W. Sinclair)	6,130	3,170	-9%	-14%	24%	13%
	Junction Route 411 (E. Sinclair)	6,050	3,170	-2%	-5%	20%	10%
	Fort Steele	6,010	3,170	-1%	-4%	19%	14%

Source: WYDOT 2010.

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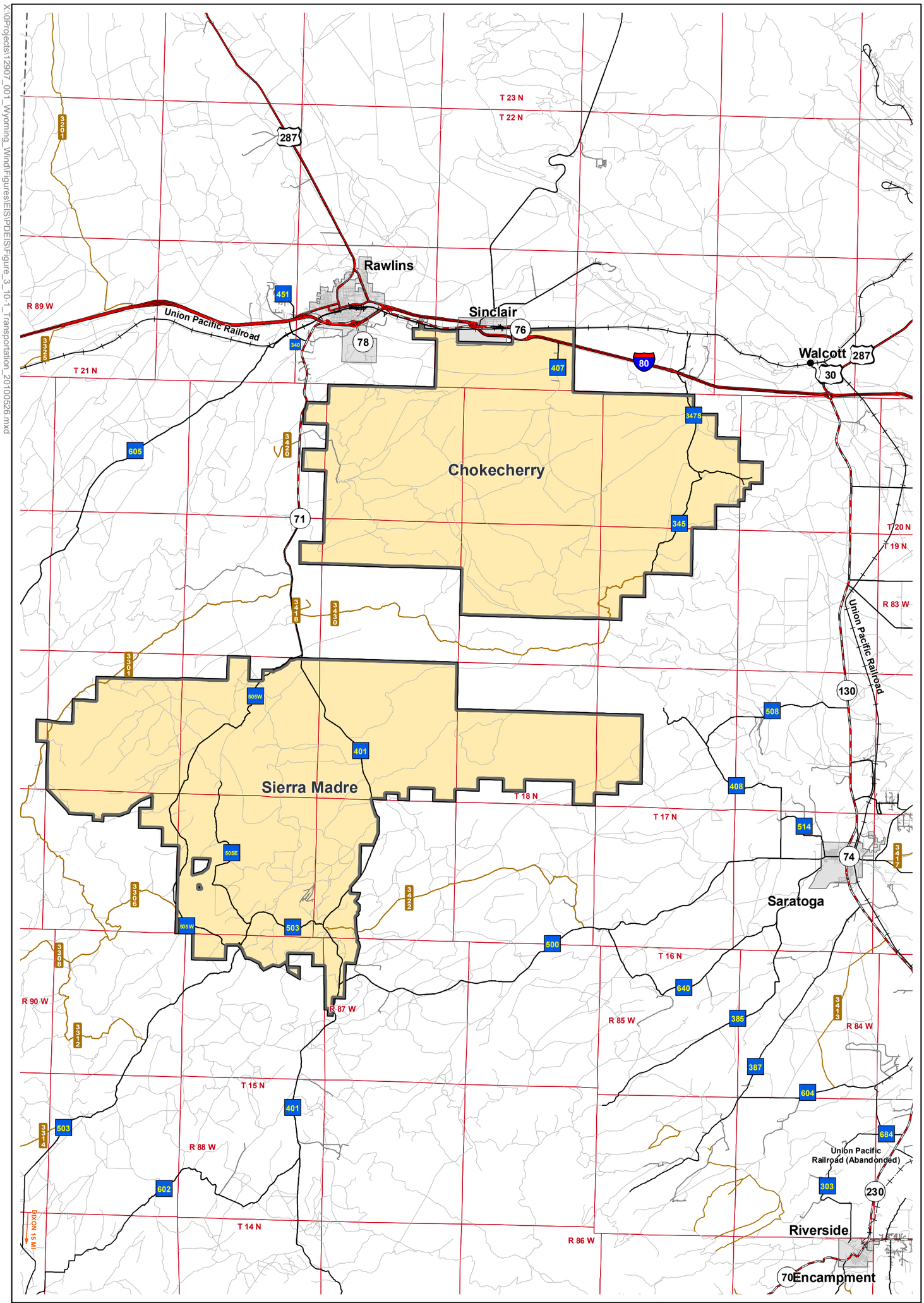
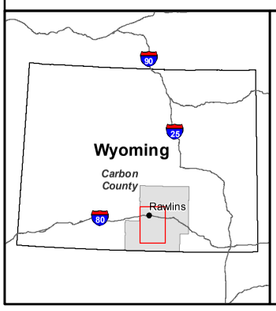




Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Rural Road
- BLM Road
- Other Road
- Railroad
- Abandonded Railroad
- Application Area
- City or Town

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.10-1

Application Area Surface Transportation Map

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 15 Kilometers
1:260,000

3.10.4.2 Wyoming State Highway 76

WY 76 travels approximately 6 miles from the east Rawlins I-80 interchange at Exit 215 through the Town of Sinclair and across the I-80 overpass at Exit 221 east of Sinclair. The highway is two-lane, undivided, with paved 12 foot travel lanes in each direction (PCW 2009d).

Table 3.10-2 displays recent and historic traffic volumes on WY 76.

Table 3.10-2 Recent and Historic Traffic Volumes on Wyoming SH 76

Route	Section Description	2008 AADT		Change from 2007		Change from 1997	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
WY 76 Both Directions	Junction I 80 (W Sinclair Into)	2,790	240	0%	0%	40%	-4%
	Sinclair E Corp Limits	670	80	0%	0%	43%	-58%

Source: WYDOT 2010.

During 2007 and 2008, construction related to the Sinclair Refinery expansion elevated traffic levels in the community. Traffic increased approximately 40 percent on WY 76 over the last decade, but truck traffic decreased, perhaps because of the increasing use of rail transport for refinery products.

3.10.4.3 Wyoming State Highway 71

WY 71 begins at a junction with WY 78 in southwest Rawlins. Within Rawlins, WY 71 has “T” intersections at Washington Street and Jackson Street, but with the exception of the intersection at WY 78/Higley Boulevard at its beginning, has no cross-traffic intersections. WY 71 through Rawlins is essentially separated from most traffic within the city. From the junction, the highway, the northern portion of which was recently upgraded, runs south for about 10.5 miles providing access to private and public lands south of Rawlins. Further to the south, state maintenance ends and the highway becomes CR 401 (Sage Creek Road), which provides access to the Medicine Bow National Forest and eventually intersects with WY 70 between the communities of Encampment to the east and Savery to the west. CR 401 (Sage Creek Road) is designated as National Forest Road 801 within the MBNF. **Table 3.10-3** displays recent and historic traffic volumes on WY 71.

Table 3.10-3 Recent and Historic Volumes on Wyoming SH 71

Route	Section Description	2008 AADT		Change from 2007		Change from 1997	
		All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
WY 71 Both Directions	Junction Route 78 (WY 78)	1,680	60	-2%	0%	-5%	-57%
	Junction Washington St.	1,000	60	-2%	0%	-43%	-57%
	Rawlins - S. Corp. Limits	380	40	0%	0%	27%	-43%
	Rawlins - S. Urban Limits	250	20	0%	0%	39%	-33%

Source: WYDOT 2010.

Overall, traffic on WY 71 decreased by two percent in Rawlins between 2007 and 2008 and 5 to 43 percent over the last decade. South of Rawlins, overall traffic has increased by 27 to 39 percent over the last decade but truck traffic has decreased by 33 to 43 percent. Truck AADT south of Rawlins is fairly light – less than 40 trucks per day on average – therefore a small decrease can result in fairly large percentage decreases.

WY 71 is designated by the WYDOT as a Minor Arterial and Collector route within Rawlins and a Rural Major Collector route outside the city limits. Widening, reconstruction and paving of the 10.5-mile segment of the highway immediately south of Rawlins was completed in the fall of 2008. This was the first phase of the eventual reconstruction and repaving of the entire length of WY 71/CR 401(Sage Creek Road) over the next 10 to 20 years; the pace of project completion will depend on the availability of state and federal funding.

Carbon County also funded the chip seal resurfacing (pavement surface treatment combining asphalt and aggregate) of an 8-mile segment of CR 401 (Sage Creek Road) beginning at Miller Hill and extending north toward Rawlins during the fall of 2008 (Nation 2009).

Between 1999 and August 2010, 35 vehicle accidents occurred on WY 71, 11 of which involved injuries. There were two fatalities. The majority of the injury accidents occurred at night on rural segments of the highway. Of the total accidents, 26 percent involved wildlife or livestock and 40 percent involved rollovers. Only four accidents involved collisions between two or more vehicles (Carpenter 2010).

3.10.4.4 Vertical Clearance and Other Roadway Constraints

There are eight underpasses on highways near the Application Area. Six of these underpasses involve travel lanes of I-80 passing underneath other roads passing over the interstate. All of these underpasses have minimum vertical clearances of 17 feet. The other two underpasses involve I-80 passing over local roads. Clearance for the WY 71 underpass under I-80 along the access route to the Application Area is 15 feet, 2 inches. Clearance for the Ft. Steele access at the I-80 underpass, which provides access to the east side of the Application Area, is 14-foot 1-inch (**Table 3.10-4**).

Table 3.10-4 Underpass Clearance on Application Area Access Routes

Highway	Underpass Name	Posted Clearance
I-80 Eastbound	Spruce Street Interchange	17'
I-80 Westbound	Spruce Street Interchange	17'
I-80 Eastbound	Higley Interchange	17' 5"
I-80 Westbound	Higley Interchange	18' 2"
I-80 Eastbound	East Sinclair Interchange	17' 3"
I-80 Westbound	East Sinclair Interchange	17' 4"
WY 71 (both directions)	Sage Creek Road Separation	15" 2"
CR 347 (Savage Ranch Road)	Fort Steele Interchange	14' 1"

Source: WYDOT 2008b.

There are intersections with turning radius constraints on all primary and secondary access routes to the Application Area. The existing configuration of WY 71 includes features that would create travel issues for long, low-clearance, over-sized and/or over-weight vehicles such as WTG component and heavy equipment transport vehicles (PCW 2009d).

3.10.5 Carbon County Roads

Existing access to, and in some cases within, the CCSM Application Area is provided by a number of Carbon County Roads including CR 401 (Sage Creek Road), CR 505W (Miller Hill W. Road), CR 407 (CIG Road), CR 347S/345 (Savage Ranch Road), CR 505E (Miller Hill E. Road), CR 503 (McCarty Canyon Road), and CR 340 (Hadsell Road/Ferris Crossing) (Nation and Fritz 2009). Current conditions of these roads are summarized below.

CR 401 (Sage Creek Road) is a continuation of WY 71. The road is a two-lane, 24 foot-wide paved road with a recent chip seal overlay from the southern terminus of WY 71 to Sage Creek, a distance of about 8 miles. From there, the road has a 28 foot-wide gravel surface for the remainder of its roughly 37-mile length to its intersection with WY 70 northeast of Savery. Sage Creek Road/WY 71 provides primary access to the recreation resources on the west side of the Medicine Bow National Forest and is used seasonally by ranchers, grazing operators, and oil and gas operators. A major road reconstruction project is planned for CR 401 (Sage Creek Road) during 2011 and 2012 (Nation 2009).

CR (407 CIG Road) is a paved two-lane road that travels about 2 miles from I-80 at Sinclair to the CIG gas plant. The road parallels I-80 for approximately 1 mile and then makes a sharp 90-degree turn to the south. It primarily provides access to a natural gas processing plant and also accesses the BLM, state and private lands to the south.

CR 347S/345 (Savage Ranch Road) is a 24-foot-wide, two lane road, which provides access from the I-80 exit at Fort Steele to the west side of the North Platte River and also to the eastern boundary of the Application Area. The initial segment of the road has a reclaimed asphalt surface; later sections are gravel and dirt. Owing to its proximity to the river, the road can be muddy and soft in the spring. The road currently provides fishing access to the North Platte River and access for grazing operators.

CR 505W (Miller Hill W. Road) is a 20- to-24-foot-wide gravel and dirt surfaced road that provides access to the Sierra Madre Application Area from CR 401 on the north and CR 503 on the south. Portions of the road are steep and impassable for much of the winter and during summer storm events. The road currently provides hunting and grazing access.

CR 505E (Miller Hill E. Road) is a dirt, two-track road that provides access to CR 503 north into the Sierra Madre Application Area. The road is used primarily for recreation and grazing access.

CR 503 (McCarty Canyon Road) is 24- to-26-foot-wide road that intersects with CR 401 near the southeastern boundary of the Application Area and travels about 27 miles to WY 70 at Dixon. CR 503 has a RAP surface in segments and gravel/dirt surface in segments. The road provides primary access to the BLM, state and private lands north of the LSRV.

CR 340 (Hadsell Road/Ferris Crossing) is a 24-foot-wide gravel surface road that provides access from western Rawlins and I-80 via the West Spruce Street interchange and Wagon Circle Road. CR 340 intersects with WY 71 about 2 miles south of Rawlins and allows access to the Application Area for loads that cannot use the WY 71 underpass beneath I-80.

3.10.6 BLM Roads

Several BLM roads may be used to access portions of the Sierra Madre site. Current conditions of these roads are summarized below.

BLM 3301 (Bridger Pass Road) extends approximately 17 miles southwest from its terminus with WY 71 about 12 miles south of Rawlins. The road is approximately 18 feet wide and presently has road base of native material. The road provides access for recreation, grazing and energy development.

Consequently, road use has been increasing in recent years. A six inch gravel overlay was completed on over 17 miles of this road during the summer of 2009 (Estvold 2009).

BLM 3306 is approximately 14 miles in length, extending from CR 605 (Twenty Mile/J.O. Road) and BLM 3305 west of the Sierra Madre Application Area to the southeast where it connects with BLM 3308 and eventually to CR 505W (Miller Hill W. Road) in the southern portion of the Sierra Madre site. The road varies in width, up to a maximum of about 16 feet wide, has a native road base, and traverses through steep terrain. The road provides access for recreation, grazing and energy exploration and development.

3.10.7 Undesignated Roads on BLM, State, and Private Lands

There are a many undesignated roads and two-tracks on BLM, state, and private lands within both the CCSM sites. In most cases, these roads are unimproved and have been developed over time by users of the area for recreational and grazing purposes and oil and gas development. Some roads on private lands have been developed to support ranching operations.

3.11 Vegetation

Vegetation for the Application Area areas was determined using three methods:

- Review of the ecoregion map and summary table for the State of Wyoming (Chapman et al. 2004);
- Initial polygons for vegetation cover types were recorded on aerial photographs then digitized for the Application Area (PCW 2008b); and
- Two field reconnaissance efforts were undertaken to ground-truth the vegetation cover types in October and November 2008. This was followed by an update of the original cover type mapping in July (AECOM 2009).

The Wyoming Ecoregion Map indicates that the Application Area lies within three Level IV ecoregions. Plant community descriptions were developed based on a combination of the ecoregion descriptions (Chapman et al. 2004), the Final RFO RMP (BLM 2008a), and field reconnaissance surveys (AECOM 2009).

A majority of the Chokecherry portion of the Application Area is mapped as rolling sagebrush steppe. The rolling sagebrush steppe is a semiarid region of unglaciated plains and hills, featuring primarily ephemeral drainages. The potential natural vegetation in this ecoregion is listed as western wheatgrass (*Elymus smithii*), needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), Sandberg bluegrass (*Poa secunda*), prairie junegrass (*Koeleria macrantha*), various species of rabbitbrush (*Chrysothamnus* sp. and *Ericameria nauseosa*), fringed sage (*Artemisia frigida*), Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), silver sagebrush (*Artemisia cana*) and black sagebrush (*Artemisia nova*) in lowlands, and mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) in higher elevation uplands (Chapman et al. 2004).

The Salt Desert Shrub Basin occurs on the northeast margin of the Application Area. The Salt Desert Shrub Basin ecoregion is a semiarid, unglaciated set of plains, nearly level floodplains, terraces, and rolling alluvial fans. Most stream courses in this ecoregion are ephemeral and the channels are typically incised. The potential natural vegetation for this ecoregion is greasewood (*Sarcobatus vermiculatus*), Gardner's saltbush (*Atriplex gardneri*), shadscale (*Atriplex confertifolia*), bud sage (*Picrothamnus desertorum*), big sagebrush (*Artemisia tridentata* spp.), alkali cordgrass (*Spartina gracilis*), Indian ricegrass (*Oryzopsis hymenoides*), blowout grass (*Redfieldia flexuosa*), alkali wildrye (*Leymus simplex*), and needle-and-thread (Chapman et al. 2004).

The Sierra Madre portion of the Application Area is mapped primarily as foothills shrublands. Foothills shrublands are unglaciated hills, ridges, and footslopes. Drainages in this ecoregion include perennial, intermittent, and ephemeral streams. Precipitation is greater here than in the two preceding ecoregions, averaging 12 to 18 inches annually. The potential natural vegetation for this ecoregion includes mountain mahogany (*Cercocarpus montanus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), blue grama, prairie junegrass, and western wheatgrass. There are pockets of aspen (*Populus tremuloides*), limber pine (*Pinus flexilis*), and Douglas fir (*Pseudotsuga menziesii*), on north-facing slopes. Riparian vegetation in this ecoregion may include various willow species (*Salix* sp.), narrowleaf cottonwood (*Populus angustifolia*), box elder (*Acer negundo*), and wild plum (*Prunus* sp.) (Chapman et al. 2004).

In general terms, species composition and distribution were observed to vary across the Application Area based on soil type, available soil moisture, elevational gradient, slope aspect, and grazing pressure/disturbance.

3.11.1 Primary Vegetation Cover Types

Vegetation cover types for the Application Area are discussed in the following subsections, based on dominant cover types. These cover types correspond to the vegetation cover type map, **Figure 3.11-1**. A summary of vegetation cover types by Application Area is shown in **Table 3.11-1**. Aerial photo (PCW 2008b) interpretation and ground-truthing (AECOM 2009) produced six dominant vegetation cover types. These six cover types included mountain big sagebrush, saltbush, greasewood, Wyoming big sagebrush, aspen, and riparian/wetlands. Their estimated acreages and constituent species are listed in the following subsections. Botanical nomenclature used in this text follows Dorn (2001).

3.11.1.1 Mountain Big Sagebrush

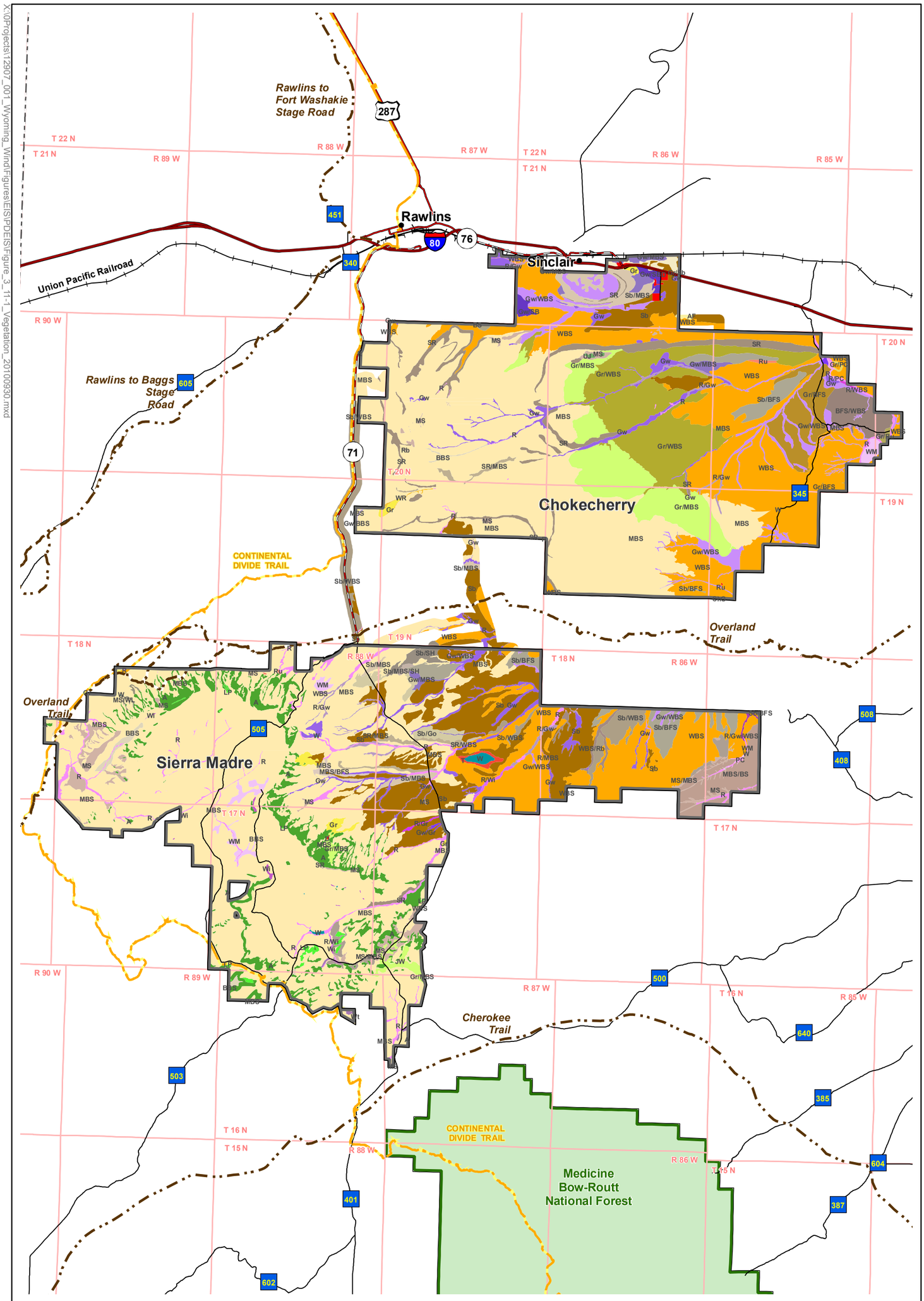
Mountain big sagebrush was mapped as the major component of vegetative cover in the Application Area. A total of approximately 117,058 acres of this cover type was estimated based on aerial photo interpretation and field reconnaissance (**Table 3.11-1**). Of these 117,058 acres, six cover subtypes were mapped that contain dominant mountain big sagebrush vegetation. These subtypes included grassland/mountain big sagebrush (7,744 acres); mountain big sagebrush (104,898 acres); mountain big sagebrush/black sagebrush (2,777 acres); mountain big sagebrush/bird's foot sagebrush (259 acres); mixed shrub/mountain big sagebrush (655 acres); and steep/rocky/mountain big sagebrush (725 acres).

Mountain big sagebrush is a variety of big sagebrush that is currently recognized as a subspecies of *Artemisia tridentata*. The vegetative stems of mountain big sagebrush form an even-topped crown. The inflorescences rise evenly above the crown. Inflorescences are narrow and spicate bearing flower heads containing four to eight flowers per head. Leaves are characteristically wider than those of basin or Wyoming big sagebrush. In extracts, ultraviolet visible coumarins are abundant. This shrub is generally smaller in stature than basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) with an average height of 3 feet. Mountain big sagebrush inhabits an elevational range from 2,600 to approximately 10,000 feet. This shrub grows in moderately deep to deep, well drained soils which provide summer moisture. Mountain big sagebrush normally is found in loamy to gravelly soils, but can contain high amounts of clay (NRCS 2008). For the purposes of this mapping, mountain big sagebrush was mapped above 7,000 feet as directed by the BLM.

Some of the mountain big sagebrush and Wyoming big sagebrush communities were determined to be thick, old, and decadent and were treated to improve rangeland conditions. Two areas received granular Spike herbicide treatments to thin the sagebrush and allow for the development of new growth. Spike treatments occurred at Miller Hill in the Sierra Madre (5,304 acres) and at Double Draw Canyon in Chokecherry (10,318 acres). Treatment locations are shown on **Figure 3.11-2**.

A wide variety of grasses and other shrubs are typical in the mountain big sagebrush cover type. Common grass species include:

- Thickspike wheatgrass (*Elymus macrourus);*
- Bluebunch wheatgrass (*Elymus spicatus*);
- Sandberg bluegrass;
- Needle-and-thread;
- Bottlebrush squirreltail (*Elymus elymoides*);
- Prairie junegrass;
- Mutton grass (*Poa fenleriana*);
- Green needlegrass (*Stipa viridula*);
- Oniongrass (*Melica bulbosa*);
- Idaho fescue (*Festuca idahoensis*); and
- Spike fescue (*Leucopoa kingii*).



Vegetation Classification

- Aspen (A)
- Juniper Woodland (JW)
- Limber Pine (LP)
- Plains Cottonwood (PC)
- Utah Juniper (UJ)
- Basin Big Sagebrush (BBS)
- Bird's Foot Sagebrush/ Wyoming Big Sagebrush (BFS/WBS)
- Black Sagebrush (BS)
- Mixed Shrub (MS)
- Mixed Shrub/ Mountain Big Sagebrush (MS/MBS)
- Mixed Shrub/ Wetland (MS/WL)
- Mountain Big Sagebrush (MBS)
- Mountain Big Sagebrush/ Bird's Foot Sagebrush (MBS/BFS)
- Mountain Big Sagebrush/ Black Sagebrush (MBS/BS)
- Rabbitbrush (Rb)
- Saltbush (Sb)
- Saltbush/ Goldenweed (Sb/Go)
- Saltbush/ Bird's Foot Sagebrush (Sb/BFS)
- Saltbush/ Mountain Big Sagebrush (Sb/MBS)
- Saltbush/ Mountain Big Sagebrush/ Spiny Horsebrush (Sb/MBS/SH)
- Saltbush/ Wyoming Big Sagebrush (Sb/WBS)
- Saltbush/ Spiny Horsebrush (Sb/SH)
- Serviceberry (Sv)
- Steep/ Rocky/ Mountain Big Sagebrush (SR/MBS)
- Steep/ Rocky/ Wyoming Big Sagebrush (SR/WBS)
- Steep/ Rocky (SR)
- Wyoming Big Sagebrush (WBS)
- Wyoming Big Sagebrush/ Rabbitbrush (WBS/Rb)
- Greasewood (Gw)
- Greasewood/ Basin Big Sagebrush (Gw/BBS)
- Greasewood/ Grassland (Gw/Gr)
- Greasewood/ Mountain Big Sagebrush (Gw/MBS)
- Greasewood/ Saltbush (Gw/Sb)
- Greasewood/ Wyoming Big Sagebrush (Gw/WBS)
- Alkali Flat (AF)
- Grassland (Gr)
- Grassland/ Bird's Foot Sagebrush (Gr/BFS)
- Grassland/ Mountain Big Sagebrush (Gr/MBS)
- Grassland/ Ruderal (Gr/Ru)
- Grassland/ Plains Cottonwood (Gr/PC)
- Grassland/ Saltbush (Gr/Sb)
- Grassland/ Wyoming Big Sagebrush (Gr/WBS)
- Wild Rye (WR)
- Riparian (R)
- Riparian/ Grassland (R/Gr)
- Riparian/ Greasewood (R/Gw)
- Riparian/ Greasewood/ Wyoming Big Sagebrush (R/Gw/WBS)
- Riparian/ Mountain Big Sagebrush (R/MBS)
- Riparian/ Plains Cottonwood (R/PC)
- Riparian/ Willow (R/Wi)
- Riparian/ Wyoming Big Sagebrush (R/WBS)
- Wetland (Wt)
- Wet Meadow (WM)
- Willow (Wi)
- Cheatgrass (ChG)
- Ruderal (Ru); Ruderal
- Tamarisk (T)
- Water (W)
- Developed (D)

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.11-1

Vegetation Cover Types in the Application Area

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers

1:220,000

N

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Table 3.11-1 Vegetation Cover Types in the Application Area

Vegetation Community	Chokecherry Application Area	Sierra Madre Application Area	Application Area Total
Alkali Flat	15	–	15
Aspen	–	7,166	7,166
Basin Big Sagebrush	75	389	464
Bird's Foot Sagebrush/Wyoming Big Sagebrush	1,759	–	1,759
Black Sagebrush	97	–	97
Cheatgrass	2	–	2
Developed	303	6	309
Grassland	188	407	595
Grassland/Bird's Foot Sagebrush	2,835	–	2,835
Grassland/Mountain Big Sagebrush	7,052	692	7,744
Grassland/Multiple Non-native Weed Species	93	–	93
Grassland/Plains Cottonwood	38	–	38
Grassland/Saltbush	329	–	329
Grassland/Wyoming Big Sagebrush	10,079	–	10,079
Greasewood	1,915	2,083	3,998
Greasewood/Basin Big Sagebrush	27	–	27
Greasewood/Grassland	36	49	85
Greasewood/Mountain Big Sagebrush	781	164	945
Greasewood/Saltbush	475	–	475
Greasewood/Wyoming Big Sagebrush	4,204	308	4,512
Juniper	–	3	3
Limber Pine	–	301	301
Mixed Shrub	368	1,989	2,357

Table 3.11-1 Vegetation Cover Types in the Application Area

Vegetation Community	Chokecherry Application Area	Sierra Madre Application Area	Application Area Total
Mixed Shrub/Mountain Big Sagebrush	–	656	656
Mixed Shrub/Wetland	–	80	80
Mountain Big Sagebrush	40,538	64,360	104,898
Mountain Big Sagebrush/Bird's Foot Sagebrush	–	259	259
Mountain Big Sagebrush/Black Sagebrush	–	2,777	2,777
Plains Cottonwood	–	3	3
Rabbitbrush	9	–	9
Riparian	397	2,597	2,994
Riparian/Grassland	–	61	61
Riparian/Greasewood	415	514	929
Riparian/Greasewood/Wyoming Big Sagebrush	–	72	72
Riparian/Mountain Big Sagebrush	–	27	27
Riparian/Plains Cottonwood	49	_	49
Riparian/Willow	–	142	142
Riparian/Wyoming Big Sagebrush	36	_	36
Ruderal/Disturbed	86	12	98
Saltbush	2,606	12,765	15,371
Saltbush/Bird's Foot Sagebrush	1,444	2,307	3,751
Saltbush/Goldenweed	–	847	847
Saltbush/Mountain Big Sagebrush	1,452	361	1,813
Saltbush/Mountain Big Sagebrush/Spiny Horsebrush	_	92	92
Saltbush/Spiny Horsebrush	–	488	488

Table 3.11-1 Vegetation Cover Types in the Application Area

Vegetation Community	Chokecherry Application Area	Sierra Madre Application Area	Application Area Total
Saltbush/Wyoming Big Sagebrush	29	1,310	1,339
Steep/Rocky	3,945	182	4,127
Steep/Rocky/Mountain Big Sagebrush	253	472	725
Steep/Rocky/Wyoming Big Sagebrush	–	49	49
Tamarisk	–	174	174
Utah Juniper	43	_	43
Water	1	225	226
Wet Meadow	281	688	969
Wetland	–	92	92
Wild Rye	65	_	65
Willow	–	108	108
Wyoming Big Sagebrush	23,100	11,666	34,766
Wyoming Big Sagebrush/Rabbitbrush		345	345

Sources: AECOM 2009; PCW 2008b.

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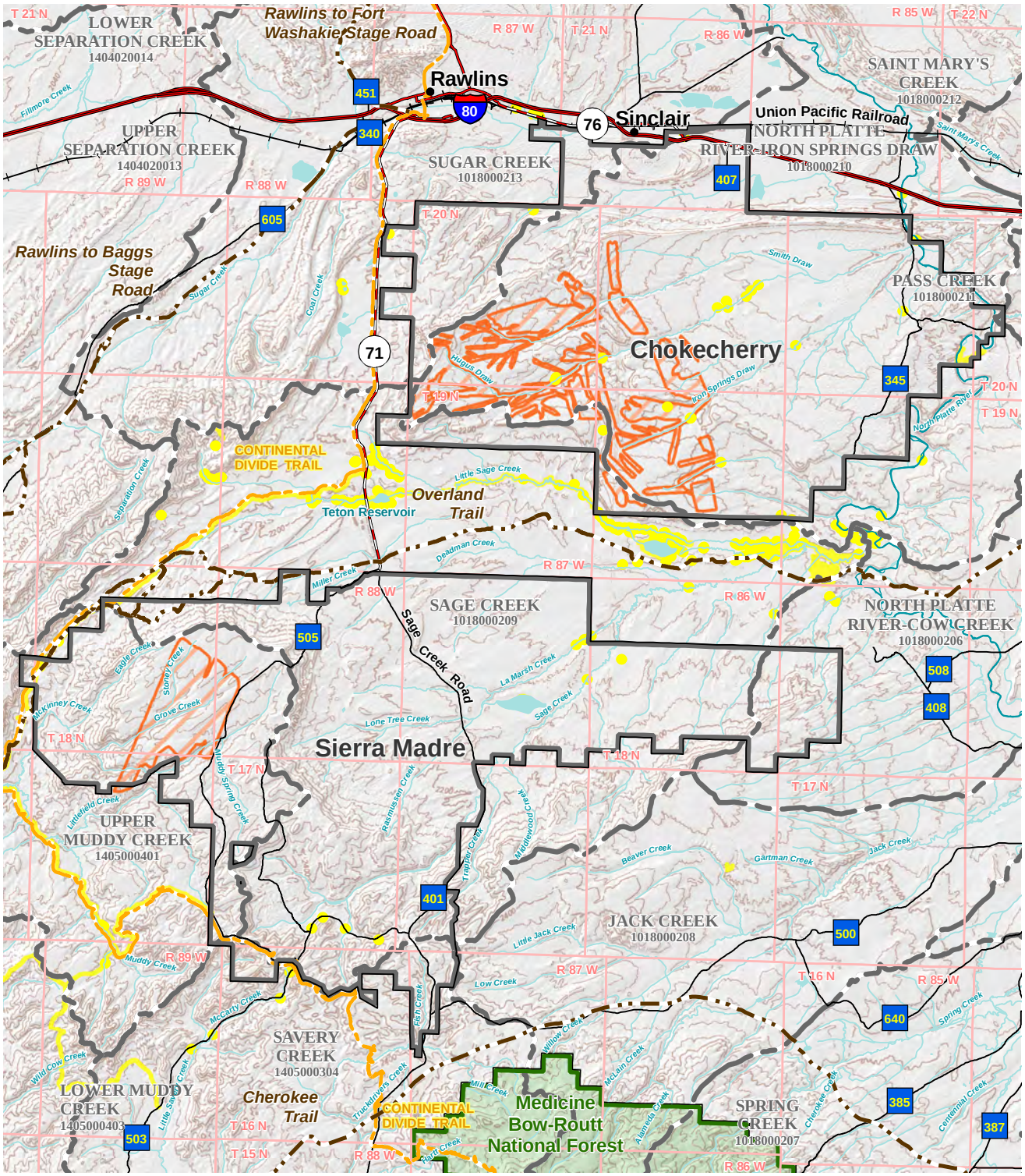

Legend

- Application Area
- Spike Treatment for Sagebrush Enhancement
- Noxious Weed Location (Not to Scale)
- National Forest
- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.11-2

Noxious Weeds and Treatment Areas

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

Common shrubs in this cover type include:

- Rubber rabbitbrush (Ericameria nauseosa);
- Bitterbrush (*Purshia tridentata*);
- Snowberry (*Symphoricarpos oreophilus*); and
- Serviceberry (*Amelanchier alnifolia*).

Field reconnaissance was conducted in October and November 2008 after herbaceous flowering plants had senesced for the year, making identification very difficult. An additional visit was conducted in July 2009, but the purpose was only to supplement the data to cover the expanded Application Area. The common herbaceous species that may be found in this cover type include:

- Bluebells (*Mertensia* spp.);
- Indian paintbrush (*Castilleja* spp.);
- Sego lily (*Calochortus nuttallianum*);
- False dandelion (*Agoseris glauca*);
- Locoweed (*Astragalus* spp.);
- Buttercup (*Ranunculus* spp.);
- Wild onion (*Allium* spp.);
- Beardtongue (*Penstemon* spp.);
- Grounsel (*Senecio* spp.);
- Phlox (*Phlox hoodii*);
- Sulfur flower (*Eriogonum umbellatum*);
- Geranium (*Geranium richardsonii*);
- Silky lupine (*Lupinus sericeus*); and
- Arrowleaf balsamroot (*Balsamorhiza sagittata*).

