3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The RBPA is dominated by two physiographic regions: the Middle Rockies and Wyoming Basin (BLM 2008b). The Middle Rockies region covers the western edge of the RBPA and is characterized by glaciated mountains with moderately steep to steep slopes. Deep, V-shaped drainages with moderate to high gradient perennial streams and boulder, cobble, and bedrock substrates are common (Chapman et al. 2004).

The high, open, unglaciated Wyoming Basin region occupies the bulk of the RBPA. The landform is composed of low mountains, hills, plains, high-elevation valleys, and nearly level floodplains and low terraces. Colorful badlands, formed by the highly erodible soils and underlying multicolored sedimentary bedrock, are also part of the Wyoming Basin landscape. Wetlands are common and streams and rivers are moderate gradient with cobble substrates of granite or limestone (see Section 3.3, Soils).

The climate of the RBPA is classified as semiarid steppe and alpine. Steppe climate is characterized by cold winters, warm summers, and precipitation less than 20 inches per year. Alpine climate is largely dependent on altitude and slope exposure, but is generally cooler than, but similar to, steppe climate.

Big Piney, the closest community to the RBPA, averages 7.5 inches of precipitation a year, ranging from 5 inches in dry years to 12 inches in wet years. Snowfall averages approximately 29 inches a year (Western Regional Climate Center 2008).

3.2 GEOLOGY, MINERALS, AND GEOHAZARDS

The proposed Project is located in southwestern Sublette County, Wyoming. The region contains a variety of geologic and structural features. The RBPA is on the western rim of the Green River Basin and eastern edge of the Wyoming Overthrust Belt. Oil and gas development is aligned on the Moxa Arch, which is the main structural feature responsible for the trapping of oil and gas. The Overthrust Belt and the Gros Ventre Mountains, located on the western and the northwestern edges of the Green River Basin, respectively, are composed primarily of Paleozoic and Mesozoic marine sedimentary rocks. The following sections discuss the geology, minerals, and geohazards in the area.

3.2.1 Geology of the RBPA

3.2.1.1 Surface Geology and Topography

Figure 3-1 provides the general stratigraphic profile for the western Green River Basin where the RBPA is located. The dominant rock in outcrop in the RBPA is the Tertiary Wasatch Formation, a sandy mudstone to muddy sandstone described below. The RBPA is drained to the east by the South and Middle Big Piney creeks in the north, Beaver Creek cuts through the RBPA from the southwest, and several small named and unnamed tributaries in draws or gulches of the hillsides surrounding the RBPA. These streams cut the relatively soft Wasatch Formation forming steep-sloping, brownish hills common to the Greater Green River Basin and Wyoming landscape. The South and Middle Big Piney creek drainages and river paths have created a broad deposition of alluvial deposits grading to the east. The western highlands and ridges on the edge of the Bridger-Teton National Forest were uplifted in the complex thrust faulting of the region.

PERIOD	FORMATION	LITHOLOGY	THICKNESS RANGE (ft)
TERTIARY	Green River	Thinly-laminated chalky shale, buff brown sandstone, & algal limestone	1200 - 1500 ft
	Wasatch	Shale & Gray Sandstones	3000 - 9000 ft
CRETACEOUS	Fort Union	Gray Shale, Coal & Sandstone	1500 - 3500 ft
	Adaville (Mesaverde)	Gray Shale, Coal & Sandstone	1000 - 4600 ft
	Baxter Shale	Gray Shale	3350 - 3600 ft
	Frontier	Gray Shale, Coal & Sandstone	1700 - 2000 ft
	Mowry	Dark Gray Siliceous Shale	335 - 2000 ft
	Bear River	Shale & Sandstones	500 - 5000 ft
	Beckwith	Light Colored, Claystone, Sandstone & Limestone	3800 - 5500 ft
JURASSIC	Twin Creek	Gray Limestone & Yellow Sandstone	800 - 3000 ft
TRIASSIC	Nugget	White to Tan Sandstone	0 -1500 ft
	Ankareh	Red Shales & Gray Sand.	400 - 1400 ft
	Thaynes	Buff - Gray Siltstone & Limestone	0 - 1990 ft
	Woodside	Red Gypsiferous Shales & Gray Sandstone	500 - 1000 ft
	Dinwoody	Gray Shale & Siltstones	0 - 750 ft
PERMIAN	Phosphoria	Gray Dolo. & Phosphatic Sh.	75 - 627 ft
PENN.	Tensleep	White-Brown Sand. Dolomitic Sand. & Dolomite	300 - 1025 ft
MISS.	Madison	Gray to Brown Limestone	170 - 1000 ft
DEVONIAN	Darby	Gray Dolomite	0 - 428 ft
ORDOVICIAN	Big Horn	Tan to Gray Dolomite	0 - 500 ft
CAMBRIAN	Gallatin	Gray to Green Limestone & Shale	200 - 400 ft
	Gros Ventre	Green Waxy Shale & Gray Limestone	0 - 700 ft
	Flathead	Gray to Tan Sandstone	200 ft

Figure 3-1. Generalized stratigraphic column of the western Green River Basin (Peterson 1986).

3.2.1.2 Formations of Interest

3.2.1.2.1 Madison Group

The Madison Group is a Mississippian-aged (323–354 million years ago [mya]) carbonate sequence of limestone and dolomite widespread in the northern Rocky Mountains and averages 850 feet in thickness on the crest of the La Barge Platform (Figure 3-2). The upper unit is predominantly a preserved limestone sequence of grainstone and packstone, while the lower three sequences are coarse-grained to calcareous mud dolomite. Permeability decreases and reservoir quality increases with calcite cementation (Westphal et al. 2004).