3.11.1.2 Saltbush

Saltbush (*Atriplex* spp.) was the second most prevalent vegetative cover type in the Application Area with a total of approximately 24,030 acres (**Table 3.11-1**). This cover type was dominated by Gardner's saltbush and shadscale. Gardner's saltbush is a subshrub, which is woody at its base and seldom grows higher than 4 decimeters (15.75 inches). It grows on alkaline soils of barren plains and hills. Gardner's saltbush in the Application Area was very diminutive at most sites. Shadscale is a relatively compact spiny shrub, also tending to grow in alkaline soils on plains and hills. Shadscale normally grows in dense clumps and ranges from 1 to 3 feet in height (USFS 1988). It is an important forage species for livestock. The total estimated acreage of saltbush-dominated land cover type was 24,030 acres. The saltbush cover type was divided among eight cover subtypes. These subtypes included saltbush (15,371 acres); saltbush/bird's foot sagebrush (3,751 acres); saltbush/mountain big sagebrush (1,813 acres); saltbush/goldenweed (847 acres); saltbush/mountain big sagebrush/spiny horsebrush (92 acres); saltbush/spiny horsebrush (488 acres); grassland/saltbush (329 acres); and saltbush/Wyoming big sagebrush (1,339 acres).

Species common to saltbush communities include:

- Sandberg bluegrass;
- Indian ricegrass;
- Bottlebrush squirreltail;
- Western wheatgrass;
- Phlox;
- Biscuitroot (*Lomatium* spp.);
- Wild onion;
- Winterfat (*Krascheninnikovia lanata*); and
- Birdsfoot sagebrush (*Artemisia pedatifida*).

3.11.1.3 Greasewood

Greasewood was the third most prevalent cover type in the Application Area, with a total of approximately 10,042 acres of cover (**Table 3.11-1**). Of these 10,042 acres, six cover subtypes were mapped. These subtypes included greasewood (3,998 acres), greasewood/mountain big sagebrush (945 acres), greasewood/Wyoming big sagebrush (4,512 acres), greasewood/saltbush (475 acres), greasewood/grassland (85 acres), and greasewood/basin big sagebrush (27 acres). Greasewood is a spine-tipped shrub growing up to 10 feet in height. Reconnaissance of the Application Area revealed most greasewood to exhibit a shorter stature (3 to 5 feet). This shrub was found along many of the ephemeral and intermittent drainages and clay flats in the Application Area. It is capable of growing on alkaline soils.

Shrub species common in greasewood communities include:

- Basin big sagebrush;
- Mountain big sagebrush;
- Shadscale; and
- Gardner's saltbush.

Grasses and forbs commonly found in the greasewood cover type:

- Basin wildrye (*Elymus cinereus*);
- Western wheatgrass;
- Sandberg bluegrass;
- Bottlebrush squirreltail;
- Inland saltgrass (*Distichlis sticta*);
- Biscuitroot; and
- Wild onion.

3.11.1.4 Wyoming Big Sagebrush

Wyoming big sagebrush was the fourth most dominant cover type within the Application Area. The 46,998 acres of Wyoming big sagebrush is comprised of five subtypes, including Wyoming big sagebrush (34,766 acres); Wyoming big sagebrush/rabbitbrush (345 acres); bird's foot

sagebrush/Wyoming big sagebrush (1,759 acres); grassland/Wyoming big sagebrush (10,079 acres); and steep/rocky/Wyoming big sagebrush (49 acres). Wyoming big sagebrush is a variety of big sagebrush and is closely related to mountain big sagebrush. Wyoming big sagebrush overlaps in range and elevation with basin big sagebrush. Plants are considerably smaller than those of basin big sagebrush, usually less than 0.9 m tall, and have main stems branching from the ground. Flowering stems are not as widely branching as those of the basin variety, but otherwise closely resemble that subspecies. Leaves are typically shorter, from 1 to 1.5 cm long, and flabelliform (NRCS undated). The range of mountain big sagebrush and Wyoming big sagebrush overlap and are known to hybridize with each other. For the purposes of mapping the vegetation communities, Wyoming big sagebrush was mapped below 7,000 feet in elevation.

Common understory species may include:

- Douglas rabbitbrush (*Chrysothamnus viscidiflorus*);
- Rubber rabbitbrush;
- Winterfat;
- Cotton horsebrush (*Tetradymia canescens*);
- Prickly pear cactus (*Opuntia polyacantha*); and
- Broom snakeweed (*Gutierrezia sarothrae*).

Common grasses and sedge species include:

- Western wheatgrass;
- Thickspike wheatgrass;
- Sandberg bluegrass;
- Bottlebrush squirreltail;
- Needle-and-thread;
- Indian ricegrass; and
- Threadleaf sedge (Carex *filifolia*).

Forbs common to this cover type include:

- Hood's phlox (*Phlox hoodii*);
- Hooker sandwort (*Arenaria hookeri*);
- Low buckwheat (*Eriognum ovalifolium*);
- Spring parsley (*Cymopterus acaulis*);
- Locoweed;
- Goldenweed (*Stenotus* spp.);
- Hollyleaf clover (*Trifolium gymnocarpum*);
- Wild onion; and
- Beardtongue.

3.11.1.5 Aspen

Aspen is a widely distributed pioneer tree species. It forms dense, pure stands with trees averaging 20 to 50 feet in height. It tends to grow at elevations ranging between 6,000 and 11,000 feet. Aspens grow on rich, moist, loamy soil, but may occupy sites that are substantially wetter or even dry and gravelly (USFS 1988). Aspen reproduces vegetatively by way of horizontal rhizomes. Aspen is limited to the Sierra Madre Application Area for a total estimated acreage of approximately 7,166 acres (**Table 3.11-1**). It was documented to occur in relatively small stands, distributed on north and east facing slopes below escarpments in the Sierra Madre area.

Aspen stands have a typical understory with several shrub species including:

- Snowberry;
- Serviceberry;
- Common juniper (*Juniperus communis*); and
- Scouler's willow (*Salix scoulerianna*).

The common grasses and forbs in aspen cover type are:

- Mountain brome (*Bromus marginatus*);
- Blue wildrye (*Elymus glaucus*);
- Kentucky bluegrass (*Poa pratensis*);
- Columbine (*Aquilegia* spp.);
- Waterleaf (*Hydrophyllum* spp.);
- Bluebells;
- Wild licorice (*Glycyrrhiza lepidota*);
- Bedstraw (*Gallium* spp.);
- Heartleaf arnica (*Arnica* spp.);
- Fairybells (*Disporum* spp.);
- Solomon's seal (*Polygonatum biflorum*);
- Yampa (*Perideria* spp.); and
- Sweet cicely (*Osmorhiza* spp.).

3.11.1.6 Riparian/Wetlands

The riparian/wetland cover type includes riparian vegetation, wetlands, and wet meadows in the Application Area. The wetlands and wet meadows are restricted to the Sierra Madre area and the transmission line corridor. The Chokecherry area does have some riparian development, but there is more riparian cover in the Sierra Madre area. The Application Area includes 5,600 acres of riparian and wetland cover types. These riparian and wetland cover types include the following cover sub-types: 2,994 acres of riparian cover; 929 acres of riparian/greasewood; 61 acres of riparian grassland; 969 acres of potential wet meadow; 72 acres of riparian/greasewood/Wyoming big sagebrush;142 acres of riparian/willow; 92 acres of wetland; 49 acres of riparian/plains cottonwood; 108 acres of willow; 38 acres of grassland/plains cottonwood; 36 acres of riparian/Wyoming big sagebrush; 3 acres of plains cottonwood; 80 acres of mixed shrub/wetland; and 27 acres of riparian/mountain big sagebrush (**Table 3.11-1**).

Shrub species common to this cover type include:

- Shrubby cinquefoil (*Pentaphylloides floribunda*);
- Coyote willow (*Salix exigua*);
- Yellow willow (*Salix lutea*);
- Bebb's willow (*Salix bebbiana*) (limited to the Sage Creek area);
- Geier's willow (*Salix geyeriana*) (limited to the Sierra Madre area);
- River birch (*Betula occidentalis*);
- Wild rose (*Rosa woodsii*); and
- Golden currant (*Ribes aureum*).

The grass and grass-like species that may be found in the riparian/wetland cover type include the following species:

- Kentucky bluegrass;
- Inland saltgrass;
- Bentgrass (*Agrostis alba* and *Agrostis stolonifera*);
- Slender wheatgrass (E*lymus trachycaulus*);
- Meadow barley (*Hordeum brachyantherum*);
- Baltic rush (*Juncus balticus*);
- Spikerush (*Eleocharis palustris*);
- Tufted hairgrass (*Deschampsia cespitosa*);
- Northern reedgrass (*Calamagrostis inexpansa*);
- Common reed (*Phragmites communis*);
- Nebraska sedge (*Carex nebrascensis*);
- Beaked sedge (*Carex utriculata*);
- American bulrush (*Scirpus americanus*); and
- Pondweed (*Potamogeton* sp.).

The common forbs in this cover type may include:

- Aster species;
- Locoweed;
- Goldenrod (*Solidago canadensis*);
- Wild licorice;
- Prickly lettuce (*Lactuca seriola*);
- Field mint (*Mentha arvensis*);
- Willowherb (*Epilobium glandulosum*);

- Plantain (*Plantago eriopoda*); and
- Strawberry potentilla (*Potentilla anserina*).

3.11.1.7 Minor Vegetation Cover Types

Minor cover types were found scattered throughout the Application Area. These cover types included basin big sagebrush (464 acres); black sagebrush (97 acres); grassland (various species) (3,834 acres); limber pine (301 acres); mixed shrub (various species) (2,357 acres); rabbitbrush (9 acres); Utah juniper (*Juniperus osteosperma*) (43 acres); tamarisk (174 acres); wildrye (65 acres); and ruderal/disturbed (98 acres). The estimated acreages of these vegetation cover types for the Application Area are listed in **Table 3.11-1**.

In addition to the minor cover types, the vegetation mapping efforts also documented approximately 309 acres of developed lands, 226 acres of water, and 4,127 acres of steep/rocky terrain with no dominant vegetation designated (**Table 3.11-1**), and 15 acres of alkali flats.

3.11.1.8 Cushion Plant Communities

The term cushion plant is described in Jones (2005) as “short, often sparse vegetation on rims and outcrops formed in resistant bedrock, where cushion plants contribute a major proportion of the plant canopy cover.” The studies performed by Jones did not occur directly in the Application Area, but both Chokecherry and Sierra Madre areas have extensive landforms favorable for cushion plant community development similar to the Jones’ (2005) study area. The Chokecherry area features very steep escarpments, many rolling hill landforms, and near-surface bedrock. The Sierra Madre area has fewer exposed bedrock features than Chokecherry, but there is extensive rim features on the north and east portion of the Sierra Madre area. These windswept locations are naturally inhabited by plants with a growth form that prevents desiccation from water loss. Jones (2005) found that only a handful of individual plant taxa are found exclusively on rims and rocky outcrops. Cushion plants contributed over twice the proportion of cover on rims and outcrops as they did on sample plots in nearby shrub steppe vegetation cover. Grasses and shrubs tend to provide more cover further away from rims and outcrops features.

The most common species found in cushion plant communities of south-central Wyoming by Jones (2005) include:

- Goldenweed (*Stenotus acaulis*);
- Goldenweed (*Stenotus armerioides*);
- Bluebunch wheatgrass (*Elymus spicatus*);
- Hooker sandwort (*Arenaria hookeri*);
- Phlox (*Phlox muscoides*);
- *Tetraneuris acaulis*;
- Milkvetch (*Astragalus spatulatus*); and
- Milkvetch (*Astragalus simplicifolius*).

Jones (2005) also noted in his cushion plant study that vehicle tire tracks and mammal burrows were commonly found at study sites on rims. However, weed invasion was not an observed outcome of this disturbance.

Cushion plant communities are important communities because they are specifically adapted to the extremely harsh environments of these rim features with shallow soils and are exposed to harsh winds

and low moisture. These communities are considered to be difficult to restore and no examples of successful restoration of these communities in the area are known. Commercial seed sources for the cushion communities are not readily available.

3.11.2 Noxious Weeds and Invasive Species

EO 13112, signed by President Clinton in 1999, established a mechanism to prevent the introduction of invasive species; provide for their control; and minimizes the economic, ecological, and human health impacts that invasive species cause. These weeds are primarily spread through roads, waterways, animals, and soil disturbing activities. Weeds are difficult to control unless there is regional land management cooperation such as federal, state, county, and private groups. The Carlson-Foley Act (P.L. 90-583) as well as state law holds the federal government responsible for controlling invasive and designated noxious weeds on public land and provide direction on their control.

Noxious and invasive weeds are a continuing threat to the biological diversity and integrity of native ecosystems. Noxious and invasive weed presence can result in the loss of productive rangeland, loss of wildlife habitat, increased soil erosion, decreased biological diversity, and an increased risk of fire. The BLM has not specifically surveyed the entire area for invasive and noxious weeds; some of the data collected is from incidental sightings. Weed observations were compiled from known populations and vegetation mapping efforts by the BLM and AECOM and are shown on **Figure 3.11-2**. Most of the weeds are associated with drainages, water features, and disturbed areas. Detailed weed mapping was not completed, but would be performed immediately prior to construction, when weeds can be treated, avoided, and/or weedy topsoil can be segregated during construction.

Although weed knowledge of the area is not comprehensive, the highest concentrations of known weed populations occur along Little Sage Creek and Sage Creek and extend from west of CCR 401 (Sage Creek Road) to the North Platte River and downriver to Fort Steele. The absence of recorded weeds does not infer that areas lack weeds, but that these areas may not have been surveyed.

The BLM and the TOTCO (as well as the previous ranch owners) have cooperatively participated in weed control since 1999, and conducted an experimental weed burn in June 2003 (Newberry 2010a). The weed burn occurred on Little Sage Creek to remove thick overstory vegetation to better find and treat perennial pepperweed and Russian knapweed.

Weeds in the Chokecherry area were primarily observed in disturbed areas, within drainages, and water impoundments. The Sierra Madre area is relatively free of noxious and invasive weeds. In addition to the weeds within the Application Area, it is important to note populations of weeds in other adjacent areas since these populations provide the most likely sources for potential infestation. The most common weeds occur within the Sage Creek Basin and Bolten sub-regions and include halogeton, whitetop, perennial pepperweed, Russian knapweed, cheatgrass, leafy spurge, and Canada thistle. Cheatgrass is found locally throughout the TOTCO, but does have a tendency to be found in the sandier soils. Less common weeds include sowthistle, black henbane, Russian thistle, poverty weed, and saltcedar. A description of recorded weed occurrences found in and adjacent to the Application Area is provided below and are listed from north to south.

<u>Chokecherry Portion of the Application Area and Vicinity</u>

- Numerous Russian knapweed sightings near the UPRR just east of Rawlins.
- Perennial pepperweed is prevalent throughout Sugar Creek.
- The pipeline easement and associated access roads south of the Greenville Dome contain a number of pipeline disturbances with annual weeds including halogeton, cheatgrass, and Russian thistle.

- Cheatgrass, alyssum, and tumble mustard are recorded throughout Chokecherry, mostly on the sandier soils.
- Along the North Platte River, there are several large patches of sow thistle, Russian knapweed, Canada thistle, whitetop, and leafy spurge.
- There is Russian olive and saltcedar scattered along the North Platte River upstream (south) of the I-80 bridge.
- Along Pass Creek, near the gravel pit, there is Russian olive and Russian knapweed.
- Hugus Draw has whitetop scattered throughout, but its heaviest occurrence is the middle section.
- Iron Spring Draw contains Russian knapweed and common whitetop,

Sierra Madre Portion of the Application Area and Vicinity

- Common whitetop occurs along Rasmussen Creek.
- Russian knapweed, whitetop, and Canada thistle occur along Sage Creek east of Sage Creek Road.
- Canada thistle occurs along perennial drainages and roadsides throughout the area.
- Cheatgrass occurs sporadically along the main roads and soil disturbances throughout the area.
- Rasmussen Reservoir, near the confluence of Lone Tree Creek and Rasmussen Creek, has a large stand of saltcedar surrounding its banks.

Other Adjacent Areas

- There is halogeton along the main ranch road and roads in the south central portion of Chokecherry and the natural gas development.
- Starting at Beckman Canyon at the base of Atlantic Rim, Little Sage Creek has numerous occurrences of musk thistle, common whitetop, and Russian thistle. Near Little Sage Reservoir, perennial pepperweed and sowthistle occur to WY 71 (Sage Creek Road). The area surrounding Teton Reservoir contains large patches of saltcedar and perennial pepperweed.
- Perennial pepperweed extends along Little Sage Creek from Teton Reservoir to the confluence with Sage Creek. Numerous occurrences of Russian knapweed also occur along this area.
- Kindt Reservoir is surrounded by large populations of perennial pepperweed, Russian knapweed, saltcedar, and Canada thistle.
- Around the ranch buildings and hay meadows, there are several large patches of Russian knapweed, whitetop, and perennial pepperweed.
- Russian knapweed also extends from these large patches along the ranch roads in all directions.
- Numerous occurrences of leafy spurge, whitetop, Russian knapweed, sowthistle, and Canada thistle have been documented along the North Platte River.
- There also is Russian olive and saltcedar scattered along the North Platte River.

Some of these weed species require soil disturbance to become established, while other species do not. The weeds appear to be mostly spread through soil moving activities such as pipeline and road construction, surface flows, grazing, and road corridors in the Chokecherry site and other adjacent areas. However, the county road and ranch roads in Sierra Madre do not appear to have the same amount of weed influence as Chokecherry.

The Rawlins RMP (BLM 2008a) states that the BLM's primary focus is treatment of noxious weeds. The secondary priority is controlling invasive species such as halogeton, henbane, and cheatgrass through management of grazing, wildlife, and human activities. In areas infested with invasive and noxious weeds, surface disturbing activities such as roads and pipeline construction are increasing their opportunity to spread at a higher rate. Species such as halogeton can accumulate selenium from the soil that when ingested by livestock can create a cumulative poisoning at certain thresholds. Selenium poisoning also is known as "alkali disease" and "blind staggering." Halogeton has been observed along the pipeline construction ROWs at the north side of the Chokecherry area.

3.11.3 Wetlands and Riparian Zones

Wetlands and associated riparian zones are a rare and unique habitat type in Wyoming's semi-arid environment and the general project vicinity. In general, they provide a multitude of ecological, economic, and social benefits including habitat for fish, wildlife, and a variety of plants. They also can serve as nurseries for many fish of commercial and recreational importance. Wetlands are important landscape features because they hold and slowly release flood water and snow melt, recharge groundwater, act as filters to cleanse water of impurities, recycle nutrients, and provide recreation and wildlife viewing opportunities.

The importance of wetlands has long been recognized and is protected by national and BLM legal and regulatory guidelines, including:

- Section 404 of the CWA requires the USACE issue permits for placement of dredged or fill material in, or excavation of, waters of the U.S. and their adjacent wetlands;
- EO 11990, Protection of Wetlands, requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands;
- EO 11988, Floodplain Management, provides for the restoration and preservation of natural and beneficial floodplain values, and enhancement of the natural and beneficial values of wetlands in carrying out programs affecting land use (most 100-year floodplains within the Application Area likely would occur within 500 feet of perennial waters and within 100 feet of ephemeral drainages); and
- The BLM RMP stipulates that no surface disturbance may occur within 500 feet of surface water or riparian areas (BLM 2008a, RMP, pg. 2-99).

The analysis area for the assessment of impacts to wetlands and associated riparian zones is the Application Area. Wetlands and associated riparian zones were determined by mapping those drainages that likely contain wetlands and riparian zones. These drainages were based on National Hydrography Dataset (NHD) and classified by AECOM using a combination of existing field knowledge and aerial photographs (PCW 2008b). Since many of these wetlands and associated riparian zones are linear and narrow in nature, they were too small to be mapped by the vegetation community mapping. This data only identifies the length of the drainages these features are associated with and does not account for any width that the wetlands and riparian zones take up. These designations provide an understanding of the length of wetlands and associated riparian zones crossed. The National Wetland Inventory (USFWS 2008d) identifies four wetland types that occur in the analysis area: freshwater emergent wetland, freshwater forested/shrub wetland, freshwater pond, and lake. However, the National Wetlands Inventory (NWI) mapping was determined to be incomplete for the Application Area.

The data has not been verified on the ground, but prior to construction, actual wetland boundaries will be delineated in the field and a Section 404 permit will be obtained from the USACE and site-specific NEPA analysis will be conducted. It is assumed that the amount of wetland found on the ground will be greater than that shown.

There are a total of 925 miles of perennial and ephemeral drainages within the Application Area of which 403 miles are within the Chokecherry portion and 522 are within the Sierra Madre portion of the Application Area (**Figure 3.11-3**). Drainages in the Chokecherry Application Area include Hugus Draw, Iron Spring Draw, Little Sage Creek, North Platte River, Smith Draw, Pass Creek, Sugar Creek, and a number of unnamed drainages. The Sierra Madre Application Area includes Deadman Creek, Eagle Creek, Fish Creek, Grove Creek, La Marsh Creek, McKinney Creek, Middlewood Creek, Miller Spring, Muddy Spring Creek, North Fork Savory Creek, Pine Grove Creek, Rasmussen Creek, Sage Creek, Stone Creek, Trapper Creek, and many unnamed drainages.

Of those mapped drainages in the Application Area, 315 miles were identified as having the potential for containing wetlands or riparian zones. There are 53 miles of wetland or riparian drainages in the Chokecherry portion of the Application Area and 262 miles in the Sierra Madre portion of the Application Area. In addition, 129 miles of these wetland and riparian drainages are on BLM land within the Application Area of which 17 miles are on the Chokecherry portion and 112 miles are on the Sierra Madre portion.

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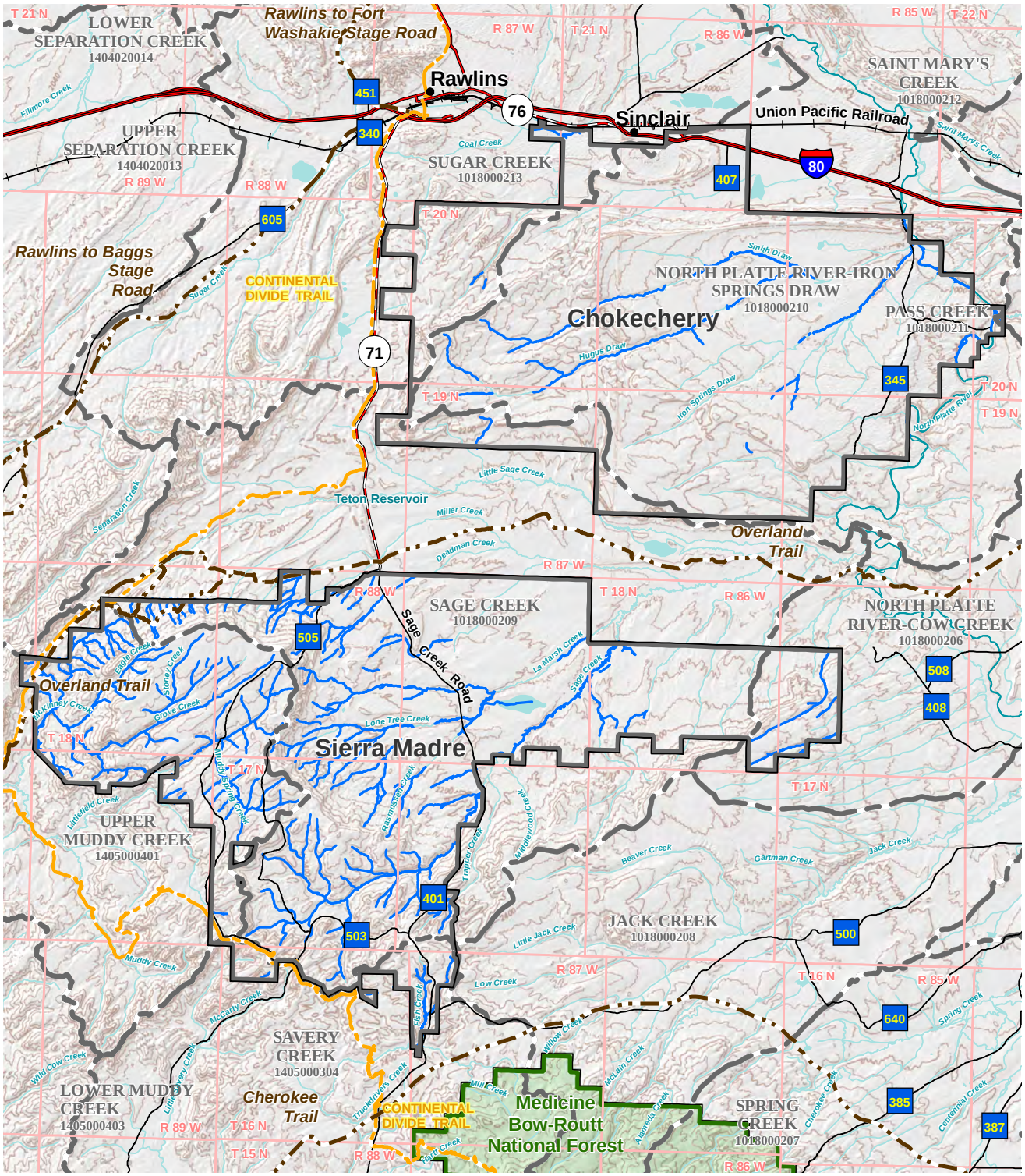

Legend

- Application Area
- Potential Wetlands and Riparian Zones
- National Forest
- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- River or Creek
- Lake or Reservoir
- Watershed Boundary

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.11-3

Wetland and Riparian Zones within the Application Area

0 1 2 4 Miles
0 1 2 4 Kilometers
1:300,000
N

3.12 Visual Resources

This section describes the visual resource setting, including user sensitivity, scenic quality, and the visibility of the Application Area that may be affected.

3.12.1 Analysis Area

The BLM VRM system divides landscapes into three distance zones based on relative visibility from travel routes or observation points:

- Foreground-middle ground: Areas seen from viewing locations that are up to 5 miles away;
- Background: Areas seen beyond the 5-mile foreground-middle ground zone to 15 miles away; and
- Seldom seen: Areas visible beyond 15 miles or not visible in the foreground-middle ground or background zones.

As WTGs are visible at great distances, the visual resources analysis area consists of the visible areas (or viewsheds) of all proposed project facilities, from the Application Area to beyond the background distance zone (approximately 30 miles), as shown on **Figure 3.12-1**. At 30 miles, the motion of a WTG is generally not discernible although project facilities and night lighting are generally still identifiable (AECOM 2011).

3.12.2 BLM Visual Resources Management

The BLM's VRM system provides a way to inventory and evaluate the scenic value of an area's visual resources in order to determine appropriate levels of management (BLM 1986a,b). The visual resources of the Application Area and the surrounding regions within the background distance zone of 30 miles were inventoried using the BLM VRI process in 2010 (Otak, Inc. 2011). The VRI consists of a sensitivity level analysis, scenic quality evaluation, and a delineation of distance zones. Based on these three factors, public lands are placed into one of four VRI classes that represent the relative value of the visual resources. Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of the least value. Inventory classes are informational in nature and provide the basis for considering visual values in the development of management alternatives, or VRM classes. The inventoried sensitivity levels, scenic quality, and visibility and distance zones are described in Section 3.12.3, Visual Resources Inventory.

VRM classes determine the degree of acceptable visual change within a characteristic landscape. The system also provides a way to analyze potential visual impacts and apply visual design techniques to ensure that surface-disturbing activities are harmonized with their surroundings or are appropriate with the surrounding landscape (BLM 1986b). VRM classes are only applicable to BLM managed lands, not to other public, state, or private lands.

VRM classes in the Application Area are established through Volume 1, which describes the RMP amendment process to development VRM Alternatives and a Preferred VRM Alternative developed from the VRI, among other management considerations. As shown on **Figure 3.12-2**, the majority of the Chokecherry site is managed for VRM Class IV and the Sierra Madre site is managed for VRM Classes III and IV. Small portions of the Application Area, namely the North Platte River Corridor and lands near the Medicine Bow-Routt National Forest, are managed for VRM Class II. **Table 3.12-1** lists the management objectives of the applicable VRM classes.

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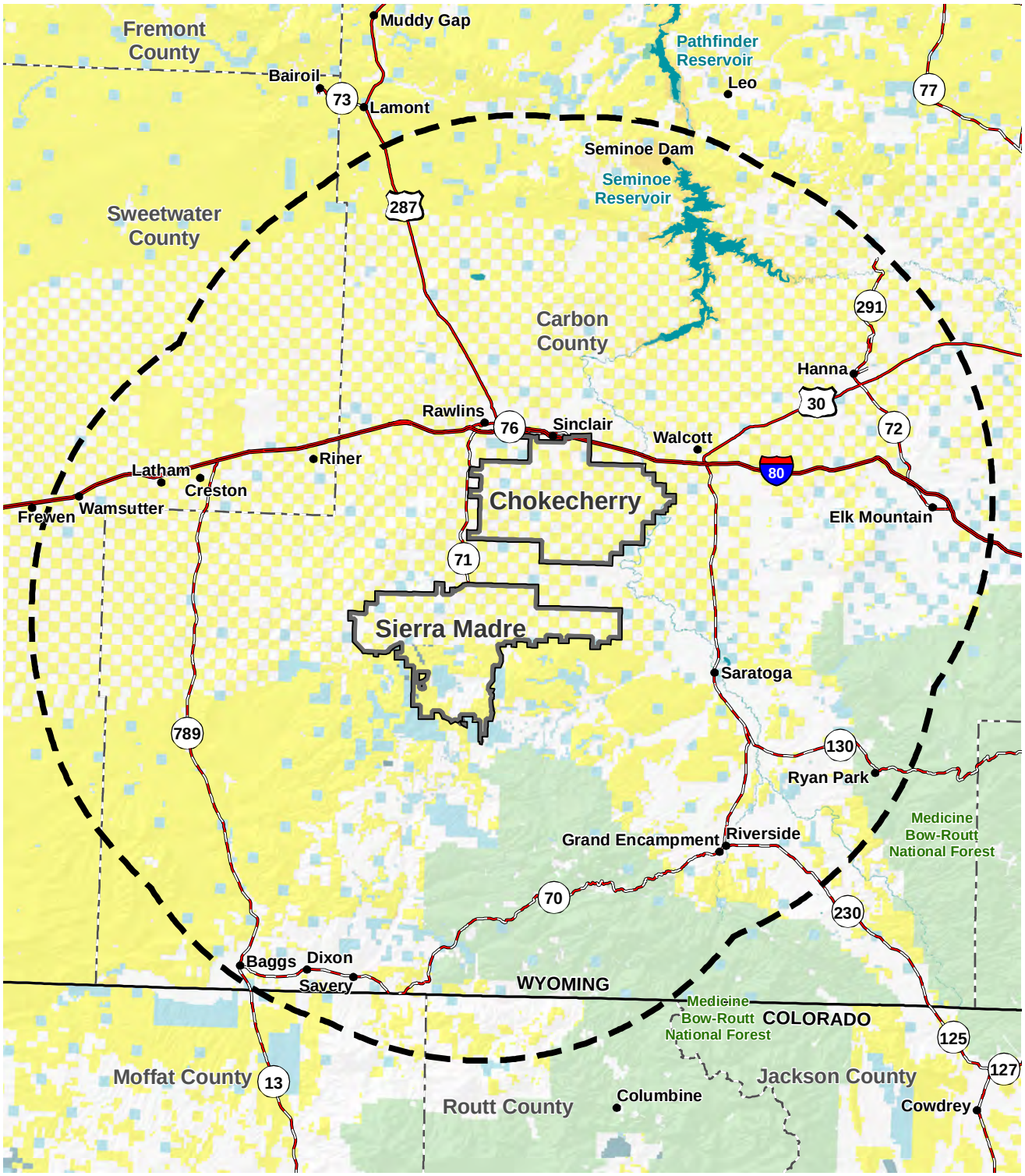

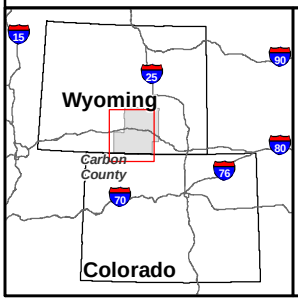

Legend

- City or Town
- Interstate Highway
- U.S. Highway
- State Highway
- Visual Resource Analysis Area
- Application Area
- State Boundary
- County Boundary

Land Owner

- Bureau of Land Management
- Bureau of Reclamation
- US Fish and Wildlife Service
- US Forest Service
- Private
- State
- State, County or City

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-1

Visual Resources Analysis Area

0 5 10 15 20 Miles
0 5 10 15 20 25 Kilometers
1:900,000
N

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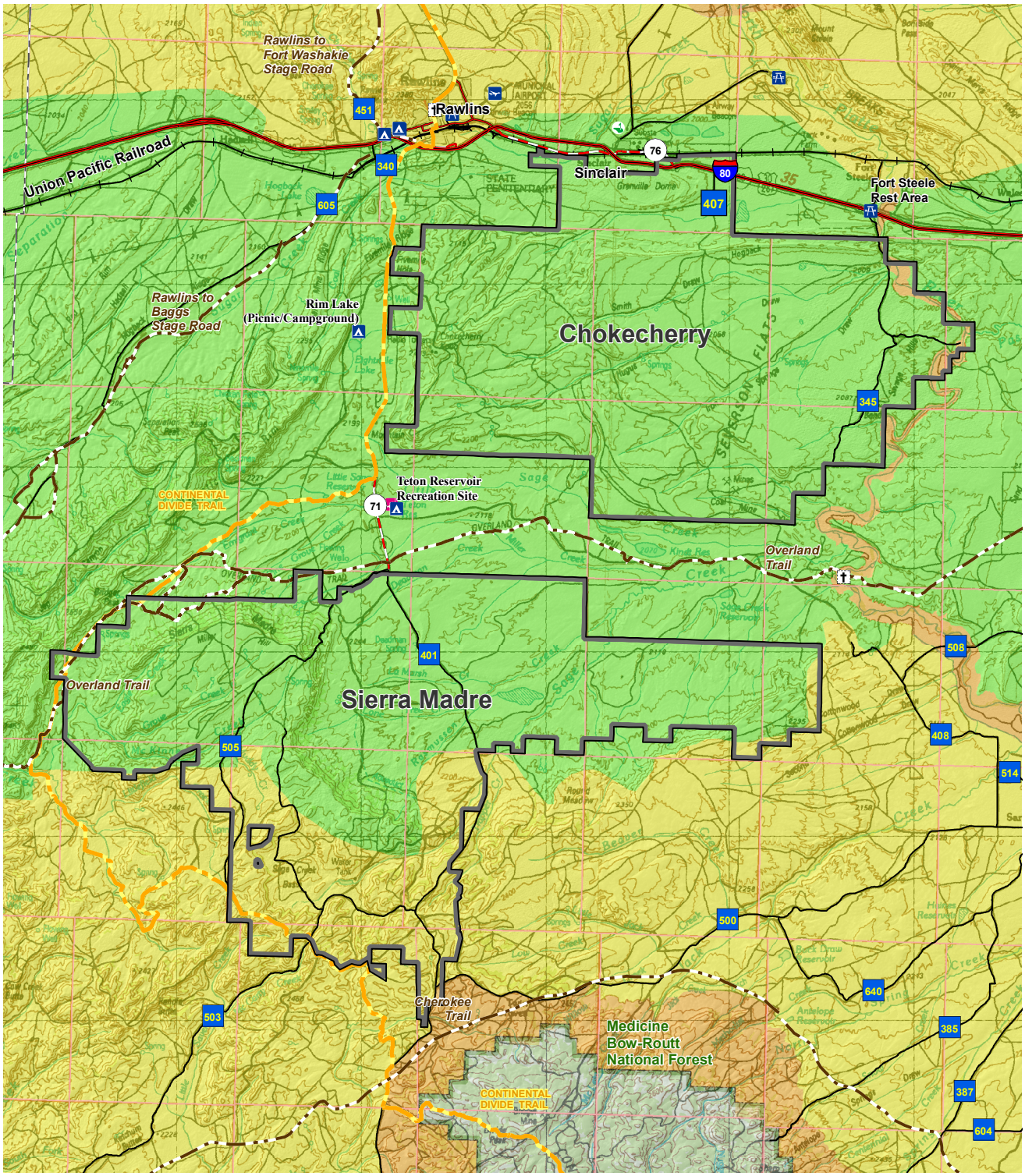

Legend

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road

Visual Resource Management

- Class II
- Class III
- Class IV
- National Forest
- Application Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-2

Visual Resources Management Classes

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.12-1 VRM Classes and Management Objectives

VRM Class	Management Objective
I	Preserves the existing character of the landscape. Provides for natural ecological changes. Does not preclude very limited management activity. Level of change to the characteristic landscape should be very low and must not attract attention.
II	Retains the existing character of the landscape. Management activities may be seen, but should not attract the attention of the casual observer. Level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
III	Partially retains the existing character of the landscape. Management activities may attract attention, but should not dominate the view of the casual observer. Level of change to the characteristic landscape should be moderate. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	Provides for management activities that require major modification of the existing character of the landscape. Management activities may dominate the view and be the major focus of viewer attention. Level of change to the characteristic landscape can be high. Every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM Manual 8431, Visual Resource Contract Rating.

3.12.3 Visual Resources Inventory

Visual resources within the Application Area are influenced by a wide variety of characteristics including topography, geology, vegetation, and hydrology. Much of the visual experience in the analysis area is dominated by the arid Wyoming western ranch landscape. This is evidenced in many views by the presence of cattle, barbed-wire fences, and dirt roads. There also is often the presence of wildlife in the analysis area including deer, pronghorn, and elk, among others.

3.12.3.1 Sensitivity Levels Analysis

Although landscapes do have common elements that can be measured, there is a subjective dimension to landscape aesthetics. Each viewer brings perceptions formed by individual influences: culture, visual expectations, familiarity with local geography, and personal values. To measure regional and individual attitudes in the evaluation of a landscape, visual sensitivity is determined by considering use volume and user attitude across BLM lands (BLM 1986a,b).

Use volume refers to the frequency of travel through an area (by road, trail, or river). Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values generally becomes more important as the number of viewers increases.

User attitude is a measure of public concern for scenic quality. User attitude is dependent on factors such as the type of users, public interest, and adjacent land uses. For example, recreational users, especially those who are attracted to an area by its scenic quality and intact landscape character, tend to be highly sensitive to changes in visual quality. Conversely, those who pass through an area on their way to work may not be as sensitive to change. User attitude also is dependent on the level of public interest associated with the Application Area. The visual quality of an area may be of concern to local, state, or national groups. Public controversy created in response to proposed activities that would change the landscape character should be considered. Lastly, user attitude can be dependent on adjacent land uses. The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a developed recreation area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.

Visual resources in the Application Area are often associated with recreational opportunities, as discussed in Section 3.7, Recreation. Lands acknowledged in the Rawlins RMP for their visual sensitivity include the CDNST, SRMA, the North Platte SRMA, cultural sites, historic trails, eligible wild and scenic river segments, and the Seminoe-to-Alcova Back Country Byway. Many recreational activities, such as backpacking, hunting, fishing, geologic and nature study, photography, and hiking, either depend on natural settings and scenic views or are the primary attraction for recreationists in these areas. The Sierra Madre, North Platte River, and Saratoga areas are recreational destinations and are easily accessible for tourists and other recreationists.

The VRI sensitivity level analysis assigns public lands high, medium, or low ratings by analyzing the various factors that include: 1) type of users; 2) amount of use; 3) public interest; 4) adjacent land uses; 5) management objectives of special areas; and 6) other indicators of sensitivity that may be specific to the region under analysis. Areas inventoried with high sensitivity levels occur in the vicinity of communities, highways, and other public roads that cross through the Application Area, and the viewsheds of special management areas, including the areas described above. The majority of the Chokecherry site was found to have low sensitivity; conversely the majority of the Sierra Madre site has high sensitivity, as shown on **Figure 3.12-3** and **Table 3.12-2**.

3.12.3.2 Scenic Quality

Scenic quality is best described as the overall impression retained after traveling through an area. The VRI scenic quality evaluation divides the inventory area into Scenic Quality Rating Units (SQRUs) for rating purposes. Rating areas are delineated on a basis of similar physiographic characteristics that include similar visual patterns, texture, color, variety, and level of development. The key factors in a landscape that affect existing scenic quality are landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification (BLM 1986a). The VRI assigns a relative scenic quality rating (A [High], B [Moderate], or C [Low]) to each SQRU on BLM lands, scenic quality A being the highest rating as identified in **Table 3.12-3**.

Diversity of topography, soils, and climate creates a range of vegetation communities in the analysis area. These communities include aspen, sagebrush, juniper, mountain shrub, saline desert shrub, and riparian/wetlands among others. Some of the vegetation communities within the analysis area are large, homogeneous, continuous, and relatively undisturbed tracts. These include large blocks of continuous grass, sagebrush, and some areas of tree cover, depending on elevation, soils, and water (Section 3.11, Vegetation).

Table 3.12-2 Sensitivity Level Rating Units in the Application Area

Application Area	SLRU Identifier	SLRU Rating Score	Acres in Application Area	Percent of Application Area	SQRU Rating Description
Chokecherry	006	Moderate	13,209	6	Moderate due to high traffic volume. A corridor for transportation, communications, utilities.
	011	High	6,793	3	Most important historic trail in southern Wyoming; high public interest.
	030	High	5,170	2	Nationally designated scenic trail, high public interest.
	033	Low	77,283	35	Low; public access and knowledge of the area has been limited for the past 35 years.
	049	High	392	0.2	High concern for scenic quality and visual variety influenced byway designation; high traffic volume, recreational access corridor.
	052	High	576	0.3	Corridor for tourism; adjacent scenery improves perceived scenic value.
	053	High	1,286	0.6	Recreational and scenic core of the Saratoga Valley.
Sierra Madre	011	High	24,631	11	Most important historic trail in southern Wyoming; high public interest.
	025	High	1,001	0.4	Major complex of recreational, scenic, and wildlife values. Important recreation area for Rawlins and southern Wyoming.
	026	High	485	0.2	A complex of values that suggest high visual sensitivity: scenic, recreational, and historic.
	027	High	10,220	5	An area of very high interest to Rawlins area and Wyoming residents.
	028	Moderate	23,406	10	Low expectations for visual management due to location in checkerboard landownership area; contains Overland Trail and portion of Continental Divide Trail.
	029	Moderate	16,619	8	Checkerboard ownership inhibits recreational use and access in northern portion. Of high interest to Rawlins area recreationists.
	030	High	38,673	17	Nationally designated scenic trail, high public interest.
	054	Low	2,235	1	Lands lack distinguishing features, visual variety.

Source: AECOM; Otak, Inc. 2011.

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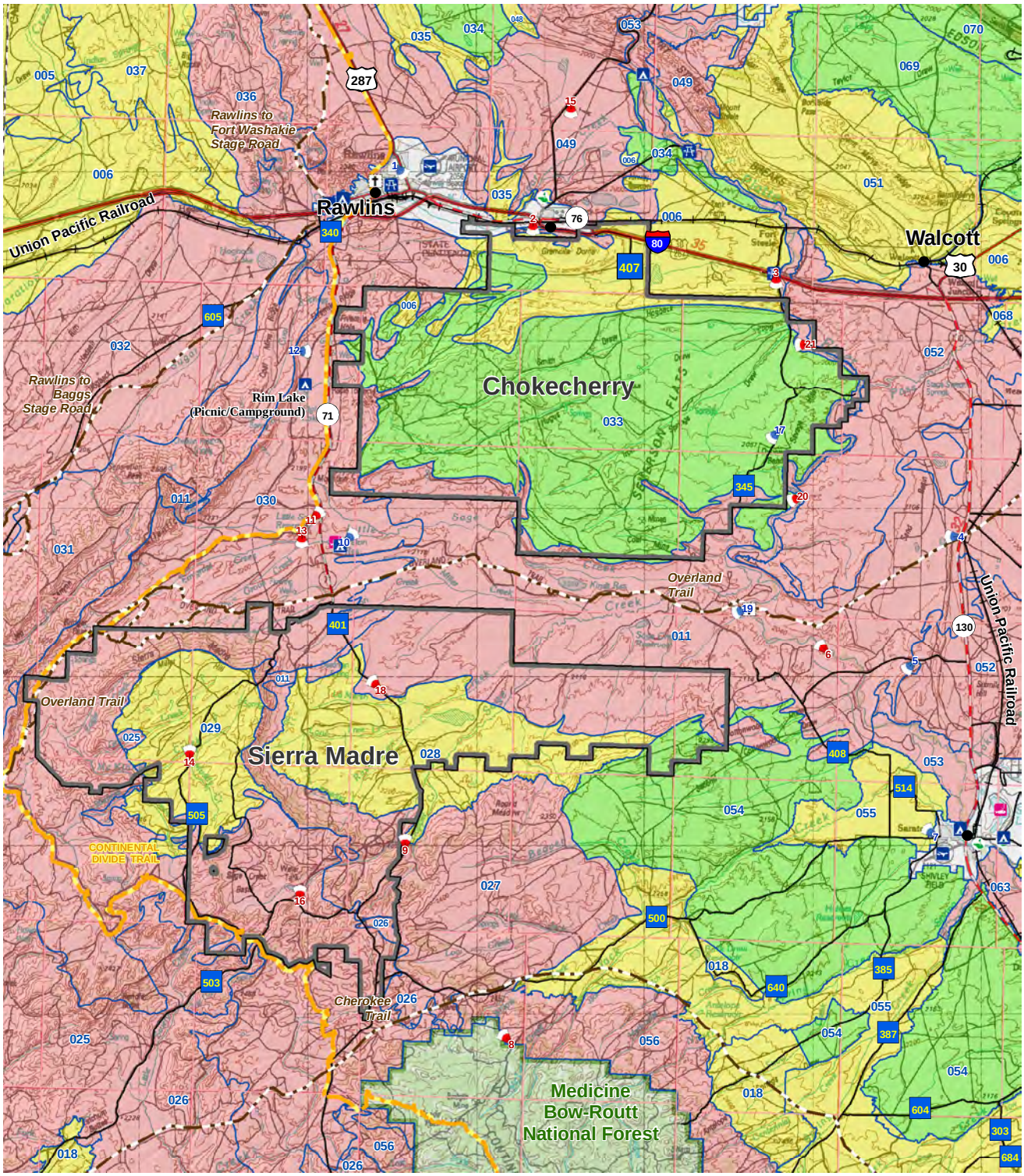
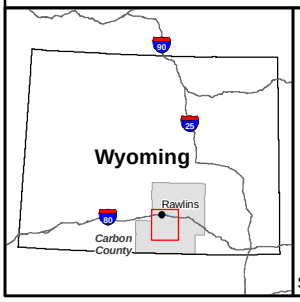




Legend

- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Continental Divide Trail
- Historic Trail
- Application Area
- National Forest

Visual Resource Inventory Sensitivity Rating Level

- High
- Moderate
- Low
- Sensitivity Level Rating Unit

Source: Otak, Inc. 2011

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-3

VRI Sensitivity Level Rating Units

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

Table 3.12-3 Scenic Quality Rating Units in the Application Area

Application Area	SQRU Number	SQRU Name	SQRU Score	SQRU Rating	Acres in Area	Percent of Area	SQRU Rating Description
Chokecherry	015	Atlantic Rim	17.0	B	48	0.02	A dramatic rim with substantial vertical relief. Interesting landforms. An imposing visual presence.
	039	Sage Creek	9.0	C	284	0.1	A large landscape that lies between Bolton Rim on the north and the foothills of the Sierra Madre Mountains in the south. Low vegetative cover gives the area a light color.
	040	Bolton Ranch	13.0	B	99,791	45	A complex system of rims, ridges, and diagonal slopes. Dramatic banded rock outcrops. High vertical relief.
	044	Separation Flats	10.0	C	2,725	1	A broad, flat area lacking in visual variety. Features are subtle. A strongly horizontal landscape. Structures jut up out of the landscape, have smooth surfaces but are considered coarse in texture.
	070	Walcott	9.0	C	576	0.3	A vast open landscape with minimal vertical relief and visual variety.
	071	Platte North	15.5	B	1,286	0.6	Very pleasant and scenic river corridor. Dominant water feature, cottonwood-riparian vegetation and pleasant pastoral setting with adjacent cultivated fields.
Sierra Madre	015	Atlantic Rim	17.0	B	474	0.2	A dramatic rim with substantial vertical relief. Interesting landforms. An imposing visual presence.
	016	Miller Hill	12.0	B	18,221	8	A gentle, rolling landscape with some modest visual variety in terms of landforms and vegetation.
	017	Grizzly Management Area	17.0	B	8,436	4	A landscape with distinct hills and buttes, deep drainages, lush vegetation. Steep slopes, contrast in color, and a distinctly coarser texture than some surrounding lands.
	037	Upper Savery Drainage	13.5	B	3,309	1.5	A mostly open area with gentle, rolling hills and distinctive drainages. Lush sagebrush/grass vegetation with pockets of aspen, willows, and meadows.
	038	Middlewood Hill	13.0	B	34,383	15	Complex topography: rims and associated steep slopes, drainages, and small perennial and intermittent streams intermingled with sagebrush, grass, patches of aspen, and mixed aspen/conifers. Narrow riparian areas with willows, meadows.
	039	Sage Creek	9.0	C	52,448	24	A large landscape that lies between Bolton Rim on the north and the foothills of the Sierra Madre Mountains in the south. Low vegetative cover gives the area a light color.

Source: AECOM; Otak, Inc. 2011.

Landforms in the Chokecherry site are characteristic of the Wyoming Basin Physiographic Province, with flat lands, flat topped mesas, tall buttes, and rocky outcrops (Fenneman 1931). This portion of the analysis area is primarily open grasslands and scrub vegetation with limited development, providing wide open spaces with panoramic vistas to the south, east, and west. Industrial development in and around Sinclair and Rawlins, where visible, attracts attention. Development in the Chokecherry site consists primarily of communication structures such as cellular telephone towers and meteorological data gathering towers. Most of these structures are located on Chokecherry Knob at an elevation of approximately 8,131 feet. There also are several private dirt roads in use by TOTCO.

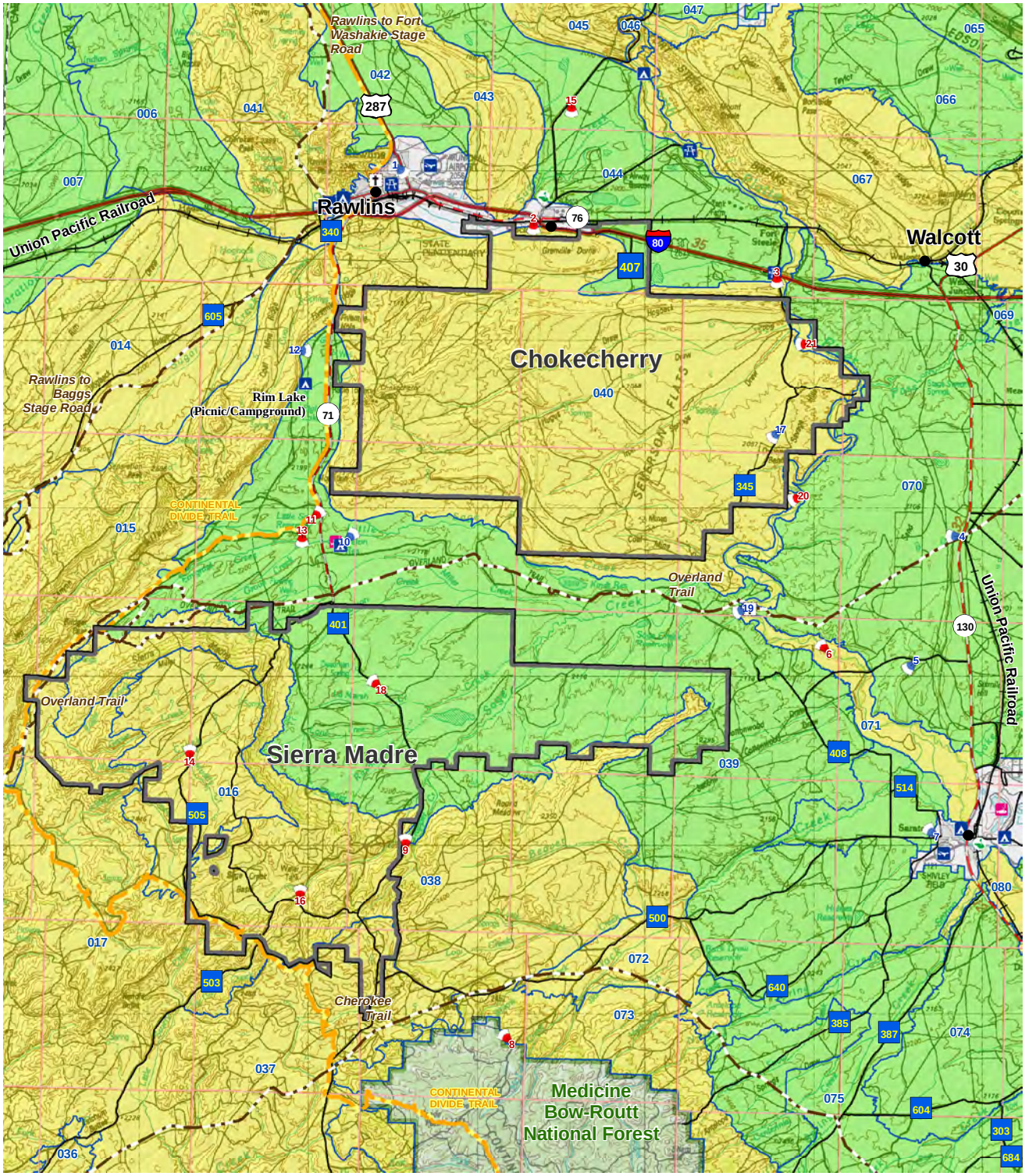
The forms, lines, colors, and textures of the North Platte River and numerous small drainages also dissect the landscape and add diversity and visual appeal to the Chokecherry site. The eastern portion of the Chokecherry site slopes toward the North Platte River, and views of its river bluffs and serpentine riparian canopy attract attention. The eastern valley associated with the North Platte River has a wide flat floor with broad floodplains bordered in some areas by wide belts of flat-topped, steep-sided buttes that rise sharply above the surrounding plains. Views in the warmer months are dominated by scrubby, low-growing gray-green vegetation, distant mountains, and deep blue skies. Views in the colder, winter months are dominated by a gray to brown apparently lifeless foreground with snow packed peaks in the background and clear blue skies. Industrial development in the Sinclair and Rawlins vicinity are the only major sources of night lighting. Often in the winter months, the fore and middle grounds are snow covered, providing a bright, white color dominating the landscape (BLM 1995). The VRI rated the majority of the Chokecherry site as Class B, or moderate scenic quality, as shown on **Figure 3.12-4**.

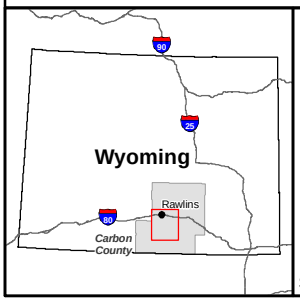
The Sierra Madre site transitions from the Wyoming Basin Physiographic Province to the Southern Rocky Mountains Physiographic Province. Landforms in the southern Sierra Madre site are more varied and striking in appearance with undulating hills, flat topped mesas, low valleys, and canyon-like slopes in the foreground and middlegrounds, with higher elevation mountain peaks to the south and east in the background. Miller Hill, a semi-circular plateau, is the dominant landform and aspen and conifer stands accentuate its visual interest. The Sierra Madre site is natural and primarily undeveloped, providing wide open spaces with panoramic vistas and scenic views in each direction. Development in this area consists primarily of ranching infrastructure (dirt roads, fences). A limited number of communication and meteorological towers, and a few private structures may be visible at times but do not attract attention. The Rawlins Reservoir and water storage reservoirs are present in the low lying Sage Creek Basin and attract attention against the arid saltbrush vegetation. Views in the warmer months are dominated by, low-growing gray-green vegetation, isolated aspen and conifer stands, distant mountains, and deep blue skies. Views in the colder, winter months are dominated by a green and yellow foreground with snow packed peaks in the background and clear blue skies. There are no major night light sources in the Sierra Madre site. Often in the winter months, the foreground-middleground is snow covered, providing a bright, white color that dominates the landscape (BLM 1995). Greater diversity in landform and vegetation occurs with increasing elevation and on the more rugged terrain of Miller Hill and Sage Creek Flat in the Sierra Madre site, which were rated as Class B, or moderate scenic quality, in the VRI. The remainder of the site was rated as Class C, or low scenic quality, as shown on **Figure 3.12-4**.

3.12.3.3 Visibility and Distance Zones

Field reconnaissance, public and agency scoping, and literature review identified 21 KOPs. KOPs are points on a travel route or at a use area or potential use area where the view of a management activity would be most revealing, and include special landscape features, populated areas, historic points, and recreational trails as shown in **Table 3.12-4** and **Figure 3.12-3**. Existing conditions photography was collected for each KOP using a digital single-lens reflex camera at a 50 millimeter equivalent.

In varying degrees, parts of the Application Area are visible from WY 71/ CCR 401, WY 130, and I-80. WY 71/CCR 401 is an important access road for recreationists utilizing developed BLM recreation facilities, for hunting on BLM lands, and to the Medicine Bow National Forest. WY 71/CCR 401 also is a primary travel corridor for auto touring. WY 130 is the primary access road to the Town of Saratoga and for recreationists accessing the North Platte River and other BLM lands and the Medicine Bow National Forest for hunting and other recreational activities.





Legend

- Airport
- Cemetery
- Park or Rest Area
- Golf Course
- Fishing
- Campground
- Key Observation Point
- Key Observation Point (With Photo Simulation)
- Continental Divide Trail
- Historic Trail
- Application Area
- National Forest

Visual Resource Inventory Scenic Quality Rating

- Class A
- Class B
- Class C
- Scenic Quality Rating Unit

Source: Otak, Inc. 2011

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-4

VRI Scenic Quality Rating Units

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

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Table 3.12-4 Key Observation Points

KOP #	Location	Heading
1	Rawlins Recreation Center	SE
2	Sinclair I-80 Overpass	S
3	I-80 Fort Steele Rest Stop	S
4	SH 130 at Overland Trail Historical Marker	W
5	Access Road to Pick Bridge Public Access Area	SW
6	Sanger Public Access Area	NW
7	West of Saratoga – CR 500	W
8	Forest Service Road 542 at USFS Boundary	NW
9	CR 71 – Kendt Reservoir Overlook	N
10	Teton Reservoir Campground	NE
11	CDNST towards Chokecherry	NE
12	CDNST above Rim Lake	E
13	CR 3301 – Bridger Pass Road along CDNST	S
14	CR 505 – Edge of VRM II Boundary on Miller Hill	N
15	Seminoe to Alcove Scenic Byway BLM Kiosk	S
16	Access Road – Homes in Sage Creek Basin	N
17	CR 345 SW Savage Hills	SW
18	SH 71 Near La Marsh Creek	NW
19	Overland Trail Crossing North Platte River	SW
20	Cherokee Historic Trail Crossing	SW
21	Rochelle Recreation Area, 3.5 Miles South of Fort Steele	W

High to very high visibility is a defining characteristic of the region. Generally, the vast, open nature of the analysis area provides for wide and distant vistas. To the west of the analysis area lies the Atlantic Rim, one of the more distinctive landforms in the area. Panoramic views are seen from the crest of the Atlantic Rim, one of the highest points in the analysis area. Bridger Pass and the Continental Divide, as the highest ridgelines along the southwest, west, and north portions of the Sierra Madre site, screen the majority of westward views. The Grenville Dome, a linear geologic ridgeline, is situated adjacent to I-80 on the north side of Chokecherry. The Grenville Dome and Hogback Ridge that run parallel to I-80 for 13 miles from the WY 130 interchange to Sinclair screen background views from I-80, Fort Steele, and the Town of Sinclair when looking south into the Application Area. From Sinclair and Rawlins, the northern half of the Chokecherry site is visible, especially north-facing slopes.

Field reconnaissance and ground-level viewshed analysis indicate that the majority of the ground surface has low to moderate visibility from major roads and KOPs, with many areas that are seldom seen (**Figure 3.12-5**). A turbine-level viewshed analysis, however, identifies large areas where a wind turbine generator (assumed height to nacelle of 100 m) would be moderately to highly visible from major roads and KOPs (**Figure 3.12-6**).

Because of the hogback terrain and low vegetation in the Chokecherry site and the prominent ridgeline and flat top of Miller Hill in the Sierra Madre site, vertical structures above the horizon line can be visible at great distances. The horizon is a significant aspect of all distant views and observers can generally discern individual skylined features such as communication towers and transmission poles that extend above the horizon beyond 5 miles, depending on atmospheric conditions. Communication towers and transmission poles below the horizon line typically are not readily discernible beyond 3 miles, as they blend with the forms, lines, colors, or textures of the background.

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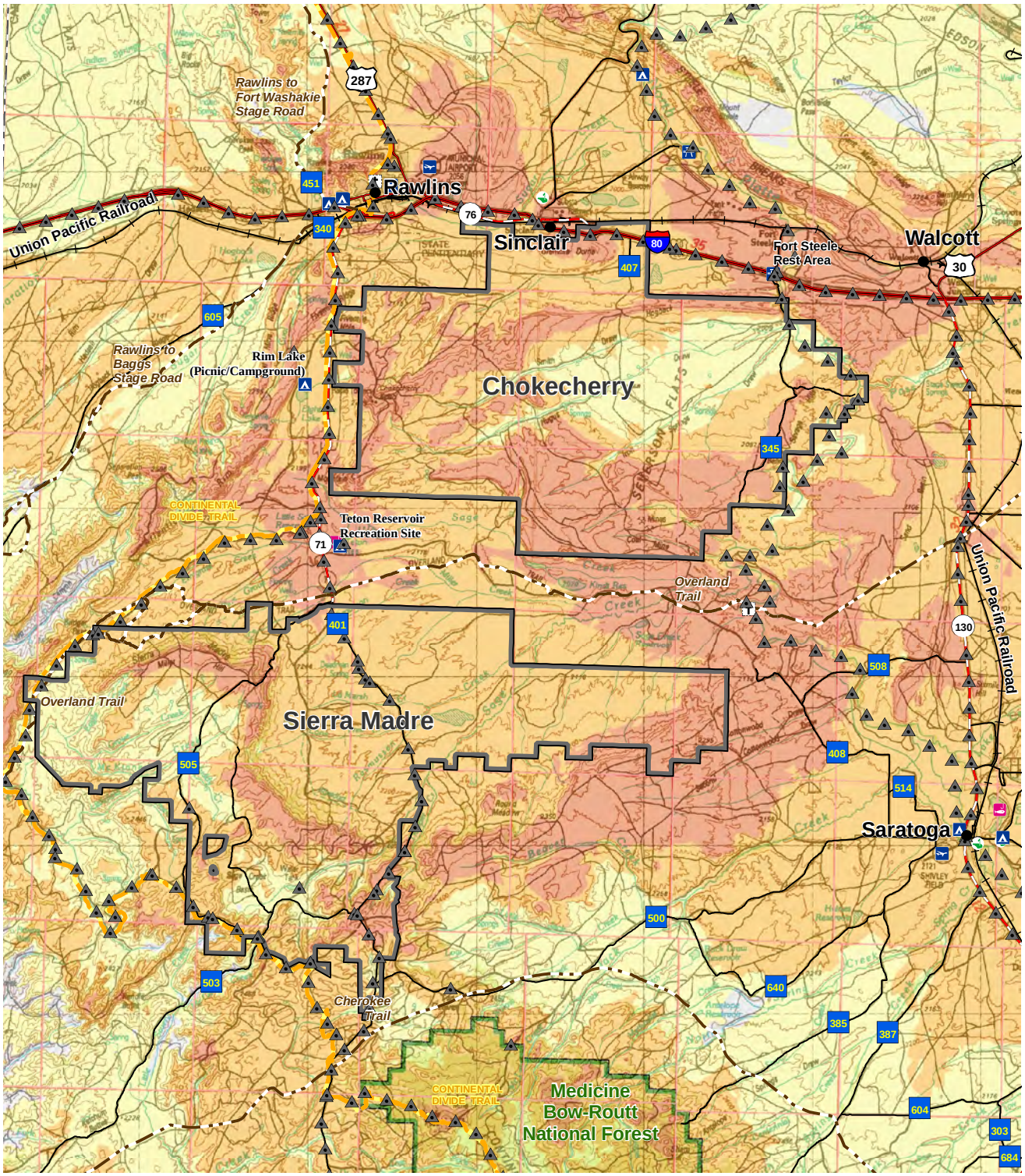
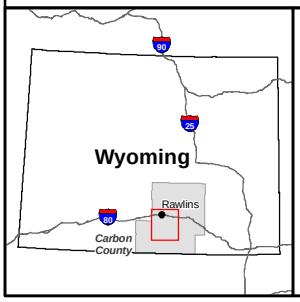




Legend

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- Model Observation Point
- National Forest

Ground Level Visibility

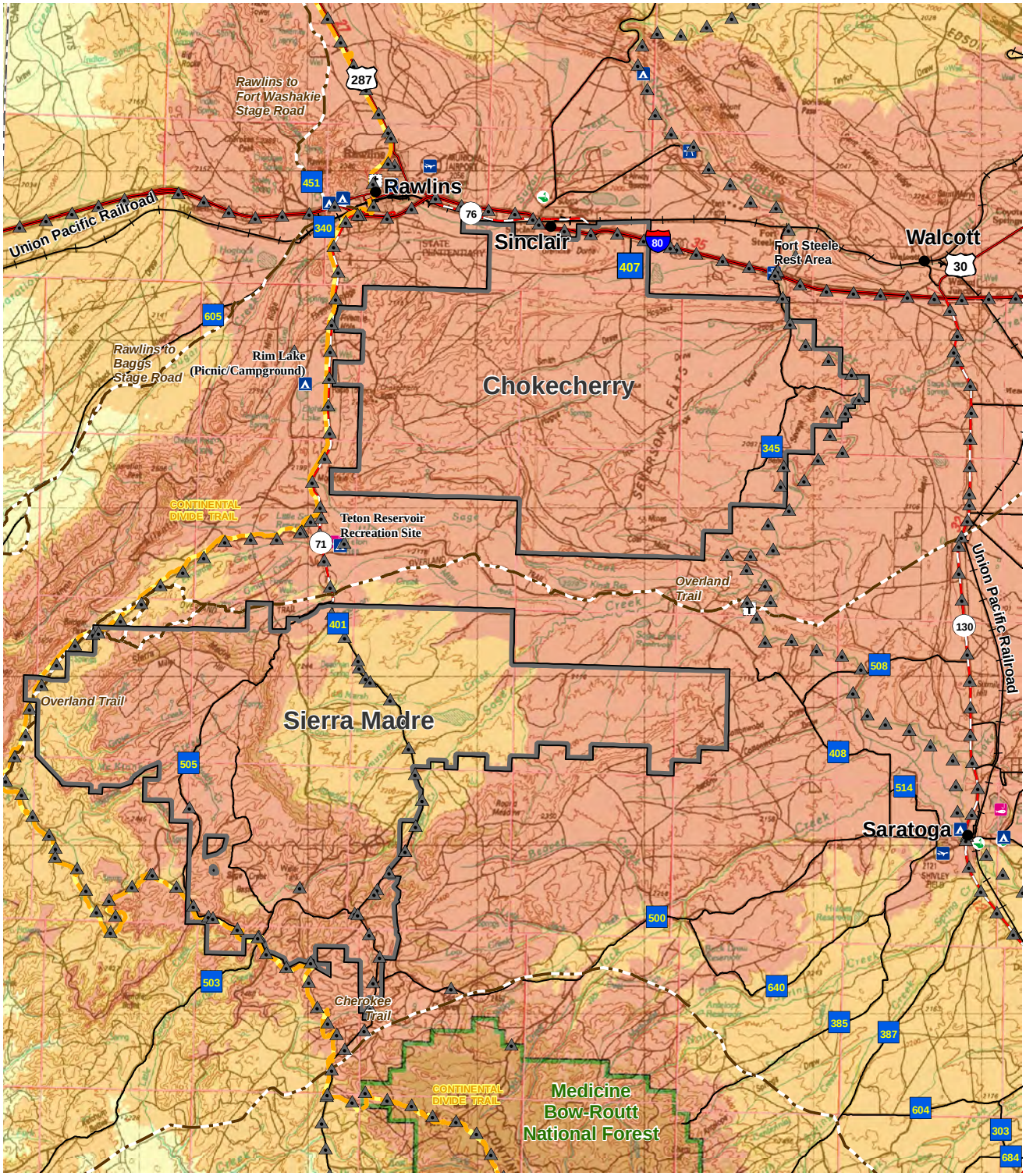
- High
- Medium
- Low

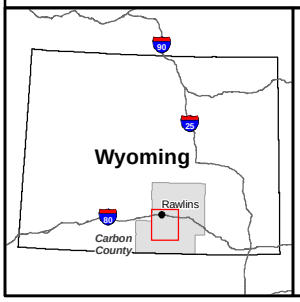
Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-5

Ground-Level Viewshed Analysis

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N





Legend

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- Model Observation Point
- National Forest

Turbine Visibility Based on 100 m Turbine

- High
- Medium
- Low

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.12-6

Turbine-Level Viewshed Analysis (100m or 328ft)

0 1 2 4 Miles
0 2 4 8 Kilometers
1:350,000
N

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3.13 Water Resources

3.13.1 Surface Water Resources

The Application Area falls within two water resource regions, as identified by their major river systems: the Missouri River Region and the Upper Colorado River Region (Seaber et al. 1994). These two regions are on opposite sides of the Continental Divide; the Missouri River drains to the east and ultimately the Gulf of Mexico (Atlantic Ocean). The Upper Colorado River drains to the west toward the Pacific Ocean. The Chokecherry site falls entirely within the Missouri River Region, and all but the western-most portion of the Sierra Madre site falls in the same. Only the western-most portion of the Sierra Madre site, including Miller Hill, falls within the Upper Colorado River Region. See **Figure 3.13-1** for a depiction of the Application Area and related surface water resources.

The dominant sources of precipitation in the area are winter and early spring snow storms; however late spring or early summer convective thunderstorms also contribute significant amounts of moisture. Precipitation amounts are affected by both meteorological and topographical conditions. Air masses that are forced to rise over higher elevation features by prevailing winds are cooled by the increased elevation, in turn causing condensation and an increase in precipitation in areas such as along the Continental Divide. Downwind, down-sloping sides of these topographic features and any adjacent low-lying areas do not receive the same amount of precipitation and are said to be within the rain-shadow. Average annual precipitation has been measured for up to 21 years at seven meteorological stations near the Application Area. The stations range in elevation from approximately 6,500 feet amsl near Sinclair to 7,635 feet amsl in the southern portion of the Sierra Madre Area and report annual averages from 6.2 inches to 14.3 inches (BLM 2008e). Bartos et al. (2006) estimates mean annual precipitation from 1961 to 1990 in the Application Area with a range from 8.1 to 10 inches in the North Platte River valley near the northeastern corner of the Bolten Area to 22.1 to 32 inches in the higher elevations of the Miller Hill and Sierra Madre areas that approach 8,500 feet amsl along the Continental Divide. The majority of the precipitation in the Upper North Platte basin and surrounding area occurs in April and May (Curtis and Grimes 2004).

The Analysis Area considered for water resources is defined as all 6th order, 12-digit Hydrologic Unit Code (HUC-12) Sub-watersheds, as delineated by the University of Wyoming (Berelson et al. 2001), that have a portion of the Application Area included within its boundary. The sub-watersheds assessed in this section are depicted on **Figure 3.13-1** and listed in **Table 3.13-1**. The total area encompassed by these sub-watersheds is approximately 640,000 acres, or 1,000 miles^2.

Although every sub-watershed listed contains a portion of the Application Area, a major portion of this area will be located within Hugus Draw, with large portions in Upper Sage Creek-North Platte River, McKinney Creek, and Rassmussen Creek sub-watersheds. **Table 3.13-2** provides a tabulation of the Application Area within each sub-watershed as depicted on **Figure 3.13-1**.

Streamflow in the Water Resources Analysis Area is dominated by snowmelt from higher elevations during the spring months. Other weather systems during the summer, fall, and winter, such as convective thunderstorms and frontal pressure systems may produce increases in discharge which are generally short in duration. This runoff regime is characterized by a great variance in streamflow throughout the year. The spring runoff brings high flows that often times will overtop stream banks. Peak runoff of snowmelt is generally encountered in April or May in the smaller streams with headwaters in the study area. The North Platte River typically attains average peak runoff a month later in May or June due to the fact that its headwaters and contributing area extends to higher elevation areas such as the Sierra Madre, Park, Rabbit Ears, Never-Summer, Medicine Bow, and Snowy mountain ranges, thus delaying the snowmelt and ensuing runoff. During late summer, fall, and winter, periods of very low flows are typical. Often the smaller streams in the area are dry for large portions of this time. **Table 3.13-3** lists statistics for several USGS stream gages near the Application Area (USGS 2010). **Figure 3.13-1** illustrates the locations of USGS stream gages.

Table 3.13-1 Sub-watershed Hydrologic Units Assessed as Project Study Area

Region	Sub-region	Basin	Sub-basin	Watershed	Sub-watershed Name	HUC-12 Code
Missouri	North Platte	North Platte	Upper North Platte	North Platte River-Cow Creek	North Platte River-First Cottonwood Draw	101800020607
				Jack Creek	Little Jack Creek	101800020802
				Sage Creek	Upper Sage Creek-North Platte River	101800020901
					Rasmussen Creek	101800020902
					Lower Sage Creek-Upper North Platte River	101800020903
					Miller Creek	101800020904
					Upper Little Sage Creek	101800020905
					Lower Little Sage Creek	101800020906
				North Platte River-Iron Springs Draw	North Platte River-Coal Mine Draw	101800021001
					North Platte River-Lost Springs Draw	101800021002
					Iron Springs Draw	101800021003
					Hugus Draw	101800021004
					Grenville Dome	101800021005
				Pass Creek	Pass Creek-Stage Station Springs	101800021105
				Sugar Creek	Middle Sugar Creek	101800021302
					Lower Sugar Creek	101800021303
					101800021304[1]	101800021304
Upper Colorado	White-Yampa	White-Yampa	Muddy	Savery Creek	North Fork Savery Creek	140500030404
					Little Savery Creek	140500030405
			Little Snake	Upper Muddy Creek	Muddy Creek-Littlefield Creek	140500040101
					McKinney Creek	140500040102

[1] Some 12-digit Sub-watersheds (hydrologic units (HUs) were assigned the HUC-12 number when no Geographic Names Information System (GNIS) name was identified on DRG-Es.

Source: Wyoming Geographic Information System Center (WGISC) 2002.

Table 3.13-2 Application Area Within Sub-watersheds

Sub-watershed	Application Area (acres)		
	Chokecherry	Sierra Madre	Total
North Platte River-First Cottonwood Draw	-	6,162	6,162
Little Jack Creek	-	8	8
Upper Sage Creek-North Platte River	-	28,140	28,140
Rasmussen Creek	-	23,140	23,140
Lower Sage Creek-Upper North Platte River	-	8,224	8,224
Miller Creek	-	15,091	15,091
Upper Little Sage Creek	818	2,540	3,358
Lower Little Sage Creek	5,718	-	5,718
North Platte River-Coal Mine Draw	15,215	-	15,215
North Platte River-Lost Springs Draw	3,347	-	3,347
Iron Springs Draw	18,851	-	18,851
Hugus Draw	35,332	-	35,332
Grenville Dome	13,669	-	13,669
Pass Creek-Stage Station Springs	53	-	53
Middle Sugar Creek	3,615	-	3,615
Lower Sugar Creek	1,733	-	1,733
101800021304 (Sugar Creek)[1]	7,069	-	7,069
North Fork Savery Creek	-	3,380	3,380
Little Savery Creek	-	1,178	1,178
Muddy Creek-Littlefield Creek	-	2,876	2,876
McKinney Creek	-	26,531	26,531
Totals[2]	105,420	117,270	222,690

[1] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRG-Es. The name in parentheses indicates the 10-digit hydrologic unit code (HUC-10) name.

[2] Discrepancies in total acreage due to rounding.

Figure 3.13-2 represents the timing of peak and low flows through the average monthly hydrographs for the reported gages near the Application Area. The actual average monthly values for the North Platte River were reduced by one order of magnitude to facilitate the direct graphic comparison of timing between the large river and the smaller streams in the area.

Table 3.13-3 Streamflow Summaries from USGS Gages Near Application Area

Gage Name	Record Period/No. of Years	Flow Range (cubic feet per second [cfs])[1]	Typical Flows (cfs)[1]	Peak Flow Months[2]	Low Flow Months[2]
North Platte River above Seminoe Reservoir, near Sinclair, Wyoming	1939 - 2010/ 72	15,700 - 37	1,120	May - Jun	Sep – Feb
Savery Creek near Savery, Wyoming	1941 - 1992/38[3]	2,440 - 0	106	Apr - Jun	Aug – Jan
Sage Creek near Saratoga, Wyoming[4]	1973 - 1981/8	700 - 0	24	Apr - Jun	Sep - n.d.[5]
Muddy Creek Below Young Draw, near Baggs, Wyoming	2004 - 2010/ 7	499 - 0.07	18	Mar - May	Jul – Dec
Muddy Creek above Olson Draw, near Dad, Wyoming[6]	2010/ <1	23 - 3.5	7	n.d.	n.d.
Coal Creek near Rawlins, Wyoming[7]	1959 - 1981/22	436 - n.d.	n.d.	n.d.	n.d.

[1] Data summarized from USGS daily mean calculations.

[2] Data summarized from USGS monthly mean calculations.

[3] No data is available for Oct-71 through Mar-72 and Oct-72 through Mar-85.

[4] Data summarized is for Apr-Sep only. No data is available for Oct-Mar.

[5] n.d. = No/not enough data available.

[6] New gage installed July 2010, short data record.

[7] Only peak flow data was collected.

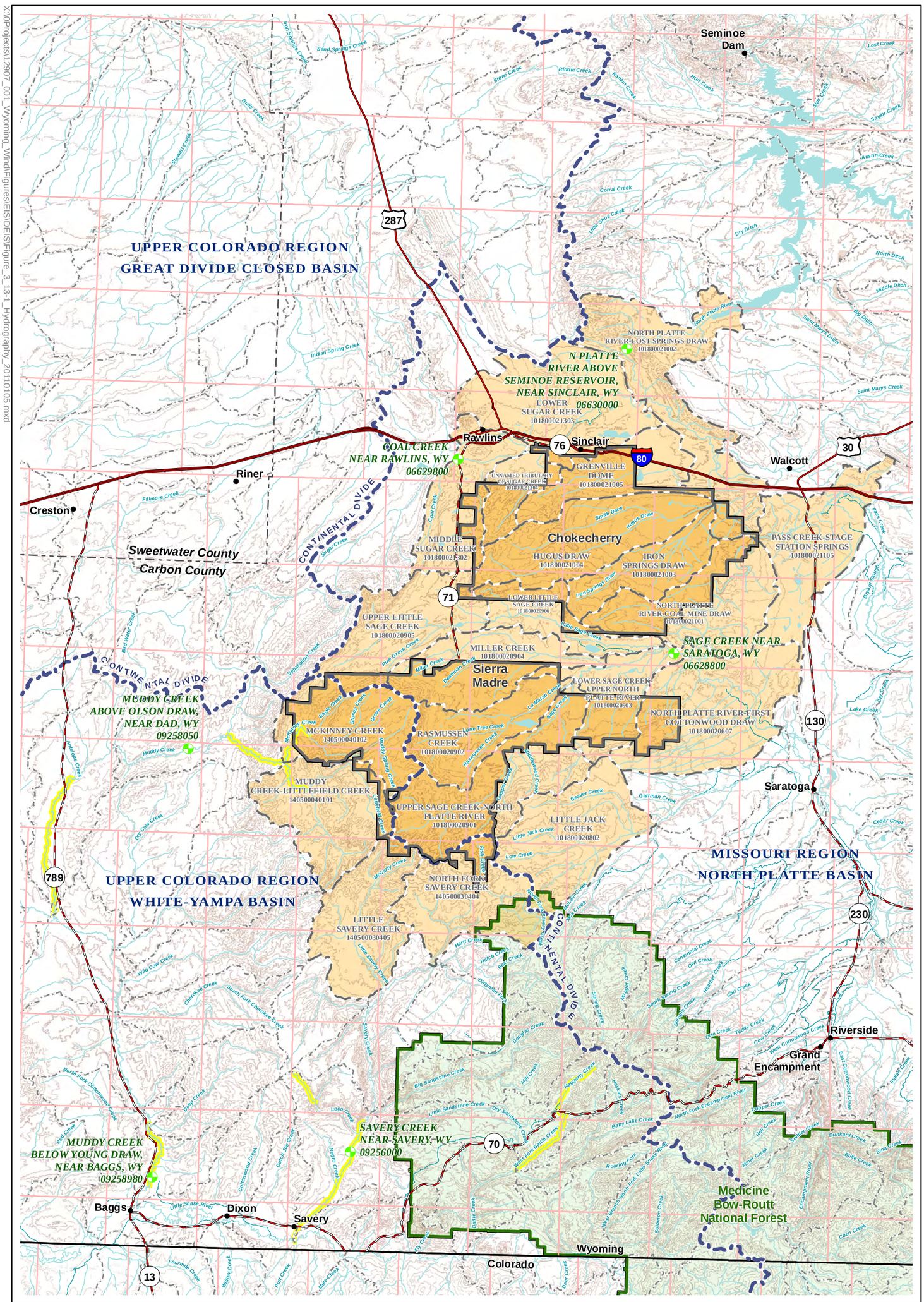
Source: USGS 2010.

3.13.2 Surface Water Quality

The CWA, Section 303(c), requires each state to review, establish, and revise water quality standards for all surface waters within the state. To comply with this requirement, Wyoming has developed a beneficial use classification system to describe state-designated use(s). Regulatory programs for water quality standards include default narrative standards, non-degradation provisions, a total maximum daily load regulatory process for impaired waters, and associated minimum water quality requirements for the designated uses of listed surface waterbodies within the state.

Surface water use classifications as set by WDEQ (2001) and which are present in the Application Area are as follows:

- 1 – Outstanding waters - water quality, physical, and biological integrity which existed at the time of designation will be maintained and protected. Uses include drinking water, cold water game fish, non-game fish, fish consumption, other aquatic life, recreation, wildlife, agriculture, industry, and scenic value;
- 2AB – Drinking water, cold water game fish, non-game fish, fish consumption, other aquatic life, recreation, wildlife, agriculture, industry, scenic value;



Chokecherry and Sierra Madre Wind Energy Project

Figure 3.13-1

Sub-Watershed Hydrologic Units

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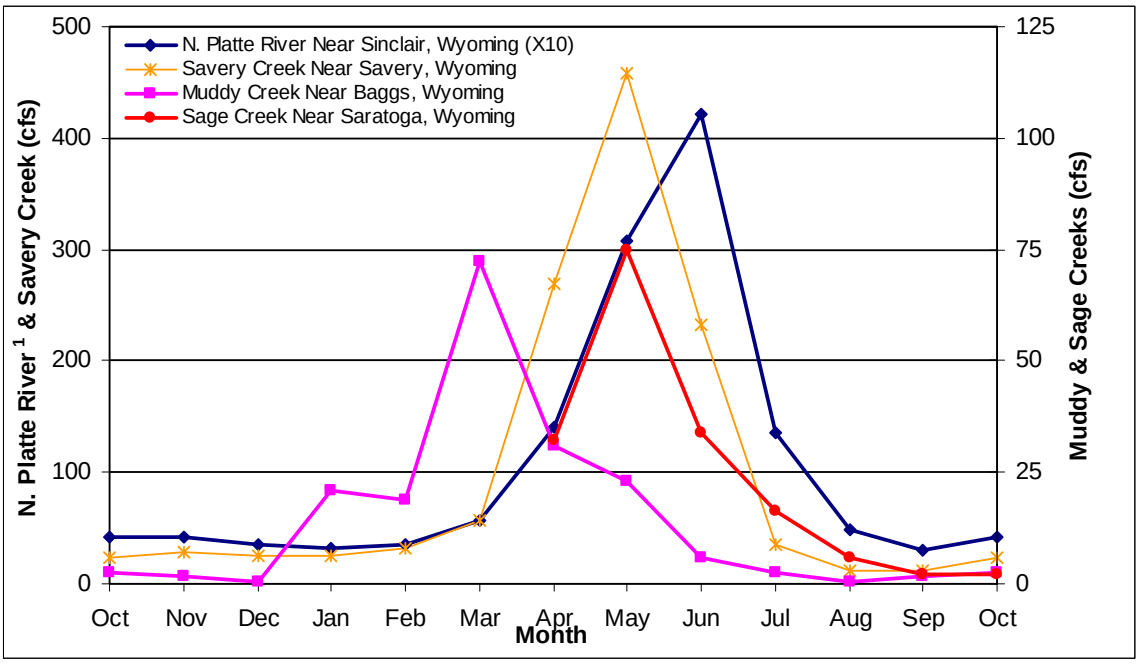

North Platte River discharge (cfs) has been divided by a factor of 10 to fit the scale. The Average Monthly Discharge shown for the North Platte River should be multiplied by 10 for actual value.

Source: USGS 2010.

Figure 3.13-2 Average Monthly Streamflow of USGS Gaged Streams near Application Area

- 2C – Non-game fish, fish consumption, other aquatic life, recreation, wildlife, agriculture, industry, scenic value; and
- 3B – Other aquatic life, recreation, wildlife, agriculture, industry, scenic value.

Table 3.13-4 is a tabulation of all waterbodies within the Water Resources Analysis Area that are named either in the NHD or in the WDEQ Wyoming Surface Water Classifications (WDEQ 2001). Several of the waterbodies named in the NHD have not been classified by the WDEQ, and are noted within the table as having no classification. Many of the streams in the Application Area have reaches with different flow regimes (e.g., perennial and ephemeral). If any reach of a stream within the subwatershed and Application Area is perennial then the stream is listed as perennial in the table. If all reaches of a stream are ephemeral within the Application Area then the stream is listed as ephemeral in the table. As a result many of the perennial streams listed in the table also have ephemeral reaches within the Application Area.

Section 303(d) of the CWA also requires states to list all streams that do not meet their water use classifications, and are therefore considered impaired streams. One waterbody within the Application Area is currently listed by the State of Wyoming as a threatened stream: McKinney Creek. There are several other stream segments within the Water Resources Analysis Area or downstream from the Sierra Madre site which are listed as having their assigned uses threatened or not supported (WDEQ 2010). **Table 3.13-5** details threatened or not supported stream segments and **Figure 3.13-1** depicts the stream segments within the Water Resources Analysis Area. There is one stream (Sage Creek) in the Water Resources Analysis Area that was de-listed from the impaired waters list in 2008.

Table 3.13-4 Named Waterbodies Within Application Area

Sub-Watershed Name	Waterbody Name	Flow Regime of Stream/River, Reservoir or Lake	State Water Quality Classification[1]
North Platte River-First Cottonwood Draw	North Platte River	Perennial Stream/River	1
	Seaverson Reservoir	Perennial Reservoir	-
Little Jack Creek	Beaver Creek[2]	Perennial Stream/River	2AB
	Little Jack Creek[2]	Perennial Stream/River	2AB
	Low Creek[2]	Ephemeral Stream/River	2AB
	Spring Creek	Ephemeral Stream/River	2AB
	Willow Creek[2]	Ephemeral Stream/River	2AB
	Low Reservoir	Perennial Reservoir	-
Upper Sage Creek-North Platte River	Sage Creek	Perennial Stream/River	2AB
	Middlewood Creek[2]	Perennial Stream/River	3B
	Trapper Creek[2]	Perennial Stream/River	2C
	Rawlins Reservoir	Perennial Reservoir	-
	Adams Reservoir[2]	Perennial Reservoir	2AB
Rasmussen Creek	Rasmussen Creek	Ephemeral Stream/River	3B
	Lone Tree Creek[2]	Ephemeral Stream/River	3B
	La Marsh Creek[2]	Ephemeral Stream/River	3B
Lower Sage Creek-Upper North Platte River	Sage Creek	Perennial Stream/River	2AB
Miller Creek	Deadman Creek[2]	Ephemeral Stream/River	3B
	Miller Creek	Perennial Stream/River	2C
Upper Little Sage Creek	Emigrant Creek	Perennial Stream/River	-
	Little Sage Creek	Perennial Stream/River	2C
	Pine Grove Creek	Ephemeral Stream/River	-
	Miller Hill Lake[2]	Perennial Lake/Pond	2AB
	Little Sage Creek Dam	Perennial Reservoir	-
	Teton Reservoir[2]	Perennial Reservoir	2AB
Lower Little Sage Creek	Little Sage Creek	Ephemeral Stream/River	2C
North Platte River-Coal Mine Draw	North Platte River	Perennial Stream/River	2AB
North Platte River-Lost Springs Draw	North Platte River	Perennial Stream/River	2AB
	Seminoe Reservoir	Perennial Reservoir	2AB
Iron Springs Draw	Iron Springs Draw	Perennial Stream/River	3B
	Johnston Number 2 Reservoir	Ephemeral Lake/Pond	-

Table 3.13-4 Named Waterbodies Within Application Area

Sub-Watershed Name	Waterbody Name	Flow Regime of Stream/River, Reservoir or Lake	State Water Quality Classification[1]
Hugus Draw	Hugus Draw	Ephemeral Stream/River	3B
	Smith Draw	Perennial Stream/River	3B
Grenville Dome	No Named Waterbodies	NA	-
Pass Creek-Stage Station Springs	Pass Creek	Perennial Stream/River	2AB
Middle Sugar Creek	Coal Creek	Ephemeral Stream/River	3B
	Sugar Creek	Perennial Stream/River	3B
	Eightmile Lake	Perennial Lake	-
	Rawlins Peaking Reservoir	Perennial Reservoir	-
Lower Sugar Creek	Sugar Creek	Perennial Stream/River	3B
101800021304 (Sugar Creek)[3]	No Named Waterbodies	NA	-
North Fork Savery Creek	Fish Creek[2]	Perennial Stream/River	2AB
	Mill Creek[2]	Perennial Stream/River	2AB
	North Fork Savery Creek[2]	Perennial Stream/River	2AB
	Truckdrivers Creek[2]	Perennial Stream/River	2AB
	Twin Groves Reservoir	Perennial Reservoir	-
Little Savery Creek	Little Savery Creek	Perennial Stream/River	2AB
	McCarty Creek[2]	Perennial Stream/River	2AB
Muddy Creek-Littlefield Creek	Littlefield Creek[2]	Perennial Stream/River	2AB
	Muddy Creek	Perennial Stream/River	2AB
McKinney Creek	Eagle Creek[2]	Ephemeral Stream/River	3B
	Grove Creek[2]	Perennial Stream/River	2AB
	McKinney Creek	Perennial Stream/River	2AB
	Muddy Spring Creek	Perennial Stream/River	-
	Stoney Creek[2]	Perennial Stream/River	2AB

[1] Streams or waterbodies that have not been classified are indicated by an "-."

[2] Water Quality Classification from Table B (WGFD "Streams and Lake Inventory" database as of June 2000), WDEQ 2001.

[3] Some 12-digit sub-watersheds (HUs) were assigned the HUC-12 number when no GNIS name was identified on the DRG-Es. The name in parentheses indicates the HUC-10 name.

Sources: NHD, WDEQ 2001, and BLM revisions.

Table 3.13-5 Streams Near Application Area with Threatened Designated Uses According to the 2010 Wyoming 303(d) List

Stream Name	Reach Location	Distance from Sierra Madre Site	Uses	Use Support	Cause	Source
McKinney Creek	From Muddy Creek upstream to Eagle Creek	Reach begins within Sierra Madre	Aquatic Life, Cold Water Fish	Threatened	Habitat	Grazing
Muddy Creek	From Alamosa Gulch upstream to Littlefield Creek	Approximately 5 miles downstream on Littlefield Creek	Aquatic Life, Cold Water Fish	Threatened	Habitat	Grazing
Muddy Creek	From below Young Draw upstream to Deep Creek	Greater than 75 miles down Muddy Creek tributaries	Aquatic Life	Not Supporting	Selenium, Chloride	Unknown
Muddy Creek	West of State Hwy 789	Greater than 30 miles down Muddy Creek tributaries	Aquatic Life, Non-game Fish	Threatened	Habitat	Grazing
Savery Creek	From Little Sandstone Creek downstream to Little Snake River	Approximately 23 miles downstream on Little Savery Creek	Aquatic Life, Cold Water Fish	Threatened	Habitat	Grazing

Source: WDEQ 2010.

The McKinney Creek and Upper Muddy Creek-Littlefield Creek sub-watersheds contain stream reaches listed as threatened for their aquatic life and cold water fish uses within and downstream from the Sierra Madre site. These are reaches of McKinney Creek and Muddy Creek. Two additional reaches of Muddy Creek not within the above-mentioned sub-watersheds, but downstream of these are threatened for aquatic life and one of the two for non-game fish use. Section 3.13.2.1 addresses the management of these sub-watersheds within the Upper Muddy Creek watershed.

Also downstream of the Sierra Madre site, approximately 23 miles from the Application Area, Savery Creek is threatened for its aquatic life and cold water fish uses. In all the above cases, the cause of the impairment listing is degradation to aquatic and riparian habitat due to unstable stream channels and loss of riparian function mainly from grazing of stock animals in or near these waterways.

Sage Creek flows through the Upper Sage Creek sub-watershed, which is located between the CCSM sites, and borders the southeastern portions of the Sierra Madre site. This creek was removed from WDEQs impaired or threatened waters list in 2008. It had previously been listed due to high sediment loads, but was delisted after a weight-of-evidence analysis indicated there are no impairments or threats to its designated uses (WDEQ 2010).

Another measure of waterway health is through the BLM's Standards and Guidelines Assessments, which include four fundamental principles: 1) watersheds are functioning properly; 2) water, nutrients, and energy are cycling properly; 3) water quality meets State standards; and 4) habitat for special status species is protected (BLM 2009b). See Section 3.6.4, Range Resources, for further details.

3.13.2.1 Special Management Areas

There have been two efforts for watershed improvement with funding through Section 319 of the CWA that have areas overlapping the Application Area. The Upper Muddy Creek watershed and Sage Creek watershed have both had very similar improvement efforts. These efforts have been undertaken by federal and state land managers and agencies, private landowners, and other stakeholders in cooperation to establish BMP's within the watersheds to improve the conditions of the uplands, riparian areas, and waterways. Cooperators in the Application Area include the BLM, NRCS, SERCD, LSRCD, University of Wyoming, WDEQ, WGFD, and TOTCO, among others. Examples of BMPs that have been implemented include modifying grazing distribution, controlling riparian area grazing, cross fencing, off-stream stock tanks, improvements to road-stream crossings, road closures, road drainage improvements, and prescribed burns.

The Upper Muddy Creek watershed improvement project includes the Muddy Creek-Littlefield Creek Basin and the McKinney Creek Basin sub-watersheds within the Analysis Area. Documented reductions of total dissolved solids and increases in macroinvertebrate total taxa have occurred in the Upper Muddy Creek watershed. These changes have been correlated to stabilization of stream channels and increased riparian vegetation densities through cooperative BMP development, implementation and monitoring (Ellison et al. 2009).

The Sage Creek watershed improvement project includes the Upper Sage Creek-North Platte River, Lower Sage Creek-Upper North Platte River, Upper Little Sage Creek, Lower Little Sage Creek, Miller Creek, and Rasmussen Creek sub-watersheds within the Analysis Area. The cooperative BMP development, implementation, and monitoring were factors in the delisting of Sage Creek from the Wyoming threatened and impaired waters list.

3.13.3 Surface Water Use

Water use in the state of Wyoming is managed by the WSEO. The North Platte River basin's water resources are highly appropriated and have special conditions restricting new uses of water according to stipulations of the Nebraska v. Wyoming Modified North Platte Decree and the Platte River Cooperative Agreement (U.S. Supreme Court 2001). Water in the North Platte Basin has been fully appropriated, and these agreements effectively prevent the development of new uses with the exception of stock, domestic, and municipal uses.

Adjudicated water uses within the Application Area consist mainly of diversions for reservoir supply for the City of Rawlins, municipal supply for the City of Rawlins and the Town of Parco (Sinclair), and for stock watering use. Irrigation, domestic, miscellaneous, recreation and fish propagation are all adjudicated uses within the area (WSEO 2008a).

3.13.4 Floodplains

The Federal Emergency Management Agency (FEMA) has delineated 100-year floodplains throughout the U.S. with its Flood Insurance Rate Maps (FIRMs). FIRMs were available for portions of the Application Area. The northern and eastern areas of the Application Area near the local population centers of Rawlins, Sinclair, and Saratoga had FIRM panels available for review. These maps covered from approximately T20N to the north and from approximately R85W to the east. The remainder of the area is covered only by the FIRM Index Map for Carbon County, Wyoming, which states that the areas without detailed panels are of undetermined flood hazard (FEMA 1987).

In the portion of the area where detailed FIRM panels were reviewed, there is a 100-year floodplain associated with the North Platte River, generally existing within 100 feet of the river channel and extending up to 0.5 mile between bends in the river. Hugus Draw has a 100-year floodplain that extends approximately 2 miles upstream from its confluence with the North Platte River. Near the Town of

Sinclair, the channel of Sugar Creek and several low-lying playas also were identified as 100-year floodplains. These are all within the northern area of the Chokecherry site.

3.13.5 Groundwater

The Application Area is located within the Rocky Mountain Physiographic Region. The Application Area is not directly underlain by a principal aquifer; however Upper Tertiary and Upper Cretaceous aquifers underlie portions of the area (Whitehead 1996). These aquifers are generally separated by shale and siltstone confining units that may act as aquitards if thick enough (Wyoming Water Resources Center [WWRC] 1998). No major alluvial aquifer systems are located near the Application Area. The North Platte River does have an associated major alluvial aquifer downstream near Casper, but it is not present in the Application Area (Zimmerman 1984). Depth to initial groundwater across the Application Area is estimated as ranging from a minimum of under 10 feet along several of the watercourses to a maximum of 50 to 200 feet in the northwestern portion of the Chokecherry site (WWRC 1998).

The Upper Tertiary aquifers generally consist of unconsolidated to semi-consolidated deposits of sand and gravel that may be interbedded with silt and clay layers. The materials composing the Upper Tertiary aquifers in central Wyoming are mostly of the Pliocene or Miocene age deposited by alluvial processes as fill in structural basins surrounded by mountains (Whitehead 1996). These formations are generally known as the North Park-Browns Park-South Pass aquifer systems in this area. They overlie the Upper Cretaceous aquifers (WWRC 1998), and are the surficial and near-surface aquifers in the higher elevations within the Application Area. These aquifers are likely encountered in the southern portions of the Sierra Madre site.

The Upper Cretaceous aquifers consist of sandstone with interbedded shale, siltstone, and small amounts of coal. The aquifers are deeply buried for the most part, with localized exposures around the borders of the Lower Tertiary aquifers. The Mesaverde Formation is the principal water-yielding formations (Visher and Durum 1952). These aquifers are located in strata overlain by the Upper Tertiary aquifers (WWRC 1998), and are surficial in the Chokecherry site on bluffs along the North Platte River.

Although no major alluvial aquifer systems are located near the Application Area (Zimmerman 1984), depth to groundwater estimates indicate localized alluvial aquifers exist in areas associated with many of the small drainages within the Application Area (WWRC 1998). These drainages include Iron Springs Draw, Littlefield Creek, Little Sage Creek, McKinney Creek, Sage Creek, and Sugar Creek.

3.13.6 Groundwater Quality

The Upper Tertiary aquifers generally produce water suitable for domestic and livestock use, but may have its uses limited by high sulfate and dissolved solids concentrations exceeding 500 and 9,000 milligrams per liter (mg/L0, respectively (Zimmerman 1984). Freshwater is generally only found near the outcrops of the Upper Cretaceous aquifers, with brine water found at depth (Whitehead 1996). Because of the hydrologic connection between the surface water sources and the alluvial aquifers, the quality of the water within these aquifers is assumed to be similar to that of the surface water.

3.13.7 Groundwater Use

Groundwater use in the state of Wyoming is managed by the WSEO. The North Platte River basin has special conditions restricting new uses of water, including groundwater that is hydrologically connected to surface water. See Section 3.13.3 for further information regarding those restrictions.

The Application Area contains 52 well permits of record filed with the WSEO according to its water rights database (WSEO 2008b). Each of these permits does not necessarily indicate a separate and single well, as many permits are issued as enlargements of existing wells that were previously permitted. All of the well permits of record are for stock water use only, with the exception of 11 permits in the area immediately north and east of Grenville Dome near Sinclair. These 11 wells have permitted uses of

domestic, miscellaneous and monitoring. Reported well depths across the Application Area range from 3 to 515 feet, with reported static depths to water of 0 to 180 feet.

The WSEO has a process in place to protect the historic and current uses of groundwater that are in good standing with the agency. Current groundwater permittees/appropriators can file an interference complaint against other water users as outlined in the WSEO Groundwater Regulations and Instructions (WSEO 1974). These regulations prevent the pumping activity at a well from negatively impacting the pumping of water from nearby wells.

3.14 Wildlife and Fisheries Resources

Information regarding wildlife and fisheries resources was obtained from a variety of sources including existing published and unpublished sources (BLM 2006; NatureServe 2008; Parker and Anderson 2001; WGFD 2008b, 2006, 2005a; Wyoming Natural Diversity Database [WYNDD] 2008) and site-specific field surveys (Western EcoSystems Technology, Inc. [WEST] 2009a,b,c, 2008a-j). These surveys examined the existing use of the Application Area by big game, birds, bats, and special status species. Representative wildlife species that may occur in the vicinity of the project based on the Wyoming Atlas (WGISC 2008) distribution maps and habitat descriptions are listed in **Appendix G**. Special status wildlife and fish species are discussed in Section 3.15, as they require additional consideration with the ESA and BLM Policy (BLM Manual 6840).

3.14.1 Habitat

The Application Area is located in the Wyoming Basin Ecoregion and is dominated by the Inter-Mountain Basins Big Sagebrush Shrubland ecological system (WGFD 2005a), more fully described in Section 3.11, Vegetation, of this document. The WGFD (2005a) evaluated the quality of landscapes (termed habitats in their report) throughout the state primarily based on “habitat intactness,” which considers factors including road density, mine presence, oil and gas pipeline presence, oil and gas well presence, residential development, dams, impaired streams, Hilsenhoff’s Biotic Index score, surface water use, and the occurrence of invasive species. The intent was to provide a comprehensive view of ongoing landscape changes in Wyoming. The Inter-Mountain Basins Big Sagebrush scored high within the Wyoming Basins Ecoregion; however, it was noted that this area scored poorly in regards to how much vegetation type was protected.

The Application Area contains portions of two WHMAs that are managed with specific goals and objectives (**Figure 3.4-2**). The Red Rim-Grizzly WHMA is managed in accordance with a cooperative agreement between the BLM and the WGFD (BLM and WGFC 2010; WGFD and BLM 1993, 1992) to maintain and enhance wildlife habitat conditions in conjunction with livestock grazing. The Red Rim-Grizzly WHMA consists of two distinct areas, the Red Rim area and the Grizzly area. The Application Area includes a portion of the WHMA that is identified as the Grizzly area. Priority wildlife species in the Grizzly area include elk, pronghorn, mule deer, greater sage-grouse, Columbian sharp-tailed grouse, several species of raptors, beaver, and Colorado River cutthroat trout (WGFD and BLM 1993). The Upper Muddy Creek Watershed/Grizzly WHMA was designated in the Rawlins RMP with goals to promote management of habitat for the Colorado River fish species unique to the Muddy Creek watershed and crucial winter habitat for elk and mule deer, as well as to seek cooperation of land owners of adjacent property in the management of the wildlife habitat (BLM 2008b). The Upper Muddy Creek Watershed/Grizzly WHMA overlaps a large portion of the Grizzly area of the Red Rim-Grizzly WHMA.

3.14.2 Wildlife

3.14.2.1 Big Game

Big game species that may be present within the Application Area include mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and pronghorn (*Antilocapra americana*). Big game seasonal ranges were identified across the Application Area (WEST 2008a) using the big game seasonal ranges designated by the WGFD. Range types included winter, winter-yearlong, crucial winter, crucial winter-yearlong, and spring-summer-fall. Winter ranges are areas where animals congregate during winter months (November through April), whereas winter-yearlong ranges are occupied throughout the year, being more heavily used during the winter as resident and migratory animals mix together. Crucial range describes a seasonal range that consistently receives high levels of use and is considered to be a limiting factor in maintaining population objective for a herd unit. Spring-summer-fall ranges are areas used by animals outside the winter months.

Mule Deer

The Application Area overlaps with two Mule Deer Herd Units; the Platte River (Unit #541) and the Baggs (Unit #427). The Platte River Mule Deer Herd Unit is managed for a population of 20,000 mule deer and provides approximately 20,000 hunter recreation days per year and the Baggs Mule Deer Herd Unit is managed for a population of 18,700 mule deer and provides approximately 13,700 hunter recreation days per year (WGFD 2006).The Chokecherry area contains 23,532 acres of crucial winter-yearlong range, 79,433 acres of winter-yearlong range, and 1,824 acres of spring-summer-fall range (**Figure 3.14-1**). The Sierra Madre area includes 107,614 acres of spring-summer-fall range, and 9,324 acres of winter-yearlong range (**Figure 3.14-1**). While the Chokecherry area contains both resident and migratory mule deer, most mule deer in the Sierra Madre area are migratory, and travel 25 to 40 miles to winter ranges along Muddy Creek. Migratory routes of mule deer to and from the Sierra Madre area were recently documented by Sawyer (2007) and Sawyer and Kauffman (2008). These mule deer occupy winter ranges that occur in or adjacent to proposed gas developments in the Atlantic Rim Project area (BLM 2006). Additionally, mule deer are identified as a priority wildlife species in the Upper Muddy Creek watershed/Grizzly WHMA, which overlaps with the western portion of the Sierra Madre area. The management of the crucial winter habitat for mule deer is one of the stated goals for the WHMA (BLM 2008b). Mule deer occur within the exterior boundary of the Grizzly area of the Red Rim-Grizzly WHMA year-round, but concentrate in the southwestern portion of the Grizzly area during the winter (WGFD and BLM 1993).

Management concerns associated with these mule deer populations include the potential impacts of energy development (direct and indirect habitat loss), maintaining functional migration routes, and sustaining native shrub communities.

Although trends in mule deer numbers from 2002 to 2007 indicated populations have grown or remained stable (WGFD 2006), the unusually harsh winter of 2007 to 2008 resulted in significant levels of mortality. Mortality rates estimated for radio-collared mule deer in the Baggs Herd Unit were 30 percent (H. Sawyer, unpublished data). Since then, mule deer numbers have remained below management objectives.

Elk

The Chokecherry area overlaps with the Snowy Range Elk Herd Unit (#533), which is managed for a population of 6,000 elk and provides approximately 32,684 hunter recreation days per year (WGFD 2006) (**Figure 3.14-2**). The Chokecherry area contains 545 acres of winter range. The Sierra Madre area overlaps with portions of the Sierra Madre Elk Herd Unit (#425), which is managed for a population of 4,200 elk and provides approximately 32,000 hunter recreation days per year (WGFD 2006). The Sierra Madre area contains 130 acres of crucial winter-yearlong range, 40,648 acres of winter-yearlong range, 20,830 acres of spring-summer-fall range, and 503 acres of winter range (**Figure 3.14-2**). Elk are considered a priority wildlife species for the Upper Muddy Creek watershed/Grizzly WHMA which overlaps with the western portion of the Sierra Madre area. Management of the crucial winter habitat for elk is one of the stated goals of the Upper Muddy Creek watershed/Grizzly WHMA (BLM 2008b). Elk are found within the Grizzly area of the Red Rim-Grizzly WHMA year-round with most use occurring in the southern portion of the Grizzly area (WGFD and BLM 1993). During winter months elk use is the heaviest within the Grizzly area, primarily occurring in the southwestern portion of the Grizzly area on southwest-facing slopes.

Elk populations in the region generally have exceeded management objectives, resulting in liberal hunting seasons. Because of their large body size and flexible dietary requirements, elk generally are less susceptible to over-winter mortality compared to mule deer and pronghorn antelope. However, large numbers of elk that occupy winter ranges approximately 10 miles west of the Sierra Madre area, which are elk of the Red Rim Habitat Unit, have died in recent years due to ingesting lichens (WGFD 2004a).

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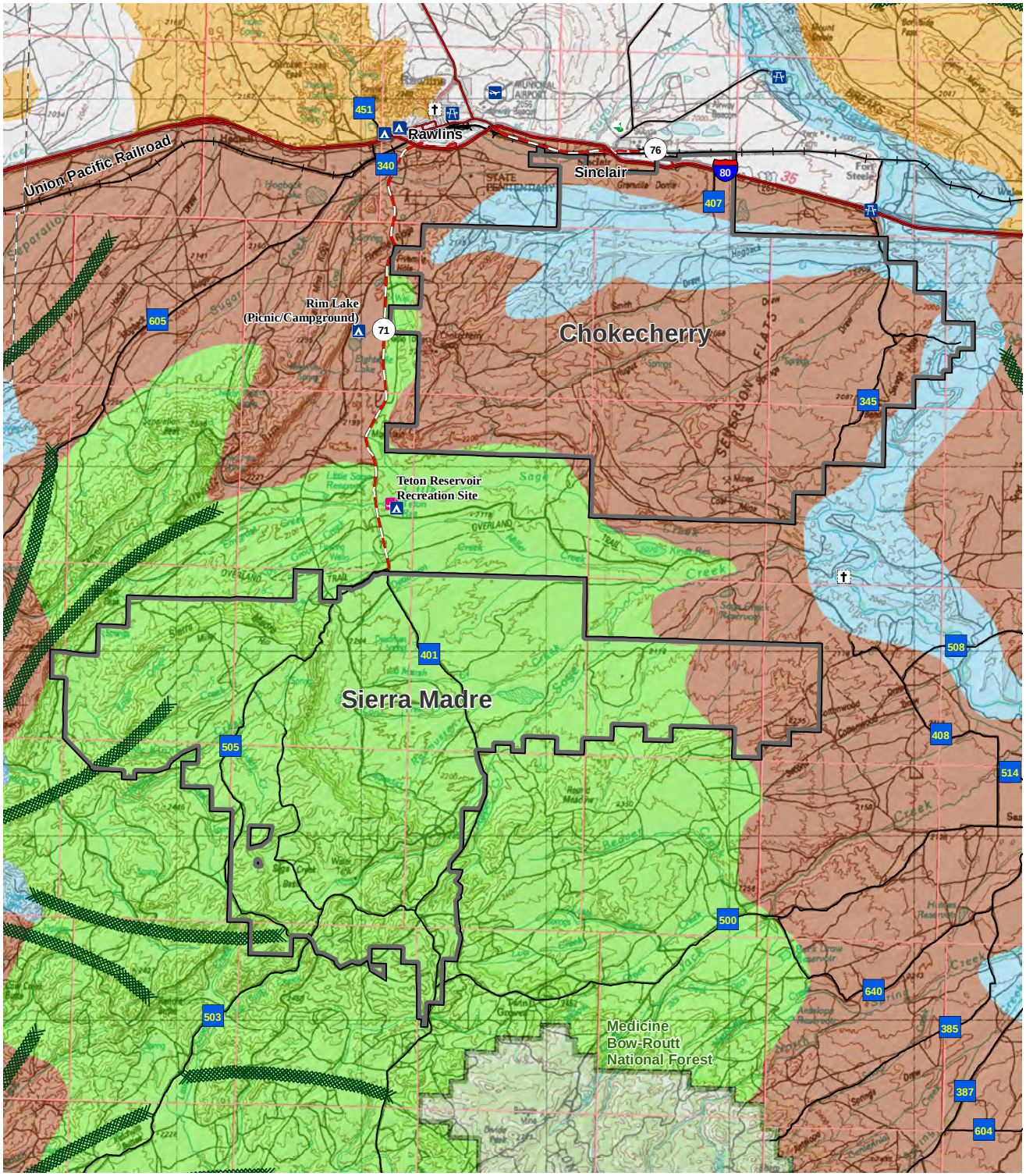

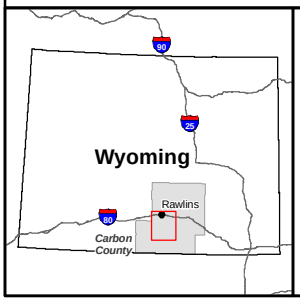

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest
- Mule Deer Migration Route

Mule Deer Seasonal Ranges

- Spring/Summer/Fall
- Winter/Yearlong
- Crucial Winter/Yearlong
- Yearlong

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-1

Mule Deer Seasonal Ranges

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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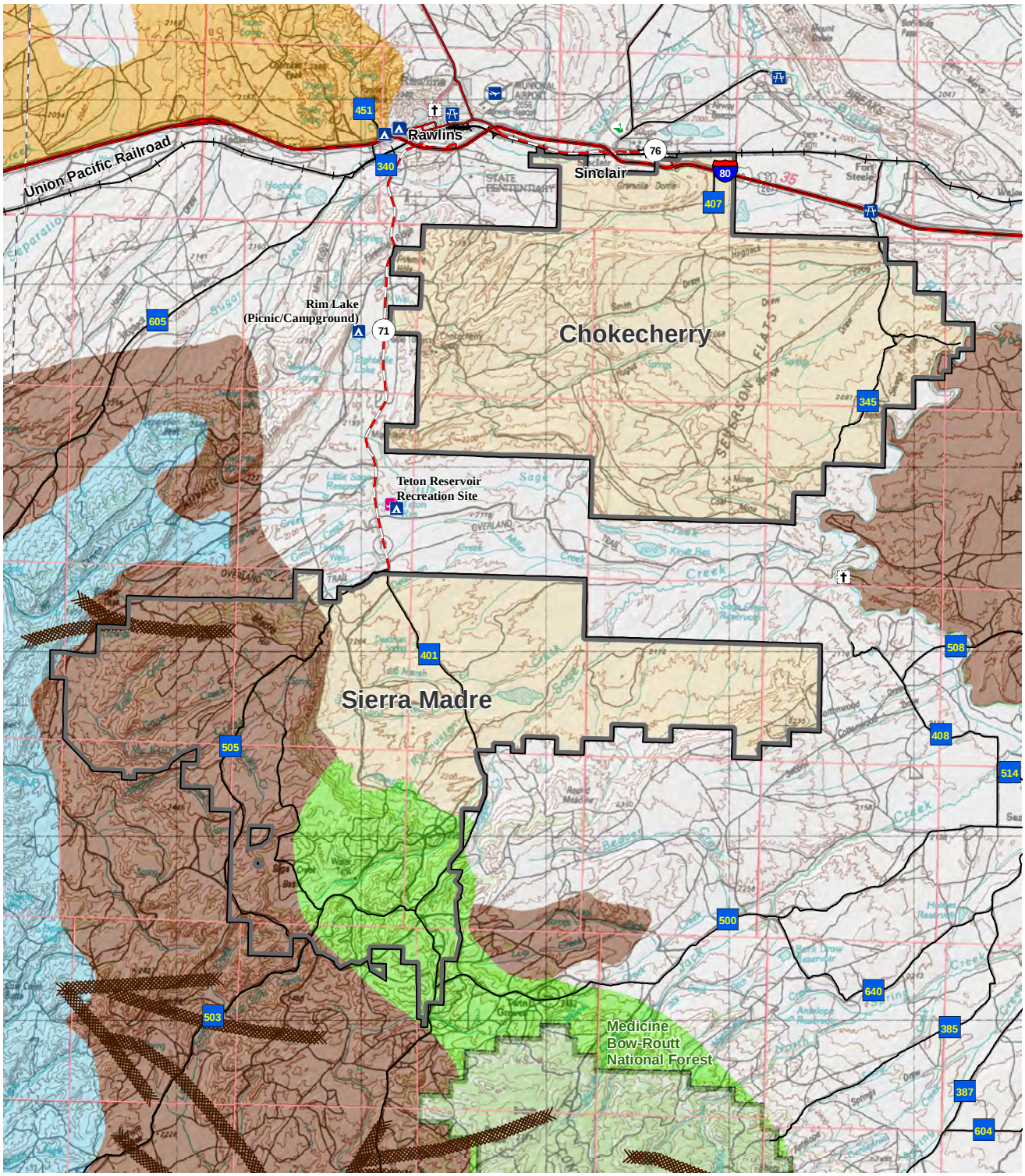

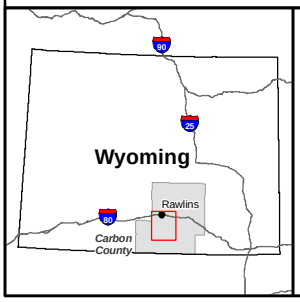

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest
- Elk Migration Route

Elk Seasonal Ranges

- Spring/Summer/Fall
- Winter/Yearlong
- Crucial Winter/Yearlong
- Yearlong

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-2

Elk Seasonal Ranges

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

While this unusual phenomenon has not occurred in the Application Area, this type of mortality may be of concern simply because of the close proximity of the Red Rim Habitat Unit. The WGFD initiated a study in 2006 in order to better understand elk movements across this herd unit; however, those results are not yet available as of November 2010 (G. Hiatt, WGFD, personal communication).

Pronghorn

The Chokecherry area overlaps with the Iron Springs (Unit #630), South Ferris (#637), Baggs Herd Unit (#438), and Elk Mountain Herd Unit (#528) Pronghorn Herd Units, which are managed for 12,000, 6,500, 9,000 and 5,000 pronghorn, respectively. The approximate hunter recreation days per year for the four pronghorn herd units are as follows: Iron Spring 2,200; South Ferris 700; Baggs 3,676; and Elk Mountain 2,286 (WGFD 2006). The Chokecherry area contains 1,194 acres of crucial winter-yearlong range, 29,478 acres of spring-summer-fall range and 74,992 acres of winter-yearlong range (**Figure 3.14-3**). The Sierra Madre area contains 86,477 acres of spring-summer-fall range and 30,460 acres winter-yearlong range (**Figure 3.14-3**). Pronghorn, a priority species for the Grizzly area of the Red Rim-Grizzly WHMA, occur within the Grizzly area during the summer within the sagebrush dominated habitats and occasionally the riparian areas. Generally, no pronghorn use the Grizzly area of the Red Rim-Grizzly WHMA during the winter (WGFD and BLM 1993).

Pronghorn populations in the Iron Springs Herd Unit have met or exceeded management objectives in recent years, while pronghorn numbers in the South Ferris Herd Unit have been below management objectives since the winter of 1992-1993. However, the unusually harsh winter of 2007-2008 resulted in significant levels of mortality. The WGFD estimated total pronghorn losses at approximately 30 percent (T. Woolley, WGFD, personal communication). Management concerns associated with these pronghorn populations include the potential impacts of energy development (direct and indirect habitat loss), maintaining functional migration routes, and minimizing movement barriers (e.g., fencing).

3.14.2.2 Small Game and Furbearers

Small game species in Wyoming consist of cottontail rabbits (*Sylvilagus audubonii*, *Sylvilagus floridanus*, *Sylvilagus nuttallii*), snowshoe hares (*Lepus americanus*), and the red squirrel (*Tamiasciurus hudsonicus*). Cottontail rabbits are the most popular with hunters, primarily because cottontails occur throughout the state, but are most abundant in the sagebrush basins, grasslands and agricultural regions (WGFD 2008c). Desert and Mountain (Nuttall's) cottontails (*Sylvilagus audubonii*; *Sylvilagus nuttallii*) are likely to inhabit the Application Area. Snowshoe hares occur within Wyoming mountain ranges but would not likely occur within the Application Area. Only the red squirrel potentially occurs within the Application Area as they have been documented to utilize areas with a mixture of aspen and sagebrush around Laramie, Wyoming (WGISC 2008). Furbearing species that are permitted for trapping by a license-holder in Wyoming consist of eleven species including: badger (*Taxidea taxus*), bobcat (*Lynx rufus*), marten (*Martes americana*), weasels (*Mustela frenata*, *Mustela nigripes*, *Mustela mivalis*, *Mustela erminea*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), skunks (*Spilogale gracilis*, *Spilogale putorius*, *Mephitis mephitis*), beaver (*Castor canadensis*), mink (*Mustela vison*), and muskrat (*Ondatra zibethicus*). Coyotes, raccoons, red fox, and skunk also are classified as predators and may be taken without a license and badger, bobcat, weasel, beaver, and muskrat may be taken if damage is being caused. Mink, beaver and muskrat potentially occur in riparian areas, ponds or lakes in the Application Area (WGISC 2008). Badger, bobcat, long-tailed weasels, coyote, red fox, and striped skunk all have distributions that include the Application Area (WGISC 2008). These species generally are widespread utilizing many habitats including sagebrush, thus they potentially occur within the Application Area.

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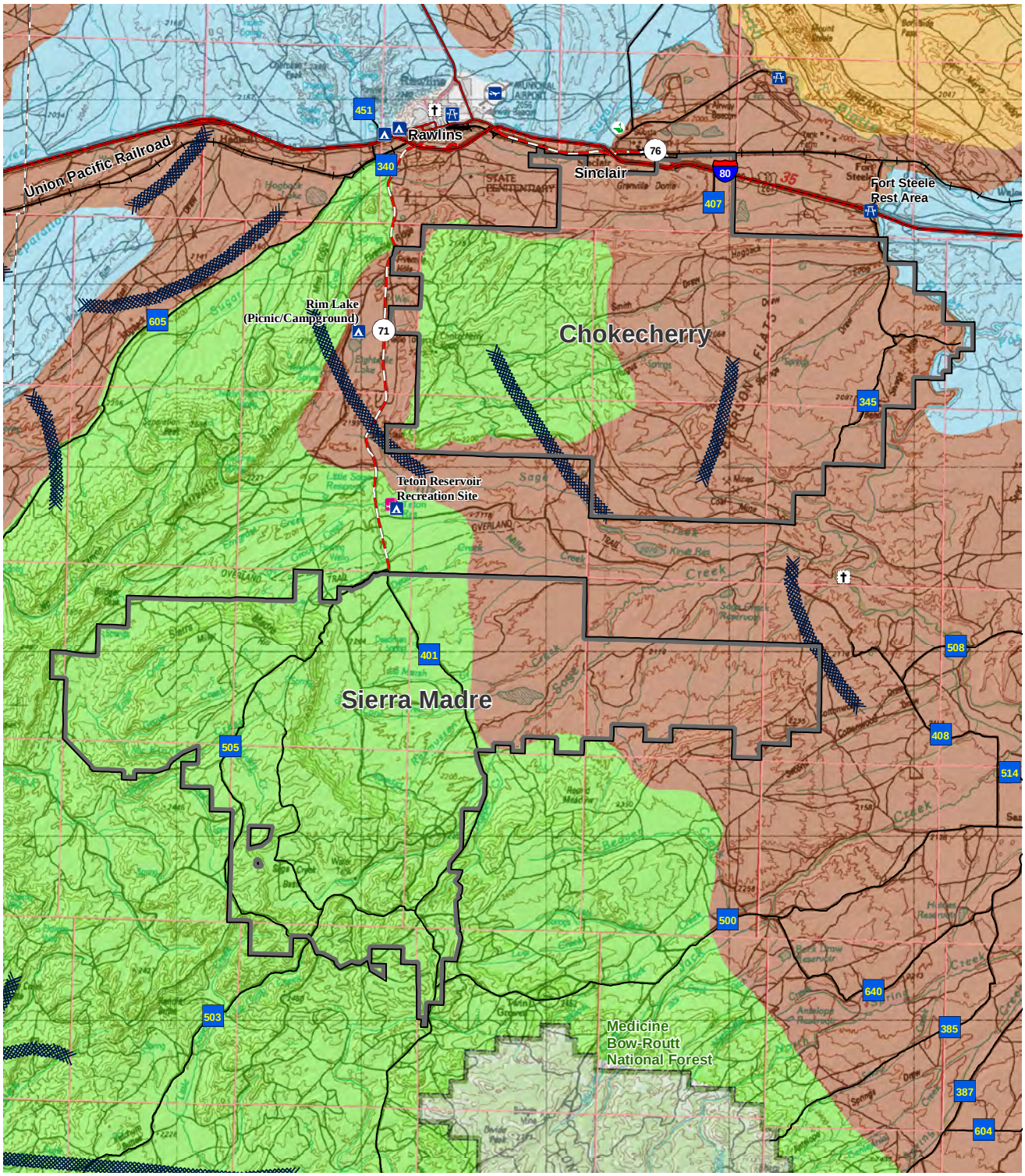

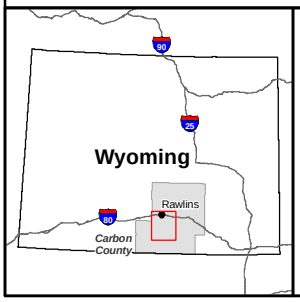

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest
- Pronghorn Migration Route

Pronghorn Seasonal Ranges

- Spring/Summer/Fall
- Winter/Yearlong
- Crucial Winter/Yearlong
- Yearlong

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-3

Pronghorn Seasonal Ranges

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

3.14.2.3 Nongame

Bats

An acoustic bat study was conducted in the Chokecherry and Sierra Madre areas to determine the spatial and temporal variation of bat use as well as species composition (WEST 2008j). The protocol included passive acoustic sampling from eight anabat stations at six locations, including two paired stations with a detector on the ground and one raised on a met tower at one location in each of the CCSM areas. The stations were located to quantify bat use throughout the Application Area (**Figure 3.14-4**). The units of activity were number of bat passes and defined as a continuous series of less than or equal to two call notes produced by an individual bat with no pauses between call notes of less than one second (Gannon et al. 2003; White and Gehrt 2001).

Spatial Variation

Bat activity was similar within the Chokecherry area for three of the ground-based Anabat units (mean = 3.0 bat passes per detector-night), but higher at A3 located in the southwestern portion of the Chokecherry area (20.6 bat passes per detector-night) (**Table 3.14-1**). Bat passes recorded at unit A3 represent 63 percent of all passes recorded during the study. In the Sierra Madre area, bat activity was relatively low and similar between both ground-based Anabat units (mean = 1.1 bat passes per detector-night).

Temporal Variation

Bat activity was highest from July 13 through the end of August, at which point bat activity abruptly decreased to lower levels through September and October. Peaks of activity occurred on July 27 and August 22 (**Figure 3.14-5**). Temporal patterns were largely consistent among stations, although unit A3 recorded more passes per night. Trends in bat activity also were similar between ground and raised units at paired stations. The number of passes gradually increased until peaking on August 22, then decreased through the end of the study period.

Species Composition

Bat calls were classified as either high-frequency (HF) calls (≥35 kilohertz [kHz]) that generally are given by small bats (e.g., mouse-eared bats [*Myotis* spp.]) or low-frequency (LF) calls (<35 kHz) that generally are given by larger bats (e.g., silver-haired bat [*Lasionycteris noctivagans*], big brown bat [*Eptesicus fuscus*], hoary bat [*Lasiurus cinereus*]). The total number of passes by HF bats (HF; 63 percent of all passes) outnumbered passes by LF bats (LF; 37 percent) in the Application Area. However, the proportion of HF and LF bat passes was similar among Anabat ground stations, with the exception of station A3, which recorded about three times more HF passes than LF passes. At the elevated units, LF bat passes outnumbered HF passes and patterns of activity for HF and LF bats were similar for ground based and elevated units(**Table 3.14-2**). The HF passes outnumbered the LF passes during July, but the number of passes was more similar during August, while LF bat passes were more frequent in September and October when overall activity was much lower (**Figure 3.14-6**).

Species identification for specific passes was possible only for the hoary bat, as mouse-eared bat species cannot reliably be separated using Anabat data, and big brown and silver-haired bats cannot be distinguished from each other based on call characteristics. Hoary bats composed 7 percent of total passes detected within the Application Area. Hoary bat activity was similar among Anabat stations and patterns of hoary bat activity were similar to activity patterns for all bat passes with most passes recorded on August 22.

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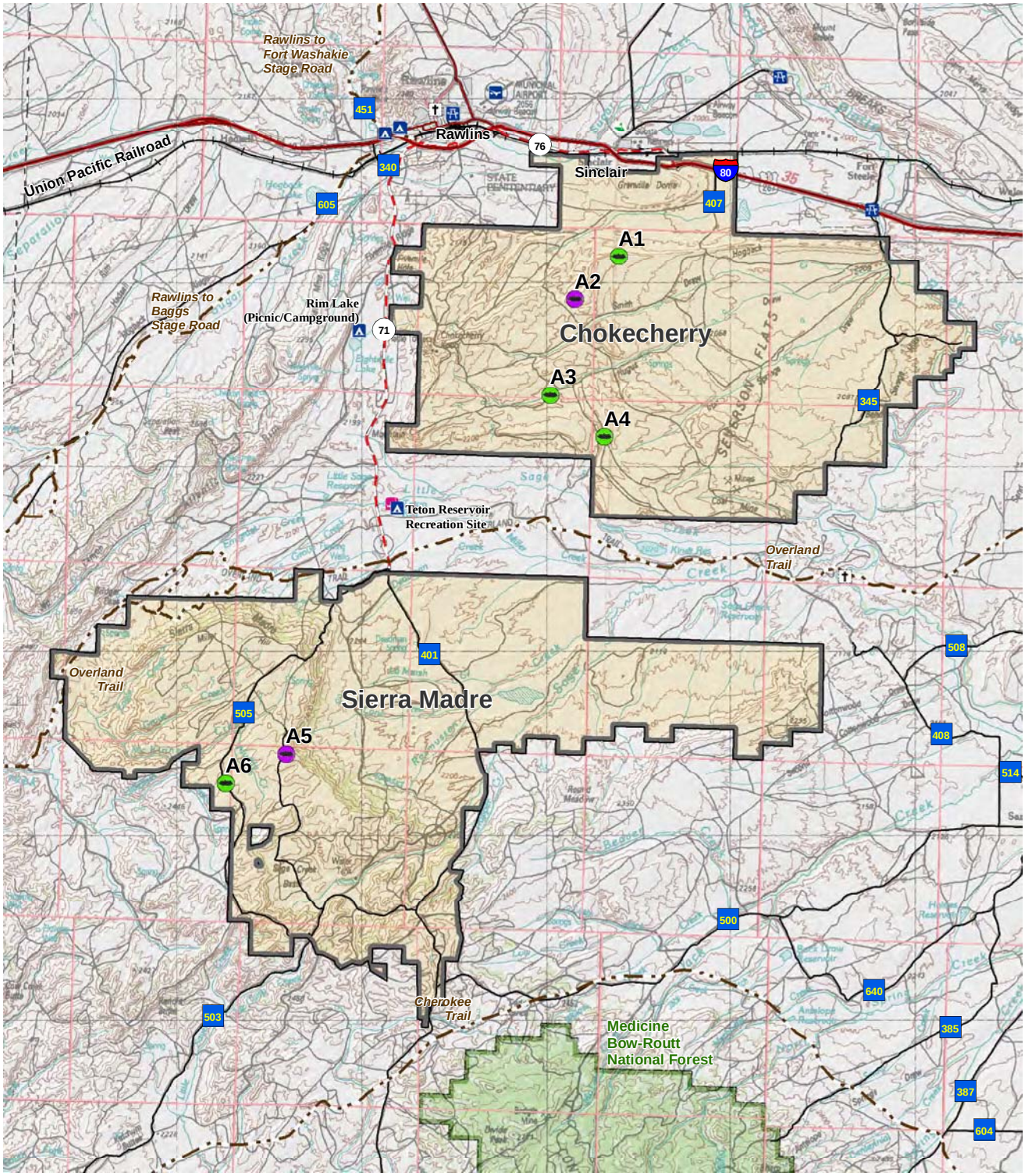

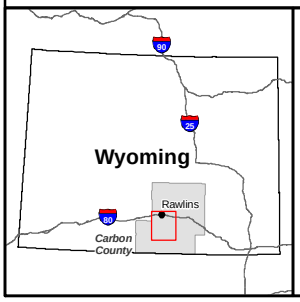

Legend

AnaBat Sampling Location

- Ground
- Paired (Elevated and Ground)
- National Forest
- Application Area

- Interstate Highway
- U.S. Highway
- State Highway
- County Road

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-4

AnaBat Sampling Locations

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.14-1 Bat Passes for Each Anabat Location for Surveys Conducted in the Application Area, July 13 - October 13, 2008

Anabat Location	Total Bat Passes	Detector- Nights	Bat Passes/Night
A1	215	92	2.34
A2 (ground)	302	85	3.55
A2 (raised)	107	71	1.51
A3	1,897	92	20.62
A4	239	73	3.27
A5 (ground)	98	92	1.07
A5 (raised)	64	71	0.90
A6	99	93	1.06
Total	**3,021**	**669**	**4.29**[1]

[1] Average nightly bat passes based on eight anabat locations.

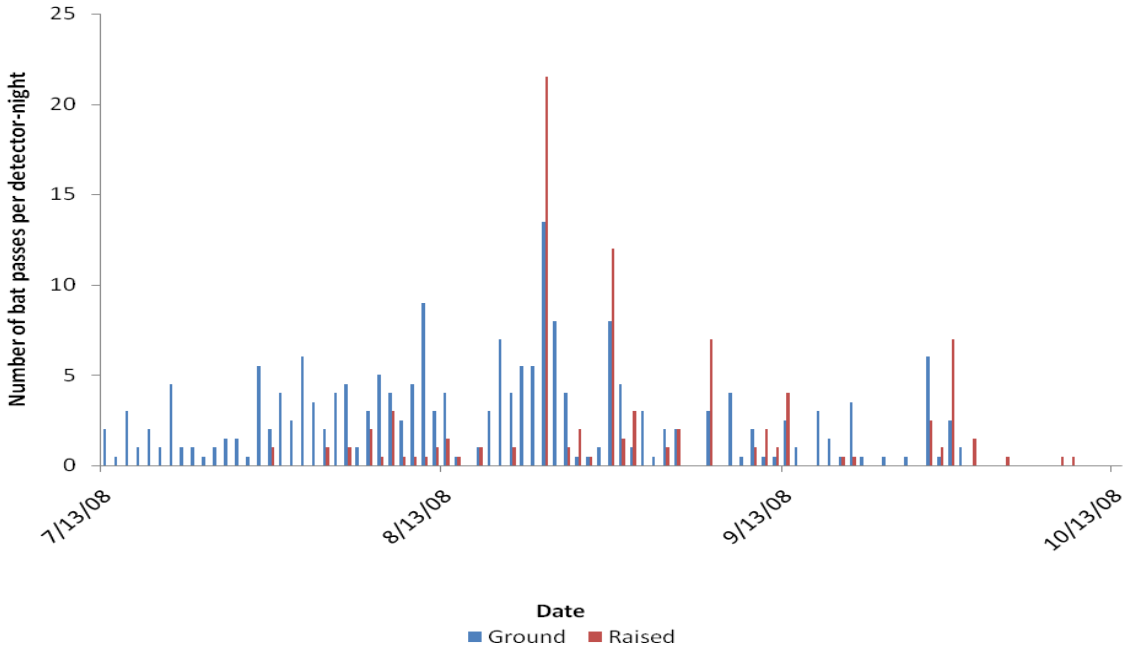

Figure 3.14-5 Nightly Activity Recorded at Ground and Elevated Anabat Units in the Application Area, During the Study Period July 13 - October 13, 2008

Table 3.14-2 Results of Bat Acoustic Surveys Conducted in the Chokecherry and Sierra Madre Areas, July 13 - October 13, 2008

Anabat Location	# of HF Bat Passes	# of LF Bat Passes	# of Hoary Bat Passes*	Detector-Nights	Bat Passes/ Night
A1	76	139	27	92	2.34
A2 (ground)	200	102	17	85	3.55
A2 (raised)	5	102	38	71	1.51
A3	1,404	493	42	92	20.62
A4	143	96	31	73	3.27
A5 (ground)	31	67	22	92	1.07
A5 (raised)	1	63	29	71	0.90
A6	49	50	11	93	1.06
Total	**1,909**	**1,112**	**217**	**669**	**4.29**[1]

[1] Average nightly bat passes based on eight anabat locations.

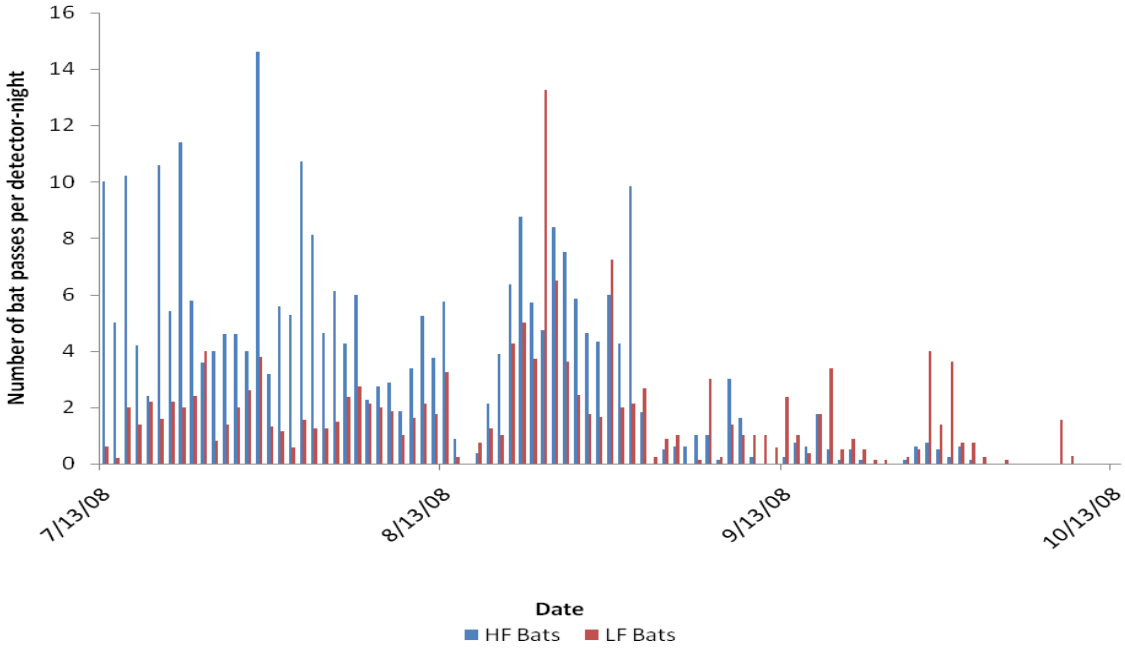

Figure 3.14-6 Nightly Activity by HF and LF Bats in the Application Area, July 13 – October 13, 2008

Birds

A year-long baseline avian use study was conducted in the Application Area to characterize the seasonal, spatial, and temporal bird use of the areas. The study was initiated June 2008 and concluded June 2009 (WEST 2009b). At the start of the study, 16 points were selected to survey representative habitats and topography of the Application Area, while also providing relatively even coverage (**Figure 3.14-7**). However the original Application Area identified was smaller, specifically the Sierra Madre area which was later extended to the west. Upon review of the Application Area, it was determined that the 16 points still were representative of the habitats and topography, therefore no adjustments were made. Although, due to snow conditions which prevented access to much of the study area, three additional points were added north of the Sierra Madre area. Sampling intensity was designed to document bird use and behavior by plant community and season within the Application Area. Surveys were conducted approximately bi-weekly during summer and winter (June 15 to August 31; November 16 to December 31) and weekly during the fall (September 1 to October 15) and spring (March 16 to May 31). For the purpose of this EIS, survey data from the Application Area is assumed to be representative of bird use in the entire Application Area.

Bird Use by Type

Fifty unique species were observed during surveys completed for the Application Area (WEST 2009b). A total of 2,005 individual birds within 1,301 separate groups were recorded, of which 230 individuals were raptors comprised of 12 species (**Table 3.14-3**). Raptor use was highest in the fall, followed by summer, spring and winter. Higher use in the summer and spring was primarily due to high use of the area by American kestrels (*Falco sparverius*). Higher use in the fall and winter was primarily due to use of the area by golden eagles (*Aquila chrysaetos*) [**Table 3.14-4]**). Only three raptors were observed in the winter including two golden eagles and one ferruginous hawk (*Buteo regalis*). Mean raptor use in the Application Area was classified as low (0 – 0.5 raptors/plot/20-minute survey). Raptor use at the nine points located in the Sierra Madre area (0.52 bird/plot/20-minute survey) was slightly higher than raptor use at the 10 points located in the Chokecherry area (0.43 bird/plot/20-minute survey) during the summer and fall survey periods.

The USFWS has recently expressed heightened concern over potential impacts of wind energy development on eagles (USFWS 2010a). During the avian baseline study, only two bald eagles were observed, indicating the Application Area receives very little use by this species. However, golden eagles were the most abundant raptor species observed during the surveys, with 62 groups totaling 69 individual eagles observed. Golden eagle use ranged from 0.07/survey in spring to 0.25/survey in fall and averaged 0.14/survey across all seasons. Golden eagles therefore comprised 30.4 percent of all raptor use of the Application Area.

Passerines were by far the most abundant bird type observed in the Application Area during all seasons with the exception of winter (**Table 3.14-3**). However, a 100-m radius viewshed was used for small bird data analysis; therefore, results are not directly comparable to the other large bird types. The most commonly observed passerine species were horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), Brewer's sparrow (*Euphagus cyanocephalus*), western meadowlark (*Sturnella neglecta*), and sage thrasher (*Oreoscoptes montanus).*

Spatial Use of the Study Area

Survey point 12 within the Sierra Madre Area had the highest use by large bird species combined for all 19 survey points, primarily due to large use by large corvids. Raptors were observed at all 19 points and use by point ranged from 0.10 to 0.93 birds/20-minute survey (WEST 2009b). Point 4 had the highest use for raptors at 0.93 birds/20-minute survey at both points. Passerines were observed at all points, with the highest use occurring at points 13 and 6 (5.10 and 4.66 birds/20-minute survey, respectively) and lowest at point 16 (1.81).

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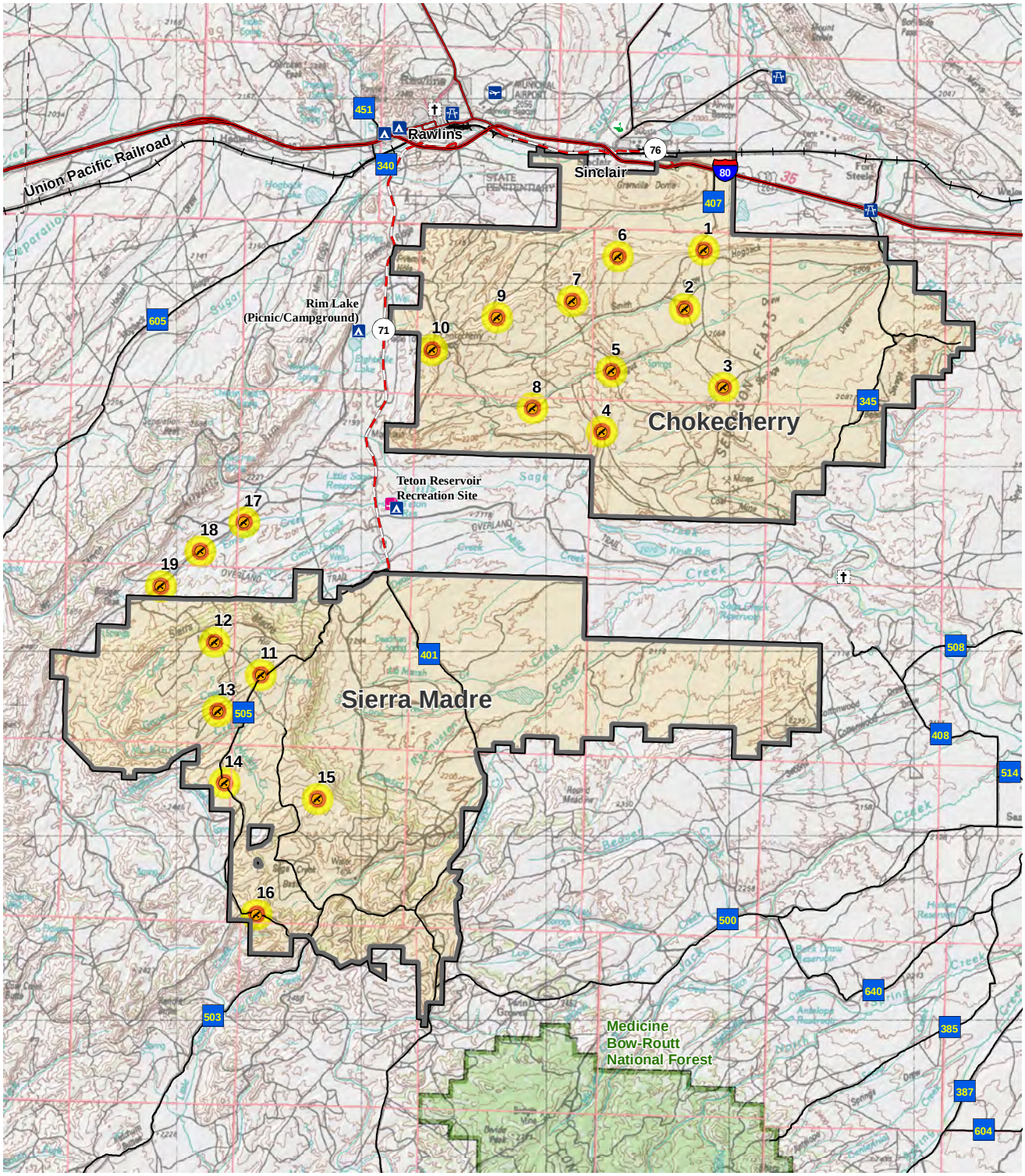

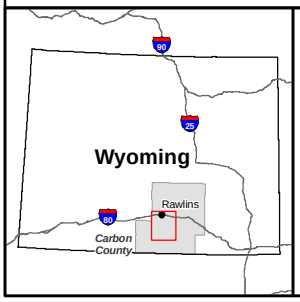

Legend

- Observation Point
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- 400 Meter Buffer
- 800 Meter Buffer
- National Forest
- Application Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-7

Fixed Point Bird Use Survey Locations

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.14-3 Total Number of Individuals and Groups for each Bird Type and Species, by Season and Overall, During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008 – June 16, 2009

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Waterbirds		0	0	0	0	0	0	2	16	2	16
American White Pelican	*Pelecanus erythrorhyncos*	0	0	0	0	0	0	1	14	1	14
Great Blue Heron	*Ardea herodias*	0	0	0	0	0	0	1	2	1	2
Shorebirds		0	0	0	0	0	0	1	1	1	1
Killdeer	*Charadrius vociferus*	0	0	0	0	0	0	1	1	1	1
Raptors		77	86	80	88	3	3	51	53	211	230
Accipiters		0	0	5	5	0	0	1	1	6	6
Cooper's Hawk	*Accipiter cooperii*	0	0	2	2	0	0	0	0	2	2
Sharp-shinned Hawk	*Accipiter striatus*	0	0	1	1	0	0	1	1	2	2
Unidentified Accipiter		0	0	2	2	0	0	0	0	2	2
Buteos		23	26	20	21	1	1	11	12	55	60
Ferruginous Hawk	*Buteo regalis*	1	1	2	2	1	1	1	1	5	5
Red-tailed Hawk	*Buteo jamaicensis*	14	16	6	6	0	0	7	8	27	30
Rough-legged Hawk	*Buteo lagopus*	0	0	9	9	0	0	2	2	11	11
Swainson's Hawk	*Buteo swainsoni*	7	8	0	0	0	0	1	1	8	9
Unidentified Buteo		1	1	3	4	0	0	0	0	4	5
Other Hawks		15	15	19	22	0	0	5	5	39	42
Northern Harrier	*Circus cyaneus*	15	15	19	22	0	0	5	5	39	42
Eagles		17	19	33	37	2	2	13	14	65	72
Bald Eagle	*Haliaeetus leucocephalus*	0	0	0	0	0	0	2	2	2	2
Golden Eagle	*Aquila chrysaetos*	17	19	32	36	2	2	11	12	62	69

Table 3.14-3 Total Number of Individuals and Groups for each Bird Type and Species, by Season and Overall, During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008 – June 16, 2009

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Unidentified Eagle		0	0	1	1	0	0	0	0	1	1
Falcons		22	26	3	3	0	0	20	20	45	49
American Kestrel	*Falco sparverius*	21	25	2	2	0	0	16	16	39	43
Prairie Falcon	*Falco mexicanus*	1	1	1	1	0	0	4	4	6	6
Other Raptors		0	0	0	0	0	0	1	1	1	1
Osprey	*Pandion haliaetus*	0	0	0	0	0	0	1	1	1	1
Vultures		0	0	1	1	0	0	1	1	2	2
Turkey Vulture	*Cathartes aura*	0	0	1	1	0	0	1	1	2	2
Upland Gamebirds		0	0	1	2	3	24	2	2	6	28
Greater Sage Grouse	*Centrocercus urophasianus*	0	0	1	2	3	24	2	2	6	28
Doves/Pigeons		8	10	0	0	0	0	0	0	8	10
Mourning Dove	*Zenaida macroura*	8	10	0	0	0	0	0	0	8	10
Large Corvids		14	65	62	105	9	15	30	60	115	245
American Crow	*Corvus brachyrhynchos*	4	49	0	0	0	0	2	16	6	65
Black-Billed Magpie	*Pica pica*	0	0	2	3	2	2	0	0	4	5
Common Raven	*Corvus corax*	10	16	60	102	7	13	28	44	105	175
Passerines		467	600	95	255	2	4	379	588	943	1,447
American Robin	*Turdus migratorius*	1	1	0	0	0	0	0	0	1	1
Barn Swallow	*Hirundo rustica*	0	0	0	0	0	0	2	2	2	2
Brewer's Blackbird	*Euphagus cyanocephalus*	8	9	0	0	0	0	2	26	10	35
Brewer's Sparrow	*Spizella breweri*	51	57	5	5	0	0	14	18	70	80

Table 3.14-3 Total Number of Individuals and Groups for each Bird Type and Species, by Season and Overall, During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008 – June 16, 2009

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Clark's Nutcracker	*Nucifraga columbiana*	1	1	0	0	0	0	0	0	1	1
Cliff Swallow	*Petrochelidon pyrrhonota*	0	0	0	0	0	0	1	1	1	1
Grasshopper Sparrow	*Ammodramus savannarum*	0	0	0	0	0	0	4	4	4	4
Green-Tailed Towhee	*Pipilo chlorurus*	1	1	0	0	0	0	0	0	1	1
Horned Lark	*Eremophila alpestris*	177	264	48	172	1	1	224	368	450	805
House Wren	*Troglodytes aedon*	8	13	3	3	0	0	0	0	11	16
Lark Bunting	*Calamospiza melanocorys*	3	3	0	0	0	0	1	12	4	15
Lark Sparrow	*Chondestes grammacus*	0	0	2	2	0	0	0	0	2	2
Lincoln's Sparrow	*Melospiza lincolnii*	0	0	0	0	0	0	2	2	2	2
Loggerhead Shrike	*Lanius ludovicianus*	2	2	0	0	0	0	2	2	4	4
Mountain Bluebird	*Sialia currucoides*	3	4	4	16	0	0	7	14	14	34
Rock Wren	*Salpinctes obsoletus*	7	7	0	0	0	0	4	6	11	13
Sage Sparrow	*Amphispiza belli*	7	7	0	0	0	0	48	52	55	59
Sage Thrasher	*Oreoscoptes montanus*	52	55	2	2	0	0	6	8	60	65
Say's Phoebe	*Sayornis saya*	1	1	0	0	0	0	1	1	2	2
Song Sparrow	*Melospiza melodia*	0	0	2	3	0	0	0	0	2	3
Townsend's Solitaire	*Myadestes townsendi*	0	0	1	1	0	0	0	0	1	1
Tree Swallow	*Tachycineta bicolor*	3	3	0	0	0	0	0	0	3	3
Unidentified Blackbird		0	0	1	4	0	0	0	0	1	4
Unidentified Passerine		28	43	16	30	1	3	1	6	46	82
Unidentified Sparrow		9	9	3	5	0	0	0	0	12	14

Table 3.14-3 Total Number of Individuals and Groups for each Bird Type and Species, by Season and Overall, During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008 – June 16, 2009

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs	# grps	# obs
Unidentified Swallow		4	4	0	0	0	0	0	0	4	4
Unidentified Wren		2	2	0	0	0	0	0	0	2	2
Vesper Sparrow	*Pooecetes gramineus*	65	79	3	4	0	0	32	38	100	121
Western Kingbird	*Tyrannus verticalis*	1	1	1	1	0	0	0	0	2	2
Western Meadowlark	*Sturnella neglecta*	33	34	4	7	0	0	28	28	65	69
Other Birds		10	22	0	0	0	0	3	4	13	26
Common Nighthawk	*Chordeiles minor*	5	6	0	0	0	0	0	0	5	6
Northern Flicker	*Colaptes auratus*	1	1	0	0	0	0	1	1	2	2
Unidentified Hummingbird		2	2	0	0	0	0	0	0	2	2
White-Throated Swift	*Aeronautes saxatalis*	2	13	0	0	0	0	2	3	4	16
Overall		576	783	239	451	17	46	469	725	1,301	2,005

Table 3.14-4 Mean Bird Use (Number of Birds/800-plot/20-min Survey), Percent of Total Composition (%), and Frequency of Occurrence (%) for each Large Bird and Species by Season During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008-June 16, 2009

Species/Type	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
Waterbirds	0	0	0	0.10	0	0	0	10.5	0	0	0	1.4
American White Pelican	0	0	0	0.09	0	0	0	9.0	0	0	0	0.6
Great Blue Heron	0	0	0	0.02	0	0	0	1.6	0	0	0	0.8
Shorebirds	0	0	0	0.01	0	0	0	0.8	0	0	0	0.8
Killdeer	0	0	0	0.01	0	0	0	0.8	0	0	0	0.8
Raptors	0.58	0.62	0.17	0.35	53.1	45.2	27.9	36.1	37.2	36.8	16.7	28.6
Accipiters	0	0.03	0	0.01	0	2.3	0	0.6	0	2.4	0	0.6
Cooper's Hawk	0	0.01	0	0	0	0.8	0	0	0	1.0	0	0
Sharp-Shinned Hawk	0	0.01	0	0.01	0	0.5	0	0.6	0	0.7	0	0.6
Unidentified Accipiter	0	0.01	0	0	0	1.0	0	0	0	1.4	0	0
Buteos	0.18	0.15	0.03	0.08	16.8	11.1	4.7	8.0	14.1	8.7	2.8	7.3
Ferruginous Hawk	0.01	0.01	0.03	0.01	0.7	1.0	4.7	1.5	0.7	1.4	2.8	1.4
Red-Tailed Hawk	0.11	0.04	0	0.04	10.3	3.1	0	3.9	8.4	2.9	0	3.8
Rough-Legged Hawk	0	0.07	0	0.02	0	4.8	0	2.0	0	5.1	0	2.0
Swainson's Hawk	0.06	0	0	0.01	5.2	0	0	0.6	4.9	0	0	0.6
Unidentified Buteo	0.01	0.03	0	0	0.6	2.2	0	0	0.7	2.2	0	0
Other Hawks	0.10	0.16	0	0.03	9.0	11.5	0	3.3	8.3	10.1	0	2.4
Northern Harrier	0.10	0.16	0	0.03	9.0	11.5	0	3.3	8.3	10.1	0	2.4

Table 3.14-4 Mean Bird Use (Number of Birds/800-plot/20-min Survey), Percent of Total Composition (%), and Frequency of Occurrence (%) for each Large Bird and Species by Season During the Fixed-point Bird Use Surveys in the Chokecherry and Sierra Madre Areas, June 26, 2008-June 16, 2009

Species/Type	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
Eagles	0.11	0.26	0.14	0.08	10.4	19.1	23.3	8.3	9.6	20.3	13.9	6.1
Bald Eagle	0	0	0	0.01	0	0	0	1.3	0	0	0	1.3
Golden Eagle	0.11	0.25	0.14	0.07	10.4	18.5	23.3	7.0	9.6	19.6	13.9	5.4
Unidentified Eagle	0	0.01	0	0	0	0.5	0	0	0	0.7	0	0
Falcons	0.18	0.02	0	0.15	16.8	1.3	0	15.2	14.0	1.8	0	13.4
American Kestrel	0.18	0.01	0	0.12	16.2	0.8	0	12.1	13.3	1.1	0	11.1
Prairie Falcon	0.01	0.01	0	0.03	0.6	0.5	0	3.1	0.7	0.7	0	3.0
Other Raptors	0	0	0	0.01	0	0	0	0.6	0	0	0	0.6
Osprey	0	0	0	0.01	0	0	0	0.6	0	0	0	0.6
Vultures	0	0.01	0	0.01	0	0.5	0	0.8	0	0.7	0	0.8
Turkey Vulture	0	0.01	0	0.01	0	0.5	0	0.8	0	0.7	0	0.8
Upland Gamebirds	0	0.01	0.09	0.06	0	1.1	15.1	5.9	0	0.7	4.9	5.8
Greater Sage Grouse	0	0.01	0.09	0.06	0	1.1	15.1	5.9	0	0.7	4.9	5.8
Doves/Pigeons	0.07	0	0	0	6.4	0	0	0	4.9	0	0	0
Mourning Dove	0.07	0	0	0	6.4	0	0	0	4.9	0	0	0
Large Corvids	0.44	0.73	0.34	0.45	40.5	53.2	57.0	45.9	7.7	29.7	16.0	20.5
Black-Billed Magpie	0	0.02	0.05	0	0	1.7	8.1	0	0	1.5	4.9	0
Common Raven	0.10	0.71	0.29	0.34	9.1	51.5	48.8	35.1	5.7	29.0	13.9	19.1
American Crow	0.34	0	0	0.11	31.4	0	0	10.8	2.1	0	0	1.4
Overall	1.08	1.37	0.60	0.98	100	100	100	100	–	–	–	–

Raptor Nest Survey

In addition to the baseline avian use study, an aerial survey to locate and map active and inactive raptor nests within 1 mile of the Application Area was conducted during May 2008 (WEST 2008f). To supplement raptor nest data collected, all raptor nest records for the Application Area maintained by the BLM were obtained. These records include nests located since 1980 (a 28-year period) and therefore do not reflect expected raptor nesting activity for any given year. Prior to 1996, the BLM mapped raptor nest locations opportunistically.

Since 1996, specific surveys have been conducted to map raptor nests in the RFO. These records have been supplemented with raptor nests located as part of the permitting process for development activities such as pipelines and oil and gas developments (H. Cline, BLM, personal communication, 2010).

Twenty-four active raptor nests, consisting of 11 nests of red-tailed hawk (*Buteo jamaicensis*), five of prairie falcon (*Falco mexicanus*), five of great horned owl (*Bubo virginianus*), and three of golden eagle were located during 2008 aerial surveys of the Application Area (WEST 2008f). Active nests contained either eggs or chicks in the nest. Twelve of the active raptor nests were found in or within 1 mile of the Chokecherry area, and 12 were found in or within 1 mile of the Sierra Madre area. A total of 110 inactive nests also were located, with 55 in or within 1 mile of the Chokecherry area and 55 in or within 1 mile of the Sierra Madre area (**Figure 3.14-8**). The BLM surveyed the remainder of the Application Area during the spring of 2009.

Most of the active and inactive raptor nests in the Chokecherry area were located along the extreme southern portion, although several also occurred along a ridgeline that runs east-west through the northern end of the Chokecherry area. Very few active or inactive nests were located within the Sierra Madre area; the vast majority were located just outside the area along steep, wooded slopes that lead away from the area on the north and east face of Miller Hill.

In addition to raptors, seven active common raven (*Corvus corax*) nests and one active Canada goose (*Branta canadensis*) nest were located during aerial surveys. Three of the common raven nests were in trees and four were on cliffs. The Canada goose nest was located in a tree along the North Platte River just east of the Chokecherry area.

Since 1980, the BLM has mapped 555 raptor nests in or within 1 mile of the Application Area, including 342 nests in the Chokecherry area, and 213 in the Sierra Madre area. Over this 30-year period, red-tailed hawk nests have been most common, with 116 active nests documented, followed by golden eagle (102), ferruginous hawk (52), Cooper's hawk (52), and prairie falcon (48). Other raptor nests located included 17 bald eagles, 15 great horned owls, 10 American kestrels, seven burrowing owls, four long-eared owls, and three Swainson's hawks. The nest records also include 10 unidentified buteos and 7 unidentified raptors, as well as 105 inactive raptor nests where species could not be determined. Most of the nests in the Chokecherry area occurred along the southern boundary, although several nests were located throughout the area. Most of the nests found at the Sierra Madre area occur along the northern and eastern boundaries.

Reptiles and Amphibians

Reptiles and amphibians are collectively referred to as herptiles. In Wyoming, information about herptiles natural history and status generally is extrapolated from what is known about a species or similar species throughout its range and distribution (Parker and Anderson 2001). Four reptiles, the greater short horned lizard (*Phrynosoma douglasi*), the northern sagebrush lizard (*Sceloporus graciosus graciousus*), the intermountain wandering garter snake (*Thamnophis elegans vagrans*), and the prairie rattlesnake (*Crotalus viridis viridis*), are commonly found in sagebrush landscapes and have been observed within

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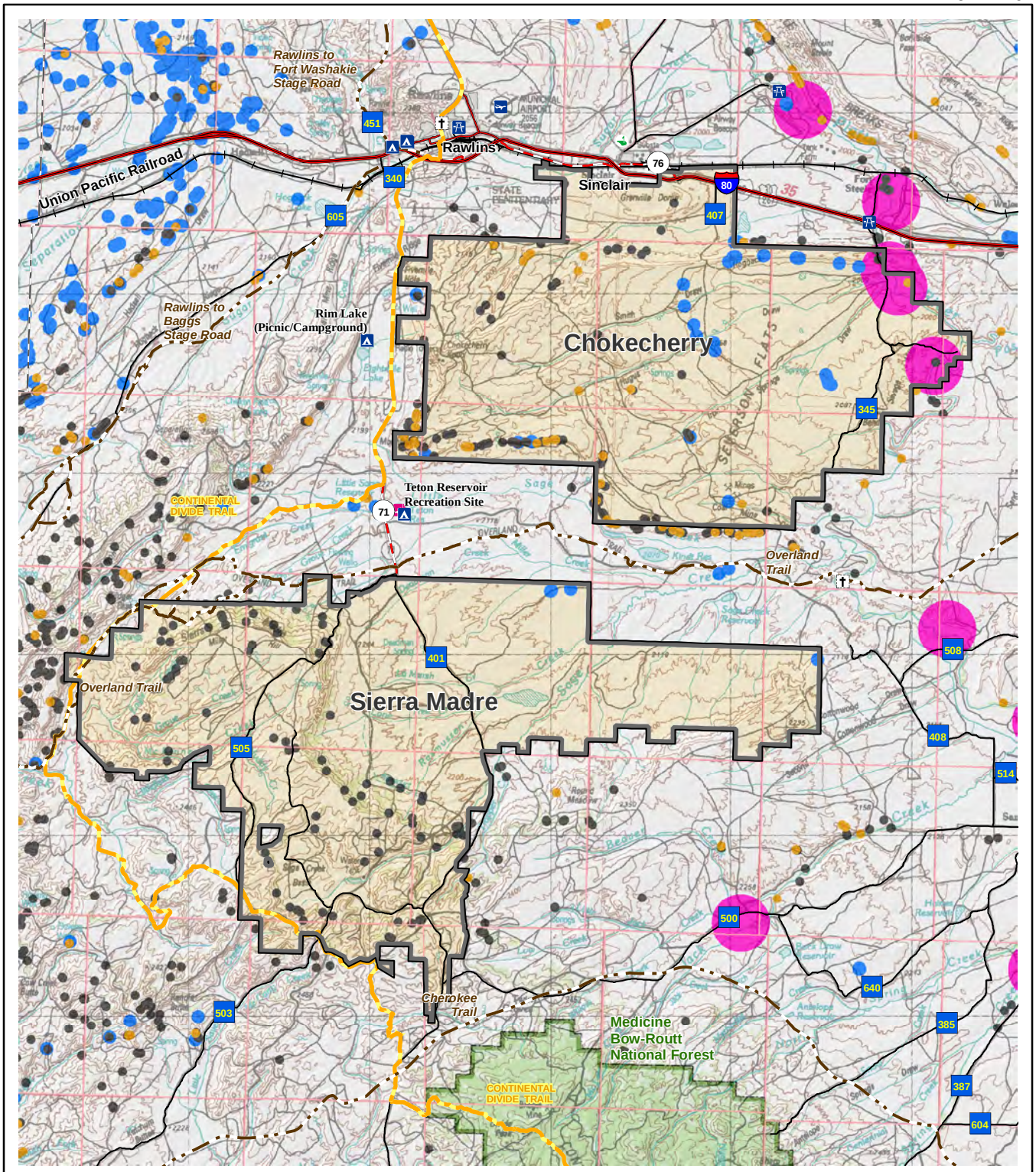

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest

Raptor Nest Locations

- Ferruginous Hawk (1,200 ft. Buffer)
- Golden Eagle (825 ft. Buffer)
- Bald Eagle (1 mi. Buffer)
- Other Raptor (825 ft. Buffer)

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.14-8

Raptor Nest Locations

0 1 2 4 Miles
0 2 4 8 Kilometers
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the Application Area. Five amphibians, the tiger salamander (*Ambyrtoma tigrinum*), the Great Basin spadefoot toad (*Spea intermontanus*), the northern leopard frog (*Rana pipiens*), the boreal chorus frog (*Pseudacris maculata*), and the boreal toad (*Bufo boreas boreas*) are known to occur within sagebrush landscapes and are expected to occur within the Application Area.

3.14.3 Fisheries

Fish habitats in the Application Area include perennial and intermittent streams, springs, lakes and reservoirs. All named waterbodies within the Application Area are presented in **Table 3.13-4**. The Application Area is located within two water resource regions; Missouri River Region and the Upper Colorado River Region, which are described in detail in Section 3.13.1, Water, of this document. Most of the Application Area drains into the North Platte River basin (approximately 188,725 acres; **Table 3.13-2**) and to a lesser extent the White-Yampa River Basin (approximately 33,965 acres; **Table 3.13-2**). Fish habitat is related to the hydrologic conditions of the riparian areas and uplands associated with, or contributing to, a specific stream or waterbody, and to stream channel characteristics (BLM 2008b). The Application Area provides habitats for many native and non-native species (**Table 3.14-5**) (BLM 2008b). The management of fisheries within the Application Area is the responsibility of the WGFD and is shared between the Laramie and Green River WGFD fisheries regions. An overview of their management concepts for the fish species present in these water bodies are presented in **Table 3.14-6**. Additionally, there is a memorandum of understanding between the WGFD and the BLM Rawlins District that establishes cooperative management of the Upper Muddy Creek Watershed/Grizzly WHMA, which includes management of fish populations and habitat (BLM and Wyoming Game and Fish Commission [WGFC] 2010).

A portion of the Application Area is within the Upper Muddy Creek Watershed/ Grizzly WHMA, which is managed to maintain, restore, and enhance habitat for Colorado River fish species unique to the Muddy Creek watershed (BLM 2008b). The portion of Muddy Creek within the Upper Muddy Creek/Grizzly WHMA has been identified as a high priority for aquatic habitat protection as it provides the best opportunity to restore native cold and warm water fish species assemblages in southwestern Wyoming (WGFD 2009b). The upper Muddy Creek watershed provides habitat for game, coldwater fish including Colorado River cutthroat trout, and non-game coldwater fish including mountain suckers, and speckled dace. These species have been successfully restored to promote a population of cold water species (WGFD 2009b). The lower, warm water reach of Muddy Creek supports the only viable assemblage of bluehead suckers, roundtail chubs, and flannelmouth suckers known to still exist in Wyoming (WGFD 2008b) and are considered BLM sensitive species. Habitat degradation has been identified as a water quality concern on Muddy Creek (BLM 2008b). Changes in upland runoff can increase peak flow conditions, reduce base flows critical for maintaining late-season pool habitats, and increase sediment loads (BLM 2008b). Within the Upper Muddy Creek Watershed/Grizzly WHMA, restoration projects, consisting primarily of deferred grazing, have been implemented to allow willows to reestablish along the riparian corridor to reduce the fish habitat degradation (BLM 2008b). Notwithstanding, native fish in the Muddy Creek watershed also are threatened by non-native fish as they hybridize with native fish and compete for habitat and food (BLM 2008b).

Endangered fish species occur downstream from the Application Area, in both the North Platte River basin and the White-Yampa River basin and these species were evaluated elsewhere in this EIS (Sections 3.15 and 4.15, Special Status Species) for potential affects from this project, including by potential reduction in water quantity or quality associated. The pallid sturgeon (*Scaphirhynchus albus*) is an endangered species that lives in the lower Platte River in eastern Nebraska and is discussed in Section 3.15, Special Status Species. While the pallid sturgeon does not occur in or near the project, its habitat in the lower Platte depends in part on flows from the North Platte River and its tributaries (National Research Council of the National Academies 2004). Similarly, the Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail chub (*Gila elegans*) are endangered species that occur in Colorado River system; however,

critical habitat for these species has not been designated in Wyoming (Upper Colorado River Endangered Fish Recovery Program 2009).

Table 3.14-5 Native and Non-native Fish Species Potentially Occurring within the Application Area[1]

Common Name	Scientific Name	Colorado River System	North Platte River System
Native Fish Species			
Colorado pikeminnow	*Ptychocheilus lucius*	X	
Razorback sucker	*Xyrauchen texanus*	X	
Flannelmouth sucker	*Catostomus latipinnis*	X	
Humpback chub	*Gila cypha*	X	
Bonytail chub	*Gila elegans*	X	
Roundtail chub	*Gila robusta*	X	
Bluehead sucker	*Catostomus discobolus*	X	
Creek chub	*Semolitus atromaculatus*	X	X
Mountain sucker	*Catostomus platyrhynchus*	X	
Mottled sculpin	*Cottus bairdii*	X	
Colorado River cutthroat trout	*Oncorhynchus clarkii pleuriticus*	X	
Fathead minnow	*Pimephales promelas*	X	X
Mountain whitefish	*Prosopium williamsoni*	X	
White sucker	*Catostomus commersonii*	X	X
Redside shiner	*Richardsonius balteatus*	X	
Longnose sucker	*Catostomus catostomus*		X
Lake chub	*Couesius plumbeus*		X
Iowa dater	*Etheostoma exile*		X
Johnny darter	*Etheostoma nigrum*		X
Longnose dace	*Rhinichthys cataractae*		X
Brook stickleback	*Culaea inconstans*		X
Brassy minnow	*Hybognathus hankinsoni*		X
Sand shiner	*Notropis stramineus*		X
Pallid sturgeon	*Scaphirhynchus albus*		X
Emerald shiner	*Notropis atherinoides*		X
Snake River cutthroat trout	*Oncorhynchus clarkii*		X

Table 3.14-5 Native and Non-native Fish Species Potentially Occurring within the Application Area[1]

Common Name	Scientific Name	Colorado River System	North Platte River System
Yellowstone cutthroat trout	*Oncorhynchus clarkii bouvieri*		X
Lake trout	*Salvelinus namaycush*		X
Non-Native Fish Species			
Rainbow trout	*Oncorhynchus mykiss*	X	X
Brook trout	*Salvelinus fontinalis*	X	X
Speckled dace	*Rhinichthys osculus*	X	
Common carp	*Cyprinus carpio*		X
Brown trout	*Salmo trutta*		X
Walleye	*Sander vitreus*		X

[1] The following species are not found in the Application Area but are included in the analysis because they may be affected by water depletions downstream of the Application Area in the Colorado River and Platte River watersheds: Colorado pikeminnow, razorback sucker, bonytail chub, humpback chub, and pallid sturgeon.

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
North Platte River-First Cottonwood Draw	North Platte River	Perennial stream/river	Blue	Brassy minnow, brown trout, creek chub, carp, Iowa darter, longnose dace, longnose sucker, rainbow trout, brook stickleback, walleye, and white sucker	Wild
	Seaverson Reservoir	Perennial reservoir	Not Applicable (NA)	Rainbow trout	Basic yield
Little Jack Creek	Beaver Creek	Perennial stream/river	Green	Brook trout, creek chub, fathead minnow, and longnose sucker	Wild
	Little Jack Creek	Perennial stream/river	Yellow	Brook trout	Wild
	Low Creek	Ephemeral stream/river	Green	Brook trout	Wild
	Spring Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Willow Creek	Ephemeral stream/river	Green	Brook trout	Wild
	Low Reservoir	Perennial Reservoir	NA	Rainbow trout	No concept – private
Upper Sage Creek-North Platte River	Sage Creek (Section 2 upstream of Highway 71)	Perennial stream/river	Yellow	Brook trout, creek chub, longnose sucker, and white sucker	Wild
	Middlewood Creek	Perennial Stream/river	Green	Brook trout	Wild
	Trapper Creek	Perennial stream/river	Clear	Creek chub	Wild
	Rawlins Reservoir	Perennial reservoir	NA	Brook trout, rainbow trout, and white sucker	Basic yield
	Adams Reservoir	Perennial reservoir	NA	Brook trout	No concept – private

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
Rasmussen Creek	Rasmussen Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Lone Tree Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	La Marsh Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
Lower Sage Creek-Upper North Platte River	Sage Creek	Perennial stream/river	Clear	Brassy minnow, creek chub, fathead minnow, Johnny darter, longnose dace, longnose sucker, sand shiner, brook stickleback, and white sucker	Wild
Miller Creek	Deadman Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Miller Creek	Perennial stream/river	No data – intermittent	No data – intermittent	No data – intermittent
Upper Little Sage Creek	Emigrant Creek	Perennial stream/river	Clear	Creek chub	Wild
	Little Sage Creek	Perennial stream/river	Clear	Creek chub	Wild
	Pine Grove Creek	Ephemeral stream/river	Clear	Creek chub	Wild
	Miller Hill Lake	Perennial lake/pond	NA	Rainbow trout	Basic yield
	Little Sage Creek Dam	Perennial reservoir	NA	Rainbow trout	Basic yield
	Teton Reservoir	Perennial reservoir	NA	Brown trout, creek chub, rainbow trout, and white sucker	Basic yield
Lower Little Sage Creek	Little Sage Creek	Perennial stream/river	Clear	Creek chub	Wild

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
North Platte River Coal Mine Draw	North Platte River	Perennial stream/river	Red	Brassy minnow, brown trout, creek chub, carp, Johnny darter, longnose dace, longnose sucker, rainbow trout, Snake River cutthroat trout, walleye, white sucker, and Yellowstone cutthroat trout	Wild
North Platte River-Lost Springs Draw	North Platte River	Perennial stream/river	Yellow	Brassy minnow, brown trout, creek chub, carp, cutthroat trout, emerald shiner, Iowa darter, longnose dace, longnose sucker, rainbow trout, walleye, and white sucker	Wild
	Seminoe Reservoir	Perennial reservoir	NA	Brassy minnow, brown trout, carp, emerald shiner, fathead minnow, Iowa darter, Johnny darter, lake trout, lake chub, longnose sucker, rainbow trout, sand shiner, Snake River cutthroat trout, walleye, and white sucker	Basic yield
Iron Springs Draw	Iron Springs Draw	Perennial stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Johnston Number 2 Reservoir	Ephemeral Lake/Pond	Location unknown		
Hugus Draw	Hugus Draw	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Smith Draw	Perennial stream/river	No data – intermittent	No data – intermittent	No data – intermittent

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
Grenville Dome	No Named Waterbodies	NA			
Pass Creek-Stage Station Springs	Pass Creek	Perennial stream/river	Green	Brassy minnow, brown trout, creek chub, fathead minnow, Iowa darter, Johnny darter, lake chub, longnose dace, longnose sucker, rainbow trout, sand shiner, brook stickleback, and white sucker	Wild
Middle Sugar Creek	Coal Creek	Ephemeral stream/river	No data – intermittent	No data – intermittent	No data – intermittent
	Sugar Creek	Perennial stream/river	No data	No data	No data
	Eightmile Lake	Perennial lake	No data	No data	No data
	Rawlins Peaking Reservoir	Perennial reservoir	No data	No data	No data
Lower Sugar Creek	Sugar Creek	Perennial stream/river	No data	No data	No data
101800021304 (Sugar Creek)	No Named Waterbodies	NA			
North Fork Savery Creek	Fish Creek	Perennial stream/river	Green	Brook trout, mottled sculpin, mountain whitefish, mountain sucker, rainbow trout, speckled dace	Wild
	Mill Creek	Perennial stream/river	Green	Brook trout	Wild
	North Fork Savery Creek	Perennial stream/river	Yellow	Brook trout, mottled sculpin, mountain sucker, mountain whitefish, rainbow trout, specked dace	Wild
	Truckdrivers Creek	Perennial stream/river	Green	Brook trout, creek chub, mottled sculpin, rainbow trout, speckled dace	Wild
	Twin Groves Reservoir	Perennial reservoir	Do not know waterbody by this name		Wild

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
Little Savery Creek	Little Savery Creek	Perennial stream/river	Green	Brook trout, brown trout, creek chub, Colorado cutthroat trout, mottled sculpin, mountain sucker, rainbow trout, redside shiner, speckled dace, white sucker	
	McCarty Creek	Perennial stream/river	Green	Brook trout, Colorado cutthroat trout, mottled sculpin	Basic yield
Muddy Creek-Littlefield Creek	Littlefield Creek	Perennial stream/river	Green	Bluehead sucker, Colorado cutthroat trout, flannelmouth sucker, mountain sucker, speckled dace, roundtail chub	Basic yield
	Muddy Creek	Perennial stream/river	Green	Bluehead sucker, creek chub, Colorado cutthroat trout, fathead minnow, mottled sculpin mountain sucker, speckled dace, roundtail chub, white sucker	Unique species

Table 3.14-6 Waterbodies within the Application Area and Associated Fish Species and WGFD Management Concepts

Sub-Watershed Name	Waterbody Name	Intermittent or Perennial Stream/River, Reservoir or Lake[1]	WGFD Trout Stream Classification[2]	Fish Species Present	Management Concept[3]
McKinney Creek	Eagle Creek	Ephemeral stream/river	Clear	No fish present	No concept
	Grove Creek	Perennial stream/river	Green	Bluehead sucker, brook trout, Colorado cutthroat trout, mountain sucker, speckled dace, roundtail chub, white sucker	Wild
	McKinney Creek	Perennial stream/river	Yellow	Bluehead sucker, brook trout, creek chub, fathead minnow, mountain sucker, speckled dace, roundtail chub, white sucker	Wild
	Muddy Spring Creek	Perennial stream/river	Do not know waterbody by this name		
	Stoney Creek	Perennial stream/river	Green	Brook trout	Wild

[1] Stream classifications listed reflect the highest flow regime stream reach within the sub-watershed and Application Area. Most streams contain reaches in lower flow regimes as well as the highest listed.

[2] Trout stream classification definitions:

Blue ribbon trout stream: is a trout stream of national importance with greater than 600 pounds of trout per mile.

Red ribbon trout stream: is a trout stream of statewide importance with 300-600 pounds of trout per mile.

Yellow ribbon trout stream: is a trout stream of regional importance with 50-300 pounds of trout per mile.

Green ribbon trout stream: is a trout stream of local importance with less than 50 pounds of trout per mile.

[3] Management concepts:

Wild is designated as a self sustaining trout population.

Basic yield is dependent on stocking of fingerlings to sub catchable trout. Basic Yield management does not rely on natural spawning of a trout species.

3.15 Special Status Species

Special status species include federally listed species that are protected under the ESA and species designated as sensitive by the BLM (BLM 2008h). Species listed under the ESA or BLM sensitive species that occur within the RFO district and their associated habitats are presented in **Appendix K**.

As defined by the ESA, an endangered species is any species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Proposed species are those that are proposed in the Federal Register by the USFWS to be listed as threatened or endangered. The BLM also maintains a list of plant and animal species that are designated as sensitive for which population viability is a concern, as indicated by a downward trend in population numbers, density, or habitat conditions that would reduce a species existing distribution.

In accordance with the ESA, the lead agency in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. As part of the coordination and consultation process with the USFWS, a Biological Assessment will be prepared and submitted to the USFWS. This document and corresponding BO will be included in **Appendix L**. In addition, it is currently the BLM's policy that agency actions do not contribute to the federal listing as threatened or endangered (BLM Manual 6840) any federal candidate species or sensitive species.

3.15.1 Federally Listed Species

Carbon County does not contain ESA critical habitat for any plant or animal species (USFWS 2008a). Notwithstanding, the Application Area potentially provides habitat for one federally listed wildlife species, the black-footed ferret (*Mustela nigripes,* endangered), and two federally listed threatened plant species, the Ute ladies'-tresses orchid (*Spiranthes diluvialus*) and Colorado butterfly plant (*Guara neomexicana* spp. *coloradensis*). Although potential sites for the Colorado butterfly plant exist within the Application Area, the elevation is higher than its known range; 5,000 to 6,400 feet (NatureServe 2008), thus, it would be unlikely to occur in the Application Area.

It is assumed that a pre-determined amount of water will be required during the 4 year construction of the proposed project. Furthermore, it is possible that all of the water might come from the Platte River Watershed. However, a small portion may be extracted from the Colorado River watershed. Depending on the source of water needed for construction, there could be depletions to the Platte River and Colorado River watersheds. Depletions within the Platte River watershed would potentially impact federally listed species found in the Platte River system in Nebraska including: the whooping crane (*Grus americana,* endangered); interior least tern (*Sterna antillarum*, endangered); piping plover (*Charadrius melodus*, threatened); pallid sturgeon (*Scaphirhyncus albus*, endangered); and western prairie fringed orchid (*Platanthera praeclara*, threatened). Depletions within the Colorado River watershed would potentially impact four federally listed species found in the Colorado River in Colorado including: the Colorado pikeminnow (*Ptychocheilus luscious,* endangered); bonytail chub (*Gila elegans,* endangered); humpback chub (*Gila cypha,* endangered); and razorback sucker (*Xyrauchen texanus,* endangered). Details regarding the amount of water required for the proposed project are discussed further in Section 4.15, Special Status Species.

Evaluations of potential habitat for the black-footed ferret and efforts to locate the two plant species within a portion of the Application Area were conducted during 2008 (WEST 2008e,g,h). Because facility locations were not finalized prior to the end of the flowering periods, the Chokecherry area was only partially surveyed for the plant species. Because the change to a programmatic approach to the NEPA analysis, further site-specific rare plant surveys were delayed through the issuance of the ROD or until the surface disturbance layout has been identified.

3.15.1.1 Federally Listed Species Found in Wyoming

Black-Footed Ferret (Federally Endangered)

The black-footed ferret was historically distributed across the western plains of North America wherever prairie dogs occurred (Anderson et al. 1986). Black-footed ferrets are very specialized in their habitat requirements and are dependent on prairie dog colonies for survival (Biggins et al. 1985). Prairie dogs compose more than 90 percent of black-footed ferret diets (Campbell et al. 1987). Because of large-scale reductions in prairie dog populations, black-footed ferrets were nearly extirpated by the 1980s. Recovery and reintroduction programs have established at least six experimental populations in seven states throughout the west including Wyoming.

Surveys were conducted to locate and delineate white-tailed prairie dog activity and potential colony complexes that occur within a portion of the Application Area to determine if black-footed ferrets could possibly occur there. Observations and mapping of areas were conducted from aircraft and ground surveys in conjunction with other biological studies being conducted within the Application Area during the months of May through September 2008 (WEST 2008e).

Block-cleared areas are defined by the USFWS as areas that no longer require black-footed ferret surveys based on the perception that the potential for an extant population of ferrets in those areas is minimal. There is no physical evidence to suggest that colonies within the non block-cleared areas of the Application Area ever supported anything but small, perhaps ephemeral, scattered pockets of prairie dogs and would be of poor quality for black-footed ferrets. The only active burrows within the Chokecherry area occurred within the block-cleared area on the eastern third of the surveyed portion of the Application Area. A few scattered burrows were located within the Chokecherry area; however, there was no evidence of recent activity. The Sierra Madre area had more active burrows and two live prairie dogs were observed, yet activity was extremely low. There are only two small areas on the Sierra Madre area identified that potentially could provide habitat for black-footed ferrets. The best observed potential ferret habitat with active prairie dog colonies was found along proposed access and utility corridors that would connect the CCSM areas. The utility and access corridor areas between the CCSM areas support two small clusters of scattered prairie dog burrows. In addition, there are two general areas of relatively extensive prairie dog colonies (circumscribed by boundaries in excess of 1,500 and 2,000 acres, respectively). However, prairie dog burrows within the two large areas are somewhat scattered in distribution and not contiguous throughout.

Recently, prairie dog towns associated with the Bolten Ranch non-blocked cleared complex have been mapped; however, this information is not currently available. It is anticipated that the mapping information will be available prior to construction and will be utilized for the micro-siting of the proposed development (H. Cline, BLM, personal communication, 2010). Furthermore, black-footed ferret surveys (between December and March) must occur within the year preceding actual site project construction and prior to approval of surface disturbing activities on public lands.

Colorado Butterfly Plant (Federally Threatened)

The Colorado butterfly plant occurs on subirrigated, alluvial (stream deposited) soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5,000 to 6,400 feet. Colonies are often found in low depressions or along bends in wide, active, meandering stream channels a short distance upslope of the actual channel. The plant requires early- to mid- succession riparian (river bank) habitat. The Colorado butterfly plant habitat is usually intermediate in moisture between wet, streamside communities dominated by sedges (*Carex* spp.), rushes (*Juncus* spp.), and cattails (*Typha* spp.), and dry, upland shortgrass prairie. Typical habitat is open, without dense or overgrown vegetation. Coyote willow (*Salix exigua*) and Canada thistle (*Cirsium arvense*) may become dominant in habitats that are not periodically flooded or otherwise disturbed. The Colorado butterfly plant occurs on soils derived from conglomerates, sandstones, and tuffaceous mudstones and siltstones of the Tertiary White River, Arikaree, and Ogallala Formations. These soils are common in eastern Colorado and Wyoming

(FR Vol. 65, No. 202, October 18, 2000). The Colorado butterfly plant can only be reliably found and identified when it is flowering, which typically occurs sometime during the period from mid-July until the first hard frost of autumn, usually late September or early October.

No Colorado butterfly plants were located in the Application Area; however, due to time constraints a survey of the entire Chokecherry area was not completed in 2008. Because the change to a programmatic approach to the NEPA analysis further site-specific rare plant surveys were delayed until the issuance of the ROD or the final surface disturbance layout has been identified.

Ute Ladies'-Tresses Orchid (Federally Threatened)

Ute ladies'-tresses orchid is endemic to moist soils near springs, lakes, or perennial streams (USFWS 1995a). The elevation range of known Ute ladies'-tresses orchid occurrences is 4,200 to 7,000 feet. Most of the occurrences are in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows in the floodplains of perennial streams, but some locations are near freshwater lakes or springs. The Ute ladies'-tresses orchid appears to require moisture in the rooting zone, typically provided by a high groundwater table, through the growing season and into late summer or early autumn. The Ute ladies'-tresses orchid is well adapted to disturbances caused by stream movement through floodplains over time, and is tolerant of other disturbances, such as grazing, that may mimic natural disturbances in their effects on riparian habitat. Suitable potential habitat is typically found along streams that experience heavy spring runoff of sufficient magnitude to create movement and reshaping of the stream channel. Ute ladies'-tresses orchid plants usually occur as small, scattered groups and occupy relatively small areas within the riparian system. It is not known how, under what conditions, and in what time frame the Ute ladies'-tresses orchid is dispersed and how new viable colonies become established. The Ute ladies'-tresses orchid is generally intolerant of deep shade and strongly alkaline or clay soils, and cannot compete with aggressive rhizomatous species or exotic species.

No Ute ladies'-tresses orchid were located in the Application Area; however, due to time constraints a survey of the entire Chokecherry area was not completed in 2008. Because the change to a programmatic approach to the NEPA analysis, further site-specific rare plant surveys were delayed until the issuance of the ROD or the final surface disturbance layout has been identified.

3.15.1.2 Platte River System Federally Listed Species

Whooping Crane (Federally Endangered)

The central Platte River provides important stopover habitat along the migration route of the whooping crane, between the wintering grounds in coastal Texas and the summer breeding grounds in north central Canada (NRCNA 2004). Migrating birds travel through Nebraska twice a year, usually in April and October. The central Platte River provides several important in-channel roosting areas for migrating birds that are not wooded and provide open areas separated from the banks and other visual obstructions by braded channels, increasing security for roosting birds. Wetlands, wet meadows and agricultural fields adjacent to these roosting sites provide important forage for migrating birds. While the North Platte River does not provide habitat for the whooping crane, the roosting sites in the central Platte River are sensitive to reductions in flows during critical periods as defined by the USFWS in their flow targets (Platte River Recovery Implementation Program 2006and a large portion of the flows come from the North and South Platte rivers in Wyoming and Colorado.

Interior Least Tern (Federally Endangered) and Piping Plovers (Federally Threatened)

The interior least tern is listed as endangered in Nebraska, Colorado, and Montana, but does not occur in Wyoming (USFWS 2008b). The piping plover is considered threatened, in most of the western Great Plains states, however, it is not known to occur in Wyoming (USFWS 2008c). The Great Plains populations of these species are dependent upon the central and lower Platte River for survival and

recovery (NRCNA 2004). Piping plovers and interior least terns have similar nesting habitat preferences including open, sandy, beach-like areas (NRCNA 2004). The suppressed variability in flow on the Platte River has reduced sandbars and beaches, and reduced aquatic habitat for invertebrate and fish prey items for the plover and tern, respectively (NRCNA 2004). While the North Platte River does not provide habitat for the two species, their habitat along the central Platte River in Nebraska is sensitive to reductions in flows during critical periods as defined by the USFWS (Platte River Recovery Implementation Program 2006), and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado.

Pallid Sturgeon (Federally Endangered)

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 (Platte River Recovery Implementation Program 2006), and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado.

Western Prairie Fringed Orchid (Federally Threatened)

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 (Sidle and Faenes 1997). 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 (Platte River Recovery Implementation Program 2006), and a large portion of these flows come from the North and South Platte rivers in Wyoming and Colorado.

3.15.1.3 Colorado River System Federally Listed Species

Colorado Pikeminnow, Bonytail Chub, Humpback Chub and Razorback Sucker (Federally Endangered)

The Colorado pikeminnow, bonytail chub, humpback chub, and razorback sucker are endemic species to the Colorado River System (BLM 2008b). These species do not occur within the Application Area; however, actions occurring within the Application Area could affect the downstream habitats of these species, primarily if actions result in water depletions. A recovery plan and Recovery Implementation Program have been approved (BLM 2008b), which requires consultation with the USFWS when potential water depletions might affect these fish species.

3.15.2 BLM Sensitive Species

According to the *BLM Wyoming Sensitive Species Policy and List* (BLM 2010c), potential habitat for several BLM sensitive species occurs within the Application Area, including 6 plants, 6 mammals, 11 bird species, 2 amphibians, and 4 fish (**Table 3.15-1**). The BLM requested that two additional species be considered in this analysis, the North Park phacelia (*Phacelia formosula*), and pale blue-eyed grass (*Sisyrinchium pallidum*).

3.15.2.1 Plants

A review of the BLM and WYNDD plant records concluded that only persistent sepal yellowcress (*Rorippa calycina)* has been documented within 1 mile of the Application Area. The species was located within approximately 1,300 feet of the Chokecherry area in 1981 and again in 1992. Surveys for these

plants within the Application Area were conducted during 2008; however, only a portion of the Chokecherry area was surveyed due to time constraints. Because the change to a programmatic approach to the NEPA analysis, further site-specific rare plant surveys were delayed until the issuance of the ROD or the final surface disturbance layout has been identified (WEST 2008g). None of the BLM sensitive plant species were located within the areas surveyed.

Table 3.15-1 BLM Sensitive Species Potentially Occurring in the Application Area

Common Name	Scientific Name	Habitat
Mammals		
Long-eared Myotis	*Myotis evotis*	Varied from grassland to conifer and deciduous forests, humid coastal forests, caves, and mines
Fringed Myotis	*Myotis thysanodes*	Conifer forests, woodland-chaparral, caves, and mines
Pygmy Rabbit	*Brachylagus idahoensis*	Basin-prairie and riparian shrub.
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves, and mines.
White-tailed Prairie Dog	*Cynomys leucurus*	Basin-prairie and riparian shrub.
Wyoming Pocket Gopher	*Thomomys clusius*	Dry, gravelly, shallow-soil ridge tops within greasewood.
Birds		
Bald Eagle	*Halieaeetus leucocephalus*	Riparian areas, lakes, rivers, streams.
Ferruginous Hawk	*Buteo regalis*	Basin-prairie shrub, grasslands, rock outcrops.
Greater Sage-grouse	*Centrocercus urophasianus*	Basin-prairie shrub, mountain-foothill shrub.
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	Grasslands, mountain-foothill shrub.
Long-billed Curlew	*Numenius americanus*	Grasslands, plains, foothills, wet meadows
Mountain Plover	*Charadrius montanus*	Grasslands, plains, basin-prairie shrub
Burrowing Owl	*Athene cunicularia*	Grasslands, basin-prairie shrub.
Sage Thrasher	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub.
Loggerhead Shrike	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub.
Brewer's Sparrow	*Spizella breweri*	Basin-prairie shrub.
Sage Sparrow	*Amphispiza belli*	Basin-prairie shrub, mountain-foothill shrub.

Table 3.15-1 BLM Sensitive Species Potentially Occurring in the Application Area

Common Name	Scientific Name	Habitat
Amphibians		
Northern Leopard Frog	*Rana pipiens*	Beaver ponds, permanent water in plains and foothills
Boreal Toad	*Bufo boreas boreas*	Wetlands, forests, woodlands, sagebrush, meadows and floodplains
Great Basin Spadefoot Toad	*Spea intermontana*	Spring seeps, permanent and temporary waters
Fish		
Roundtail Chub	*Gila robusta*	Colorado River drainage, mostly large rivers, also streams and lakes
Bluehead Sucker	*Catostomus discobolus*	Bear, Snake, and Green rivers drainages, all waters
Flannelmouth Sucker	*Catostomus latipinnis*	Colorado River drainage, large rivers, streams and lakes
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	Colorado River drainage, clear mountain streams
Plants		
Cedar Rim Thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, and sandy-shaley draws.
Colorado Butterfly Plant	*Gaura neomexicana* spp. *coloradensis*	Sub-irrigated alluvial soils of drainage bottoms surrounded by mixed grass prairie.
Gibbens' Penstemon	*Penstemon gibbensii*	Pinyon pine/juniper, sagebrush, greasewood-saltbush (sparsely vegetated shale or sandy-clay slopes on Browns Park Formation).
Persistent Sepal Yellowcress	*Rorippa calycina*	Moist, sandy, muddy streambanks (semi-disturbed or recently flooded).
Laramie False Sagebrush	*Sphaeromeria simplex*	Cushion plant communities on rocky limestone ridges.

3.15.2.2 Mammals

Long-eared Myotis

The long-eared myotis (*Myotis evotis*) has a range that extends from central British Columbia south through much of the western U.S. and south to Arizona and New Mexico (Buseck and Keinath 2004). This species utilizes a wide variety of habitats ranging from grasslands and conifer forests to humid coastal and mountain forests. Little is known about the abundance of this species within Wyoming, but the species has been documented elsewhere and is known to be fairly common if suitable roosting and foraging habitat is present (Buseck and Keinath 2004). This species does not aggregate at readily accessible traditional roost sites making it difficult to determine the population status; therefore, no

information exists on population status and trend for this species within Wyoming or throughout its range (Buseck and Keinath 2004). It is thought that the long-eared myotis has more restrictive landscape requirements than other bats, as long-eared myotis require major habitat components to be in very close proximity to each other. The reason is unknown, but Buseck and Keinath (2004) suggested such requirements are linked to the energy conservation. A review of the WYNDD records concluded this species has not been documented within the Application Area or within a 1 mile buffer. A description of the general bat activity detected within the Application Area is provided in Section 3.14, Wildlife and Fisheries Resources. Long-eared myotis calls were considered HF for the studies conducted within the Application Area. Both LF and HF calls were detected during the survey efforts; however, a greater percent of the calls overall were HF. Species identification during the surveys was only possible for the hoary bat.

Fringed Myotis

The fringed myotis (*Myotis thysanodes*) is predominately a western species with a range that extends from southern British Columbia south through southern Mexico (Keinath 2003). Fringed myotis occurs west of the Rocky Mountains to the Pacific coast, with the exception of a population in the Black Hills of South Dakota and Wyoming. This species is found throughout Wyoming and does not appear to be substantially influenced by major topographic features such as mountains (Keinath 2003). This species appears to be rare throughout its range, representing only a small portion of the bats detected during surveying efforts; however, in some areas it can be locally abundant with reasons not fully understood (Keinath 2003). The rarity of this species makes it difficult to determine population status. In Wyoming, it appears as if the population of fringed myotis has declined, as recent survey efforts according to WYNDD (unpublished data), did not record any individuals in northwestern Wyoming where there are historical records (Keinath 2003). A review of the WYNDD records concluded this species has not been documented within the Application Area or within a 1 mile buffer. A description of the general bat activity detected within the Application Area is provided in Section 3.14, Wildlife and Fisheries Resources. Similar to the long-eared myotis, fringed myotis calls were considered LF for the studies conducted within the Application Area; however, a greater number of HF calls were detected. Again, species identification was only possible for the hoary bat.

Townsend's Big-eared Bat

The range of the Townsend's big-eared bat (*Corynorhinus townsendii*) is extensive, including most of the western U.S., British Columbia, central Mexico, and the Baja Peninsula; however, it appears to be relatively uncommon throughout its range (Gruver and Keinath 2003). Townsend's big-eared bats are dependent upon the cave-like structures for shelter during all phases of their life cycle (Gruver and Keinath 2003). Townsend's big-eared bats are sensitive to a variety of intrinsic biological factors, including its habitat specificity, fragmented distribution, low reproductive rates, and intolerance of direct disturbance (Gruver and Keinath 2003). A review of the WYNDD records concluded this species has not been documented within the Application Area or within a 1 mile buffer. A description of the general bat activity detected within the Application Area is provided in Section 3.14, Wildlife and Fisheries Resources. As with the long-eared and fringed myotis, Townsend's big-eared bat calls were considered LF for the studies conducted within the Application Area. Both LF and HF calls were detected during the survey efforts; however, a greater percent of the calls overall were HF and species identification was only possible for the hoary bat.

Pygmy Rabbit

The pygmy rabbit (*Brachylagus idahoensis*), according to recently published range maps (Keinath and McGee 2004; WGFD 2005a), occurs in patches within the Great Basin and is known to occur in the southwestern portions of Wyoming. However, based on unpublished data (WEST 2008i, unpublished) the range for pygmy rabbits in Wyoming has been documented to be considerably larger, extending 116 miles east of the known range. Additionally, the unpublished data also contradicts the characterizations of patchy distribution associated with tall, dense stands of big sagebrush

(Keinath and McGee 2004). Rather, the unpublished data recorded high pygmy rabbit use in low sagebrush habitats as well as tall, dense stands of big sagebrush. Pygmy rabbits are dependent upon sagebrush for 99 percent of their winter diet and excavate their own burrows (WGFD 2005a). Therefore, based on the unpublished data it is likely that the Application Area is within the range of and provide suitable habitat for the pygmy rabbit. Additionally, a habitat model developed by WYNDD (2008) shows the probability of occurrence throughout the Application Area (**Figure 3.15-1**).

White-tailed Prairie Dog

The white-tailed prairie dog (*Cynomys leucurus*) activity and habitat within a portion of the Application Area were assessed in conjunction with the black-footed ferret evaluation (WEST 2008e) as described above. Primarily, prairie dog activity was observed within the "block-cleared" area within the eastern third of the Chokecherry area and along the utility corridor between the CCSM areas. Prairie dog activity was extremely low within the Sierra Madre area.

Wyoming Pocket Gopher

Information regarding the Wyoming pocket gopher (*Thomomys clusius*) is limited (Beauvais and Dark-Smiley 2005; WGFD 2005a), this species is only known to occur in Carbon and Sweetwater counties of Wyoming; however, it is possible populations extend into northern Colorado (Beauvais and Dark-Smiley 2005). Wyoming pocket gophers have been located in dry, gravelly, shallow-soil ridge tops within greasewood (*Sarcobatus vermiculatus*) plant communities (Beauvais and Dark-Smiley 2005). Burrow systems associated with pocket gophers range from 6 inches to 1 foot below the surface, typically consisting of a network of feeding tunnels connected to a smaller and deeper system of chambers that are used for nesting and food storage (Beauvais and Dark-Smiley 2005). Suitable habitat for Wyoming pocket gophers is found scattered throughout the Application Area and based on a habitat model developed by WYNDD (2008), likely occurs within the Application Area (**Figure 3.15-2**).

3.15.2.3 Birds

Bald Eagle

Historically, bald eagles occurred throughout most of North America in a variety of habitats. In Wyoming, the number of bald eagle nesting pairs has increased from 35 in 1980 to over 185 pairs today (Faulkner 2010). Due to increasing populations this species was removed from the list of federally threatened species in 2007. Generally, bald eagles require areas in close proximity to water for nesting and foraging, and most nesting in Wyoming occurs near major river systems, large lakes and reservoirs, while wintering eagles tend to concentrate along major river systems, including the North Platte River (Faulkner 2010). During winter, areas with abundant, readily available food sources and good roost sites are preferred. Roosts are generally old large trees where visibility is good and human disturbances are low (Green 1985). In winter, the population of bald eagles in Wyoming increases due to an influx of migrants from the north (Travsky and Beauvais 2004). During the avian baseline study conducted for the project, only two bald eagles were observed, indicating the Application Area receives very little use by this species (WEST 2008f). The vast majority of the Application Area does not provide suitable nesting or roosting habitat. No active bald eagle nests were found on or within 1 mile of the Application Area during surveys conducted in 2008 and 2009 (WEST 2008f). However, in the 30-year period since 1980, the BLM has records of 17 bald eagle nests along the North Platte River just east of the Application Area.

Ferruginous Hawk

Ferruginous hawks (*Buteo regalis*) require large tracts of undisturbed semiarid open country, primarily grasslands, basin-prairie shrublands, and badlands, and are common residents in this type of landscape in Wyoming. This species nests on outcrops, prominences on the ground, cutbanks, cliff ledges, and

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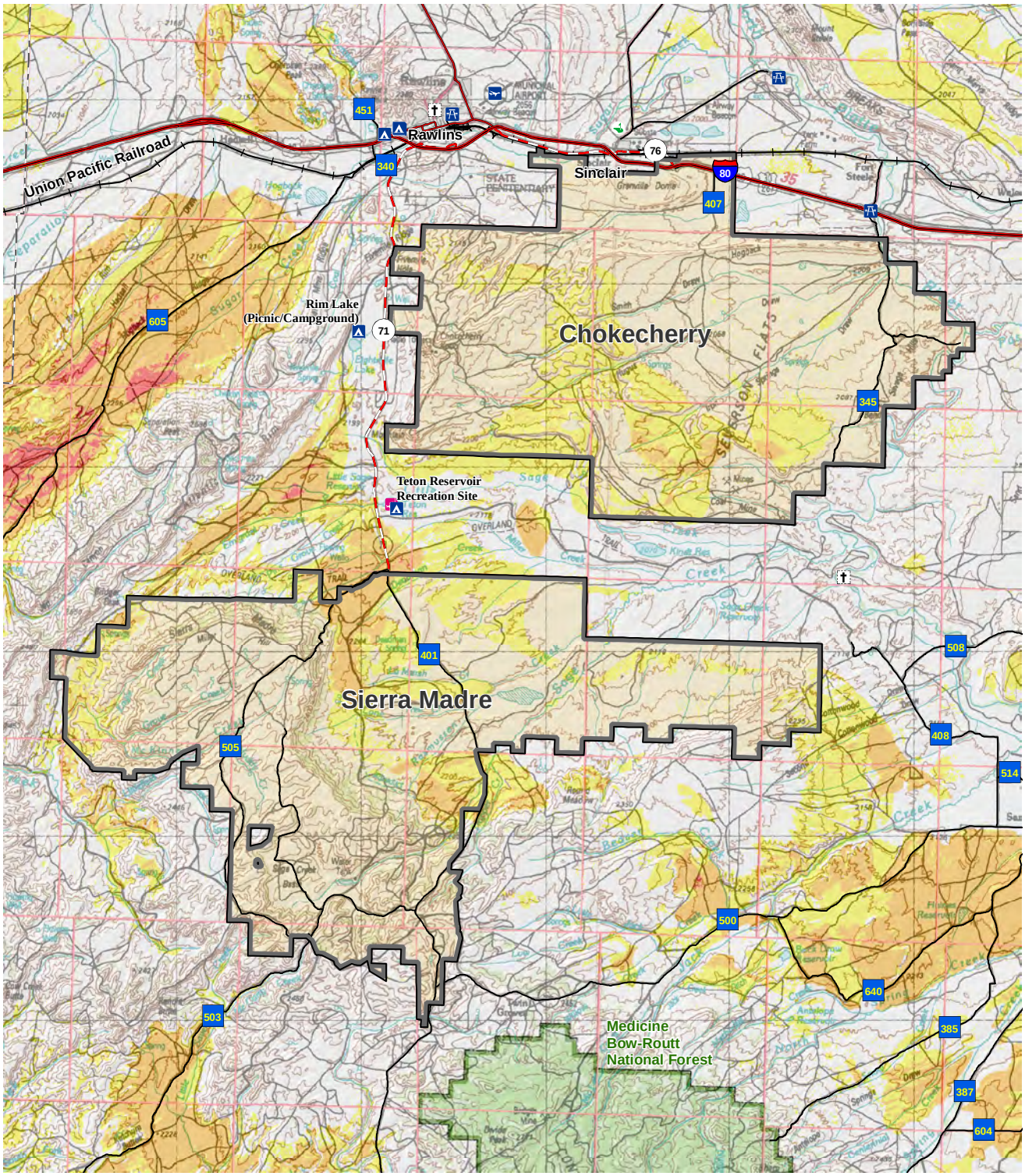

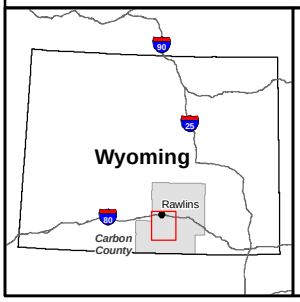

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest

Pygmy Rabbit Distribution*

- Low Probability
- Moderate Probability
- High Probability
- Very High Probability

*Source: Wyoming Natural Diversity Database 2008

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.15-1

Pygmy Rabbit Distribution Model

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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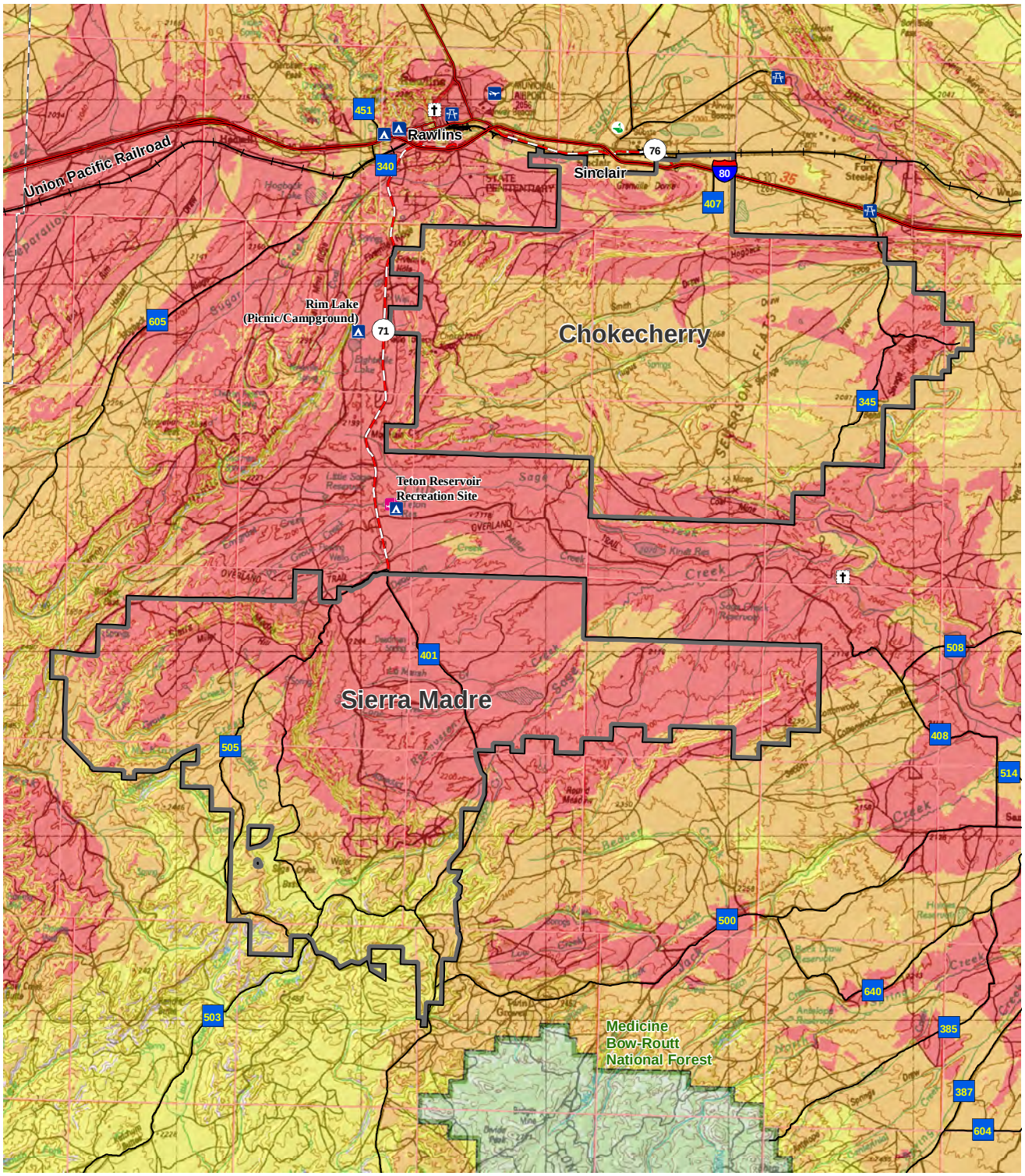

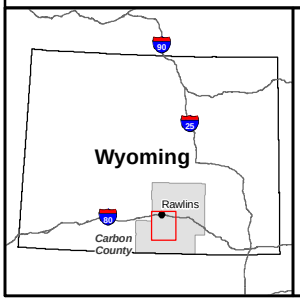

Legend

- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Application Area
- National Forest

Wyoming Pocket Gopher Distribution*

- Absent
- Low Probability
- Moderate Probability
- High Probability

*Source: Wyoming Natural Diversity Database 2008

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.15-2

Wyoming Pocket Gopher Distribution Model

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

trees. The western two-thirds of Carbon County have the highest nesting density of ferruginous hawks in Wyoming (BLM 2008g). Ferruginous hawk populations in Wyoming are restricted in distribution and are sensitive to human disturbance (WGFD 2005a). Generally, ferruginous hawk nesting habitat in Wyoming is being utilized for energy development which can potentially decrease prey abundance and/or reduce availability of nesting sites (WGFD 2005a). Five ferruginous hawks were detected during fixed-point bird use surveys conducted as part of a baseline avian study in the Application Area. Additionally, eight ferruginous hawks were recorded outside of the standardized fixed-point surveys. No ferruginous hawk nests were located during aerial or ground nest surveys conducted within 1 mile of the Application Area (WEST 2008f), although during a 28 year period starting in 1980 the BLM recorded 25 active ferruginous hawk nests within 1 mile of the Application Area (WEST 2008f).

Burrowing Owl

Burrowing owls (*Athene cunicularia*) are considered uncommon summer residents in Wyoming and utilize a wide variety of arid and semiarid environments characterized by sparse vegetation and bare ground (WGFD 2005a). Burrowing owls are dependent upon burrowing mammals, such as prairie dogs and ground squirrels, for nesting, roosting, and escape cover (WGFD 2005a) and their abundance and distribution is determined by the presence of these species. One burrowing owl was recorded outside of the standardized fixed-point surveys within the Chokecherry area during the baseline avian study (WEST 2009b).

Columbian Sharp-tailed Grouse

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus)* occur in a broad range of plant communities dominated by grasses and shrubs in steppe, grassland, and mixed-shrub habitats throughout the north-central U.S. and central and south-central Canada (Connelly et al. 1998). The species occurs in scattered pockets in northwestern and south-central Wyoming in the mountain-foothills shrub and sagebrush-snowberry habitat in the transitional zone between sagebrush-grass and forested habitats (WGFD 2005a). Breeding habitat generally consists of dense herbaceous cover and shrubs, but key species of vegetation may vary considerably (Connelly et al. 1998). Leks typically occur on elevated areas with little slope and low, sparse vegetation providing good visibility. Brood-rearing areas require a mosaic of dense shrubs and grasses with rich forb and insect foods (WGFD 2005a). Habitat for this species has been declining due to conversion of habitat to cropland and human development. Columbian sharp-tailed grouse were not detected during the baseline avian use study of the Application Area (WEST 2009b); however, the WYNDD reported an observation in 2002 within 2 miles of the Application Area.

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) was petitioned for listing as threatened or endangered under the ESA. The USFWS announced on March 4, 2010 (FR 2010) that the greater sage-grouse would not be listed as threatened or endangered, but would be placed on the candidate species list. It was stated that the listing under the ESA was warranted, but precluded by higher priority listing actions.

Four habitats are considered essential to maintaining greater sage-grouse populations: lekking or strutting grounds, nesting, brood-rearing, and winter habitats. Baseline studies were conducted to locate and document leks and brood-rearing habitats within the Application Area in 2008 and 2009. In areas where breeding habitat is uniform and the population is non-migratory, nest habitat is generally within a 2 mile radius of leks, according to several studies (Braun et al. 1977; Connelly et al. 2000). Therefore, the lek survey would likely represent the nesting habitat within the Application Area. Suitable winter habitat found within the Application Area typically includes sagebrush extending approximately 10 to 14 inches above the snow providing leaves and buds for forage, or on southwest facing slopes or relatively flat areas where the snow is routinely blown clear of the sagebrush. Canopy cover associated with winter habitat ranges from 10 to 30 percent.

Lek Surveys

Greater sage-grouse in Wyoming are managed by the WGFD, while most of their habitat is located on federal or private lands. The conservation of the species in Wyoming is currently coordinated by the WGFD in cooperation with regional greater sage-grouse working groups in an attempt to increase grouse population levels and avoid federal listing under the ESA. In an effort to prevent listing of greater sage-grouse, the WGFD has recently completed a revised map of greater sage-grouse core breeding areas. These include areas with the highest densities of breeding greater sage-grouse in the state, as well as identified areas important for connectivity between populations. The core population areas include roughly 25 percent of the state but 83.1 percent of the greater sage-grouse population is found in the western part of the state. The Application Area includes portions of the South Rawlins Core Population Area (**Figure 3.15-3**).

Baseline data on greater sage-grouse leks in the Application Area was obtained during the springs of 2008 and 2009 (WEST 2009c, 2008c). The surveys conducted in 2008 were based on the initial Application Area, which was smaller than the current Application Area and the WGFD protocol for lek surveys required a 2-mile buffer around affected areas. By spring of 2009, the Application Area was delineated for the project and the WGFD protocols also were modified to require a 4-mile buffer for lek surveys (Holloran and Anderson 2005). Therefore, surveys in 2009 were conducted to gather baseline information for the expanded Chokecherry and Sierra Madre areas and additional buffer.

The objective of the 2008 and 2009 surveys was to determine the presence of activity at historical leks and to locate, map, and document activity at new leks within the Application Area and a 4-mile buffer area. Surveys consisted of aerial and ground survey efforts. Aerial surveys were conducted to locate and map historic and new leks within the identified Application Area, as well as document activity. Ground surveys were then conducted at the mapped leks to record activity. In accordance with the WGFD biological techniques (Christiansen 2007), a lek was considered active if it had been attended by male greater sage-grouse during the strutting season when the surveys took place, which includes observation of birds using the site or signs of strutting activity.

Based on WGFD records, at least 22 historic and existing greater sage-grouse leks occur within the Application Area and a 4-mile buffer. During the 2008 aerial surveys, a total of 28 leks, including six previously unrecorded leks (hereafter new leks) were mapped within the initial Application Area and 2-mile buffer. Sixteen of the 28 leks were active, including 10 previously documented and the six new leks (WEST 2008c). At two of these leks, Hillside in Chokecherry and New Lek 2 in Sierra Madre, three males were observed during aerial surveys but no males were ever detected during subsequent ground surveys; therefore, the status of these leks is uncertain, but they were treated as active leks for this analysis.

Ground surveys in 2008 were conducted at the 28 leks detected during aerial surveys. During ground surveys a total of 14 of the leks were determined to be active in the Application Area; therefore, with the inclusion of the two active leks observed during aerial surveys a total of 16 active leks were recorded in 2008. Eight of the 16 lek locations within the Chokecherry area were active in 2008 and included two of the six new leks. Using maximum counts for each lek, 161 males and 35 females were counted on these eight leks (**Table 3.15-2**). The number of males on each active lek ranged from 3 to 34 and averaged 22.6. Similarly, 8 of the 16 leks within the Sierra Madre area were active in 2008 and included 4 of the 6 new leks. Using maximum counts for each lek, 123 males and 9 females were counted on these 8 leks (**Table 3.15-2**). The number of males on each active lek ranged from 3 to 31 and averaged 15.4.

Additional baseline data surveys for greater sage-grouse leks were conducted in the spring of 2009 to supplement both the 2008 lek surveys by resurveying the six new leks discovered during 2008 and conducting surveys in portions of the Application Area that had not been surveyed, including the extended buffer area totaling 4 miles around the expanded Application Area. Aerial survey efforts in 2009 located 10 historic leks, all within the extended buffer area with the exception of Deadman Creek, which is located within the Sierra Madre expansion area (**Figure 3.15-3**).

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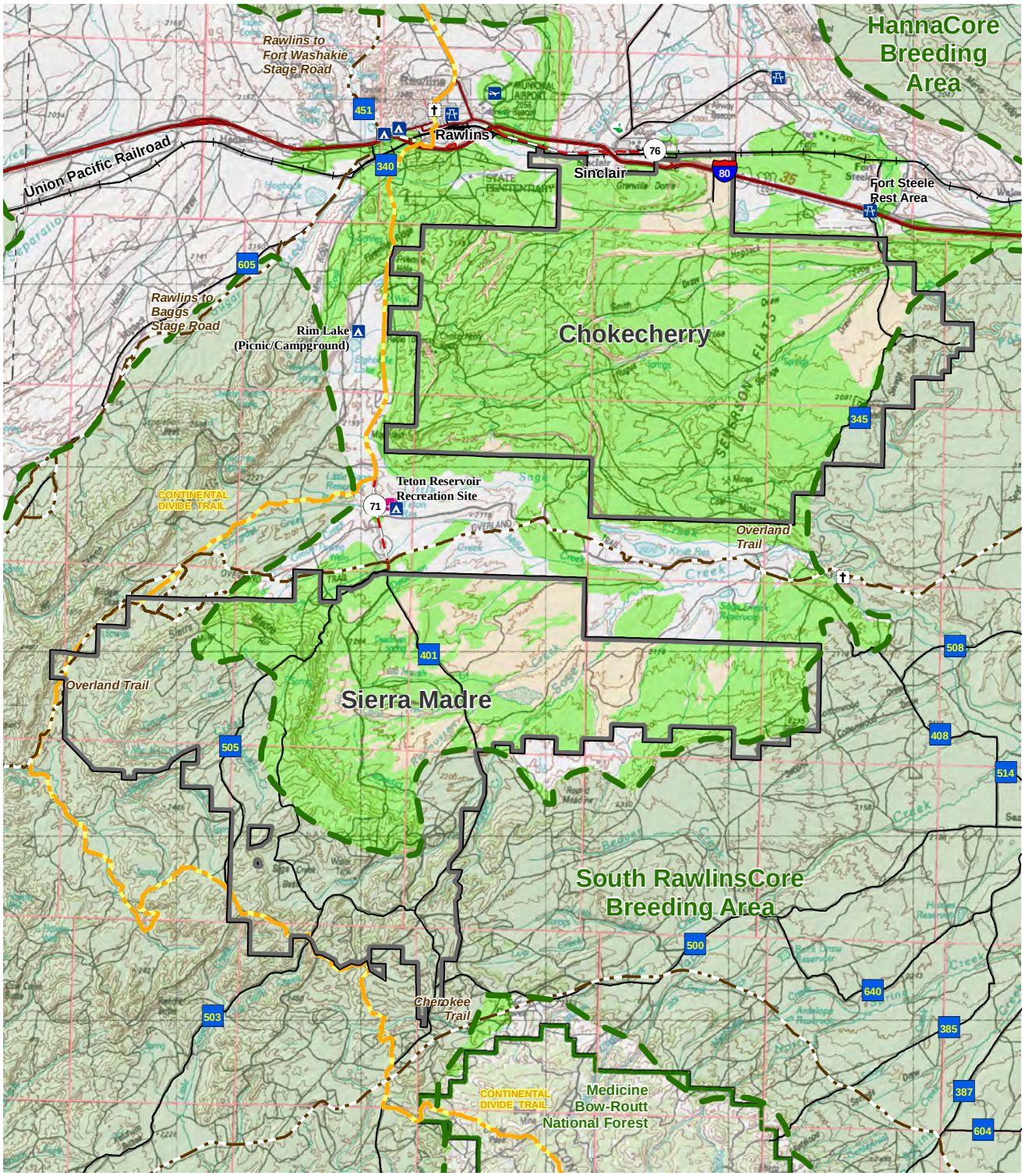

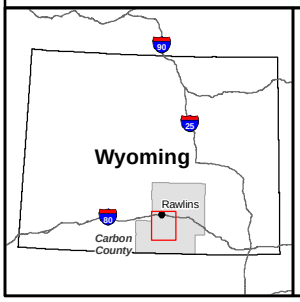

Legend

- Sage Grouse Core Breeding Area
- Sage Grouse Nesting/ Brooding Habitat
- Application Area
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- National Forest

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.15-3

Greater Sage-grouse Core Breeding Areas and Nesting/Brooding Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Table 3.15-2 Maximum Counts of Greater Sage-Grouse by Sex in the Initial Chokecherry and Sierra Madre Areas and 2-mile Buffer Determined by Ground Counts, Spring 2008

Chokecherry Area			
Lek Name	**Males**	**Females**	**Total**
Hugus Draw	23	7	30
Iron Springs Draw	34	8	42
Wild Horse Canyon	20	3	23
Upper Iron Springs	20	2	22
Junction	29	6	35
New Lek 1	4	5	9
New Lek 5	28	3	31
Hillside[1]	3	1	1
Total	**161**	**35**	**196**
Sierra Madre Area			
Lek Name	**Males**	**Females**	**Total**
Miller Hill	10	0	10
Sage Creek Ranch	31	1	32
Little Beaver	14	0	14
Sage Creek Basin	27	5	32
New Lek 3	17	2	19
New Lek 4	10	1	11
New Lek 6	11	0	11
New Lek 2[1]	3	0	0
Total	**123**	**9**	**132**

[1] Males observed on lek during aerial surveys.

During 2009 ground surveys, the 10 historic leks and the six new leks located during the 2008 surveys were visited to record activity. A total of 10 leks were determined to be active in 2009, including six historic leks and four of the six new leks identified in 2008. Activity within the Chokecherry area consisted of the two new leks from the 2008 surveys with maximum counts of 14 males and 2 females (**Table 3.15-3**). Within the Sierra Madre area two of the four new leks from 2008 and Deadman Creek were active. Using maximum counts for each lek, 74 males, and 12 females were counted at these three leks (**Table 3.15-3**). Nine historical leks were visited during 2009 ground surveys within the extended buffer area. Again, using maximum counts for each lek, a total of 134 males and 6 females were recorded on the 9 historic leks.

Table 3.15-3 Maximum Counts of Greater Sage-Grouse by Sex in the Expanded Application Area and Extended 4-mile Buffer Determined by Ground Counts, Spring 2009

Chokecherry Expansion Area			
Lek Name	**Males**	**Females**	**Total**
New Lek 5	11	2	13
New Lek 1	3	0	3
Total	**14**	**2**	**16**
Sierra Madre Expansion Area			
New Lek 3	16	4	20
New Lek 4	10	0	10
Deadman Creek	48	8	56
Total	74	12	86
Extended Buffer Area			
1786252	58	2	60
Little Sage Creek	28	2	30
1786163	26	0	26
1785042	17	1	18
1885223	5	1	6
Total	**134**	**6**	**140**

In summary, a total of 22 active leks were recorded throughout the Application Area and the associated 4-mile buffer during surveys conducted in 2008 and 2009. The distribution of the leks was eight within the Chokecherry area, eight within the Sierra Madre area, and six within the 4-mile buffer. A total of eight active leks were recorded within the Chokecherry area. A total of 564 greater sage-grouse were detected during both years with 209 observed within the Chokecherry area; 215 within the Sierra Madre area, and 140 within the extended buffer area. Based on the total numbers of male grouse observed on leks, density of male greater sage-grouse during the two breeding seasons was similar between the Chokecherry area (1.6 male grouse/miles^2) and the Sierra Madre area (1.1 male grouse/miles^2), while the buffer area had the lowest density (0.2 male grouse/miles^2).

Brood-rearing Habitat Surveys

Two studies were conducted to determine if the Application Area provides greater sage-grouse brood-rearing habitat, and if so, to document the location of these areas (WEST 2009c, 2008b). The results of the studies indicate that the Sierra Madre area appears to provide higher quality greater sage-grouse core breeding area than the Chokecherry area. During the two brood rearing surveys, mesic areas were widespread over the Sierra Madre area and vegetation conditions appeared optimal for greater sage-grouse (Connelly et al. 2000), likely due to above-normal precipitation levels in the spring and summer and a lack of livestock grazing in 2008 and 2009. Most sagebrush stands in the Sierra Madre area were robust, and only small areas of decadent sagebrush were observed on the far northern portion of the area.

During the two surveys, a total of 39 discrete groups of greater sage-grouse totaling 192 individual birds were observed in the Chokecherry area, and 325 discrete groups of greater sage-grouse totaling 1,581 individual birds were observed in the Sierra Madre area. For the Application Area, the 1,773 greater sage-grouse observed included 318 adult males, 329 adult females, 666 chicks, 158 unclassified adults, and 302 unclassified adult or young greater sage-grouse (**Table 3.15-4**). Twenty-four (61.5 percent) of the greater sage-grouse groups on the Chokecherry area contained chicks, whereas 171 (49.7 percent) of the 344 greater sage-grouse groups on the Sierra Madre area contained chicks.

Table 3.15-4 Composition and Numbers of Greater Sage-Grouse Classified During Brood Surveys in the Application Area from August 18 – September 10, 2008, and July 13 – September 3, 2009

Area	Adult Male	Adult Female	Chicks	Unidentified Adult	Unidentified Adult or Young	Total
Chokecherry	17	33	103	22	17	192
Sierra Madre	301	296	563	136	285	1,581
Total	**318**	**329**	**666**	**158**	**302**	**1,773**

Many of the greater sage-grouse broods in the Chokecherry area occurred along Smith Creek and Hugus Creek as well as in the southwest portion. Greater sage-grouse broods were well distributed throughout most of the Sierra Madre area with the exception of its southern-most and northeastern–most extensions.

The Chokecherry area was more arid than the Sierra Madre area, and as summer progressed, water was restricted to higher elevation reaches of stream channels, a few associated seeps, and water wells. Compared to the Sierra Madre area, sagebrush appears to be in decline over much of the Chokecherry area and there are extensive areas of decadent sagebrush stands. Much of the potential brood rearing habitat along riparian areas in the Chokecherry area contained vigorous stands of basin wild rye (*Elymus cinereus*). No adult greater sage-grouse or broods were found within those portions of drainages dominated by wild rye, likely because vegetation was too dense and too high to provide good brood-rearing habitat.

Mountain Plover

The mountain plover (*Charadrius montanus*) is a BLM sensitive species but has recently been reinstated as a “proposed” federally threatened federal species (Federal Register 2010). The mountain plover is considered a summer resident in Wyoming, however, its population status and trend are unknown, but suspected to be stable (WGFD 2005a). Mountain plovers inhabit open landscapes and nest in large, flat grassland expanses with sparse short vegetation. Specific surveys were conducted to map suitable habitat for mountain plovers within the Application Area and record any observations of individual birds (WEST 2008d). The mapping effort resulted in identifying suitable habitat of approximately 6,654 acres within the Chokecherry area and 402 acres within the Sierra Madre area. Suitable mountain plover habitat in the Chokecherry area is largely confined to the northeast portion; whereas suitable habitat in the Sierra Madre area occurs only along the extreme northern end of the area (**Figure 3.15-4**).

Additionally, a total of 37 mountain plovers at 25 locations were recorded within the Chokecherry area (**Figure 3.15-4**). No mountain plovers were observed in the Sierra Madre area. Because the change to a programmatic approach to the NEPA analysis, further site-specific mountain plover surveys were delayed until the issuance of the ROD or the final surface disturbance layout has been identified. Impacts in surveyed areas will be based on the potential for occurrence in areas identified as suitable based on vegetation maps of the area.

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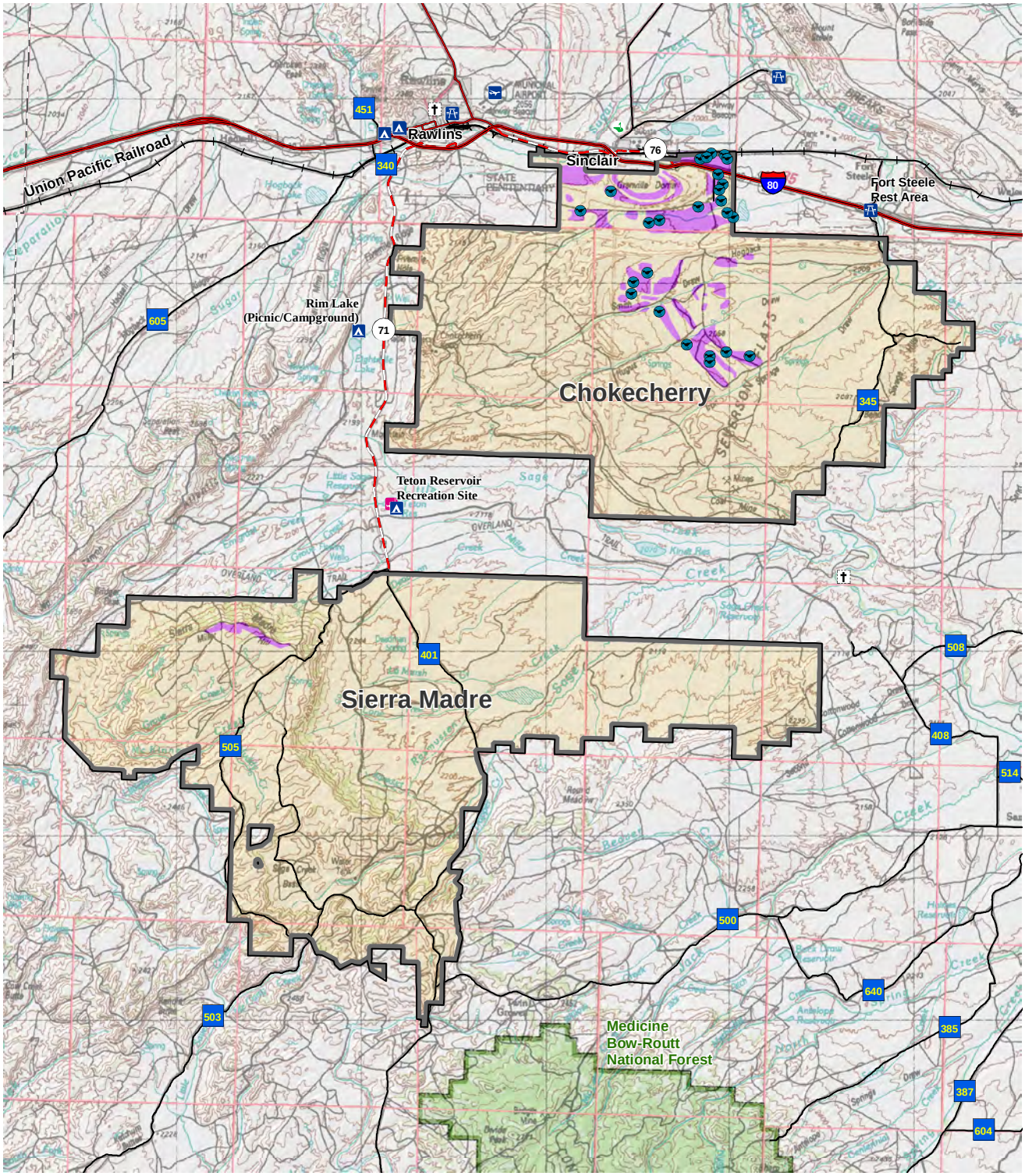
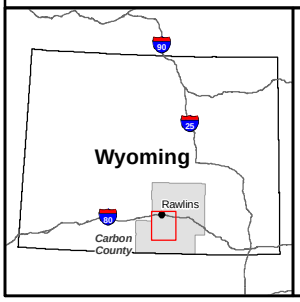




Legend

- Mountain Plover Occurrence
- Potential Mountain Plover Habitat
- National Forest
- Application Area
- Interstate Highway
- U.S. Highway
- State Highway
- County Road

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.15-4

Mountain Plover Observations and Potential Habitat

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

Long-billed Curlew

Long-billed curlews (*Numenius americanus*) breed in the Great Plains, Great Basin, and intermountain valleys of the western U.S. and southwestern Canada. Populations have declined significantly during the past 150 years due to overharvesting during the period 1850-1917, and elimination of suitable habitat (Dark-Smiley and Keinath 2004). Long-billed curlews have been recorded during the breeding season (May through August) throughout Wyoming, except in heavily forested areas. A total of 68 breeding records have been recorded for the state, of which only 19 are considered current (less than 15 years old). Similarly, a total of 155 non-breeding records for the state, of which 80 are considered current, indicating possibly more birds are breeding within the state, but confirmation of breeding is lacking (Dark-Smiley and Keinath 2004). Long-billed curlews were not detected during the baseline avian use study of the Application Area (WEST 2009b) and a review of the WYNDD concluded that long-billed curlews have not been recorded within the Application Area. Long-billed curlews have been documented within the 1 mile buffer around the Application Area; however, the records within the buffer area are greater than 30 years old and not considered current observations.

Loggerhead Shrike

Loggerhead shrikes (*Lanius ludovicianus*) have a wide distribution throughout North America and are closely related to open areas with short vegetation (Cornell Laboratory of Ornithology 2008). They are considered to be opportunistic feeders adjusting their diet to prey availability. Loggerhead shrike populations have experienced a continent-wide decline due to changes in land use and competition with species that are more tolerant of human-induced changes (Cornell Laboratory of Ornithology 2008). Similarly, in Wyoming, population declines are contributed to habitat loss and conversion to cultivation and urbanization, loss of insect prey due to pesticide use, and pesticide contamination (Nickoloff 2003). Loggerhead shrikes were detected four times during the baseline avian use study of the Application Area (WEST 2009b).

Sage Thrasher, Sage Sparrow, and Brewer's Sparrow

The sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*), and Brewer's sparrow (*Spizella breweri*) are considered sagebrush obligate species (Paige and Ritter 1999; WGFD 2005a) requiring sagebrush for some part of their lifecycle. These three species are common breeding birds in landscapes dominated by big sagebrush (*Artemisia* spp.), preferring areas of large, undisturbed tracts of tall and dense sagebrush. They are all common summer residents in Wyoming where sagebrush is present. Generally, native sagebrush steppe habitat is vulnerable in the western U.S. (WGFD 2005a; Hansley and Beauvais 2004). For example, in Washington, over half of the native shrubsteppe has been converted to agriculture in the last 150 years (Vander Haegen et al. 2000); however, in Wyoming, there is no ongoing significant loss of habitat (WGFD 2005a). Sixty-five sage thrashers, 80 Brewer's sparrows, and 59 sage sparrows were detected during the baseline avian use study conducted in the Application Area (WEST 2009b).

3.15.2.4 Amphibians

Northern Leopard Frog

Northern leopard frogs (*Rana pipiens*) are found in cooler climates with a geographic range that encompasses most of the northern United States and far north into Canada (Smith and Keinath 2004).The northern leopard frog was previously abundant across its range, but recently has experienced population declines throughout North America (Smith and Keinath 2004). In Wyoming, northern leopard frogs appear to be extinct in the Targhee National Forest of western Wyoming and eastern Idaho and have experienced severe reductions in population in the Laramie Basin; however, in other parts of Wyoming this species remains abundant (Smith and Keinath 2004). Habitat for this species includes swampy cattail marshes on the plains, and beaver ponds in the foothills and montane zones (WGFD 2005a). No single factor has been identified as the cause for the population decline, rather several contributing factors, including disease, introduced species, chemicals, and habitat

loss/alteration/fragmentation have all been linked to the decline (Smith and Keinath 2004).A review of the WYNDD concluded that the northern leopard frog has been recorded within the Application Area; however, the most current record was 1995.

Boreal Toad

The boreal toad (*Bufo boreas boreas*) is considered to be declining in abundance and distribution across its range in western North America especially in the southern Rocky Mountains (Wyoming, Colorado, and New Mexico) (McGee and Keinath 2004). In the southern Rocky Mountains, the boreal toad was historically present in the Medicine Bow, Sierra Madre, and Laramie ranges in Wyoming, but is currently only found in a few isolated areas in Medicine Bow National Forest in Wyoming (McGee and Keinath 2004). Boreal toads have been observed in a variety of habitats including wetlands, forests, woodlands, sagebrush, wet meadows, and floodplains across a wide range of elevations. The following threats have been identified for boreal toads on BLM managed lands in Wyoming: air quality and atmospheric deposition, timber harvest, grazing, fire and fire management activities, non-native species and their management, road and trail development and management of water impoundments, harvest and commerce, and habitat fragmentation and metapopulations impacts (McGee and Keinath 2004). It is assumed that any resource management resulting in a negative impact on wetlands or ponds also will negatively affect breeding habitats for boreal toads (McGee and Keinath 2004). A review of the WYNDD indicated that the boreal toad has been recorded within the Application Area; however, the most current record for the area was 1947.

Great Basin Spadefoot Toad

The Great Basin spadefoot toad (*Spea intermontana*) is found from extreme southern British Columbia south through the Great Basin to northern Arizona and New Mexico between the east base of the Cascade-Sierra Mountain System to the Rocky Mountains (Buseck et al. 2005). In Wyoming, distribution of this species is patchy with most records west of the Continental Divide in the Wyoming Basin and the Green River Basin, and a few records east of the Continental Divide in Natrona and Fremont counties in portions of the Wind River Basin. All records occur at elevations ranging from 6,000 feet to 9,200 feet (WGFD 2005a). Little information exists on the abundance of this species across its range, primarily due its behavior. During non-breeding months it is only active on humid/rainy nights and spends inactive periods within inconspicuous burrows (Buseck et al. 2005). Furthermore, the sporadic breeding habits make it difficult to monitor populations (Buseck et al. 2005). Great Basin spadefoot toads require a network of habitat components to survive including: overwintering burrow sites, temporary breeding ponds, and foraging areas. Lack of data precludes identification of specific threats to the species. A review of the WYNDD did not result in records of this species within the Application Area.

3.15.2.5 Fish

Colorado River Cutthroat Trout

The Colorado River cutthroat trout (*Oncorhychus clarki pleuriticus*) is a native coldwater fish which was once distributed throughout the Colorado River Basin above the Grand Canyon, but now only occupies a fraction of its range (Young 2008). The introduction of nonnative fish that displace native fish and land management practices that alter the suitability of coldwater stream habitat have been identified as contributing factors relating to the decline in the distribution of this species. Management of the Colorado River cutthroat trout in the Application Area is guided by two efforts: the *Conservation Agreement and Strategy for Colorado River Cutthroat Trout in the States of Colorado, Utah, and Wyoming* for range-wide management and the *Conservation Plan for Colorado River Cutthroat Trout – Little Snake River, southeastern Wyoming* provides actions to be implemented to ensure the persistence of this species in the Little Snake River enclave. The latter document identifies areas where management for the species will be emphasized, which includes the upper Muddy Creek watershed. Actions implemented within the upper Muddy Creek watershed include improving the stream conditions to provide fish habitats, removal of introduced fish, and reintroduction of native fish.

Roundtail Chub, Bluehead Sucker, and Flannelmouth Sucker

Roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*) are native fish of the Colorado River basin, specifically within the Little Snake River drainages and the Muddy Creek watershed (Bower et al. 2008). These native warm water species occur in about half of their historic ranges, thus, are classified as sensitive by the BLM. The primary reason for the declines is anthropogenic, including diversions of water changing the flow regimes in both mainstem rivers and tributary streams; physical habitat degradation; construction of diversion dams and reservoirs; and introduction of non-native species that are predators and competitors with the species (Bower et al. 2008; Ptacek et al. 2005; Rees et al. 2005a,b). Conservation planning efforts have been initiated for these species throughout their range (Utah Department of Natural Resources [UDNR] 2006). These efforts have focused on conducting research to better understand the populations of these species so as to develop meaningful conservation actions.

3.16 Noise

This section pertains to the fundamentals of noise propagation and background within the Application Area.

3.16.1 Fundamentals of Acoustics

Noise can essentially be classified into three different types: broadband, tonal, and low frequency. Noise that is characterized as broadband is a consistent distribution of sound with frequencies greater than 100 Hertz (Hz). In relation to wind turbines, broadband noise is often caused by contact of the turbine blades with the wind. This creates the familiar whooshing noise associated with wind farms. Tonal noise is defined as noise at discrete frequencies. This noise is often caused by the wind turbine mechanical components, such as gears interacting, or air flow over holes or slits. Low Frequency noise ranges from 20 Hz to 100 Hz. This type of noise sometimes occurs when there is a flow deficiency around a turbine often caused by the air flow wake from a neighboring turbine. This phenomenon is often associated with older downwind turbines (National Wind Coordinating Committee [NWCC] 2002).

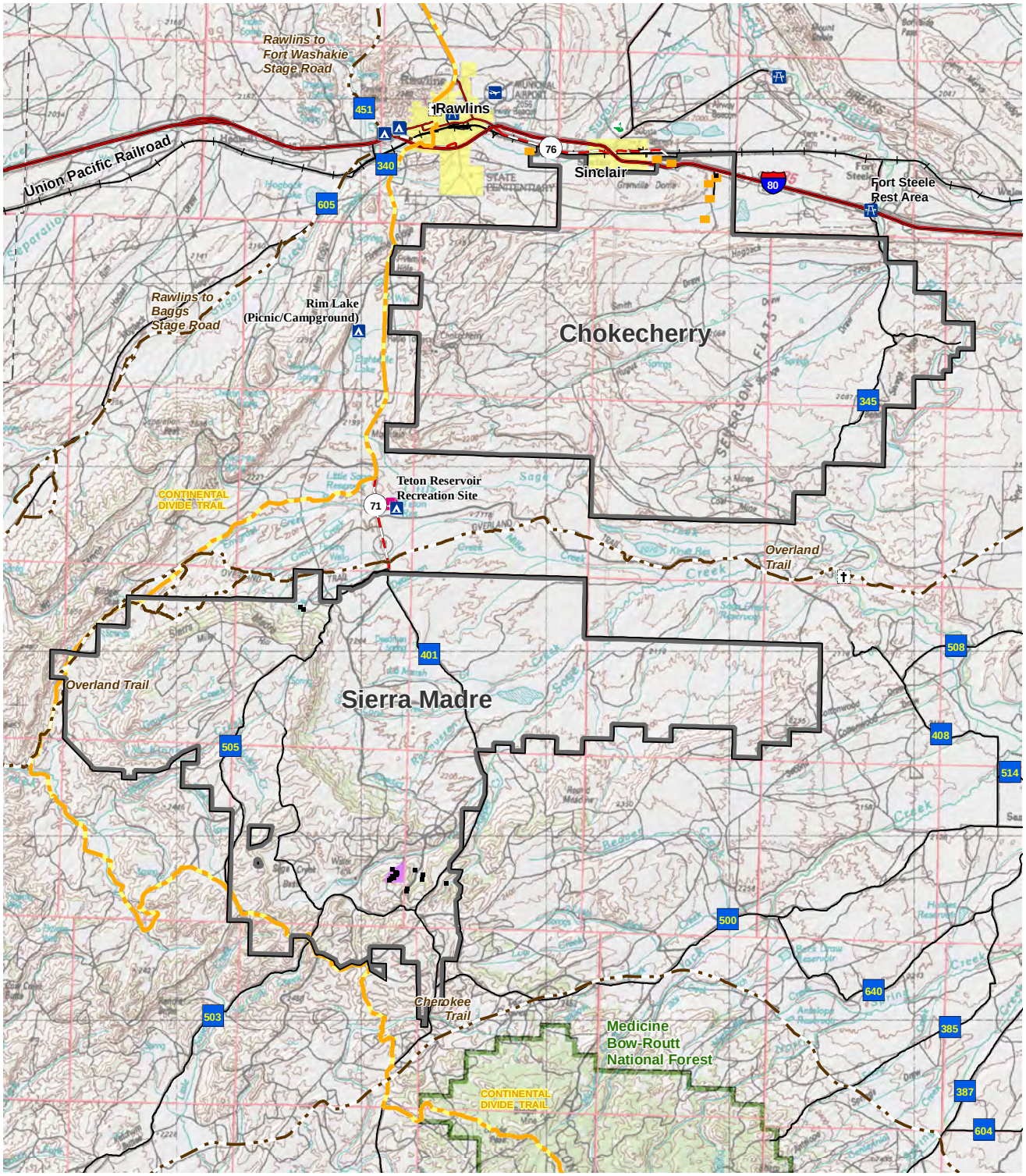
3.16.2 Characterization of Background Noise Levels

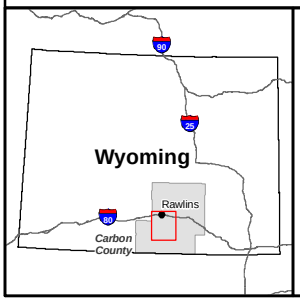
Ambient noise, or background noise, is defined as an assortment of noise from nearby and distant sources, relatively steady and homogeneous, with no particular source identifiable within it (NWCC 2002). Along the northern boundary of the Chokecherry area, ambient noise is often in the form of noise emitted from the Sinclair refinery, the city of Rawlins, traffic along I-80 and WY 71, and trains operating on the UPRR. In the southern portions of the Application Area which are more rural, background noise typically consists of wildlife and ranching noise such as cattle and ranch vehicles. Rural ambient noise typically has a range within 20 decibels (dBs) to 40 dBs (BWEA 2000). Rural ambient noise will not be spread uniformly throughout the Application Area, as the northern portion of the Application Area is more affected by ambient background industrial activity; while the southern portion primarily experiences rural ambient noise as a product of ranching and ranching associated activity and residences. There are 18 residences within the Application Area. **Figure 3.16-1** portrays the location of these residences.

As noted in **Table 3.16-1**, there are three line noise sources, the UPRR, I-80, and WY 71. There are two point sources, the Sinclair refinery and the City of Rawlins. The UPRR, City of Rawlins, and the refinery are approximately 0.5 mile or less from the northern edge of the Application Area, while I-80 and WY 71 are within the Application Area. The railroad is not within the Application Area but runs parallel to its northern border.

Table 3.16-1 Noise Point and Line Sources

Noise Source	Point or Line Source	Type	Proximity to the Application Area
Railroad	Line	Developed ROW	Adjacent to northern boundary of the Chokecherry area
Rawlins	Point	Municipal	0.6 mile from northern boundary of the Chokecherry area
Refinery	Point	Developed Industrial	0.4 mile from northern boundary of the Chokecherry area
WY 71	Line	Developed ROW	Adjacent to the western boundary of the Chokecherry area and through Sierra Madre
I-80	Line	Developed ROW	Adjacent and through the northern boundary of the Chokecherry area





Legend

- Residence
- Industrial or Commercial Site
- Subdivision
- Municipality
- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- National Forest
- Application Area

Chokecherry and Sierra Madre Wind Energy Project

Figure 3.16-1

Residential Noise Receptors

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

X:\0Projects\12907_001_Wyoming_Wind\Figures\EIS\PDEIS\Figure_3_16-1_NoiseResidences_20101021.mxd

3.16.3 Noise Propagation

There are many factors which determine how well and how far noise moves from a certain source. Topography is a factor, especially when ground rises between a noise emitter and a noise receptor. Atmospheric conditions are another contributing factor, specifically humidity, and how sound is absorbed by the air, depending on frequency. Ground cover, which includes shrubs and trees (e.g., wind breaks), is another contributing factor to noise propagation as are meteorological features such as air turbulence.

Wind can have a significant effect on noise travel, especially when the noise receptor is downwind of the noise source. There is a significant difference in how noise is perceived when a receptor is upwind or downwind from the noise source. A receptor downwind from a noise source will be more prone to hear noise than a receptor upwind from a noise source (Uppsala University 2007).

The noise level from a point source, such as a wind turbine, will decrease by 6 dBs for every doubling of the distance away from the point source. For a line source, such as a power line or highway, the noise level will decrease by 3 dBs for every doubling of the distance away from the source (Truax 1999). This concept, known as geometric spreading, is based on the inverse square law. This law states that the intensity of the influence at any given radius is the source strength divided by the area of the sphere. The energy twice as far from the source is spread over four times the area, hence the sharp drop off in intensity. Sound intensity follows the inverse square law assuming there are no reflections or reverberations. **Table 3.16-2** displays the human perception of a change in decibel levels, while **Figure 3.16-2** illustrates the inverse square law as it relates to the perception of noise moving away from a point source.

Table 3.16-2 Human Perception of Noise Level Changes

Change in Decibel Level	Result
1 dB	Cannot be perceived
3 dBs	Barely discernible
5 dBs	Noticeable community response
10 dBs	Causes an adverse community response

3.16.4 Noise Standards and Guidelines

There are no federal noise regulations, however, municipalities and local governments may adopt laws and regulations that impose a maximum noise limit within a community. These ordinances are often enforced by police or an agency. Despite meeting these locally imposed ordinances, complaints have arose regarding wind turbines (NWCC 2002). Complaints can stem from when there is not enough broadband noise to obscure the tonal noise or, at night when background noise decreases and broadband noise becomes more prevalent.

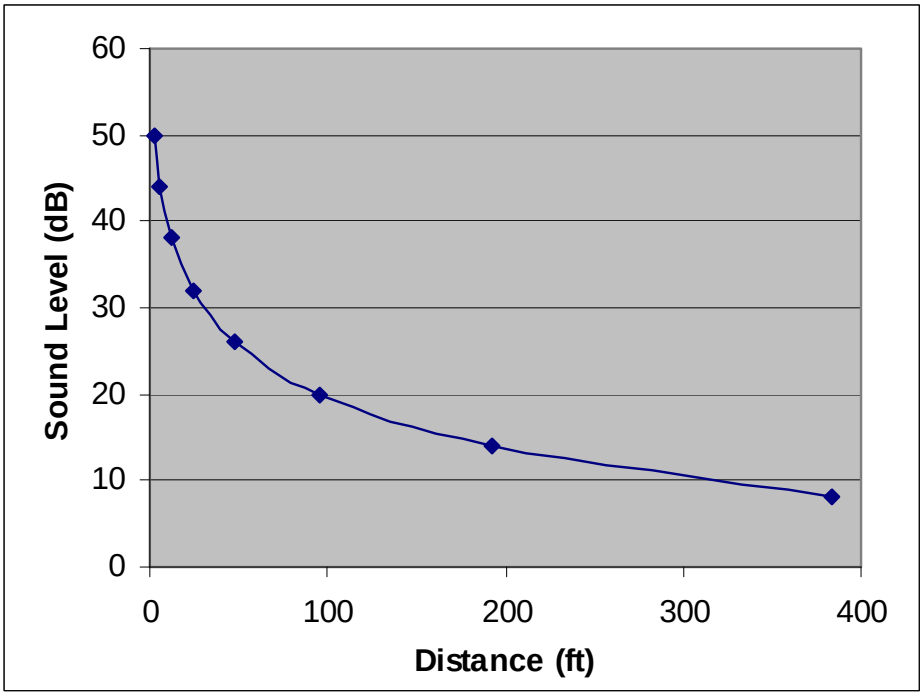


Figure 3.16-2 Perception of Sound from a Point Source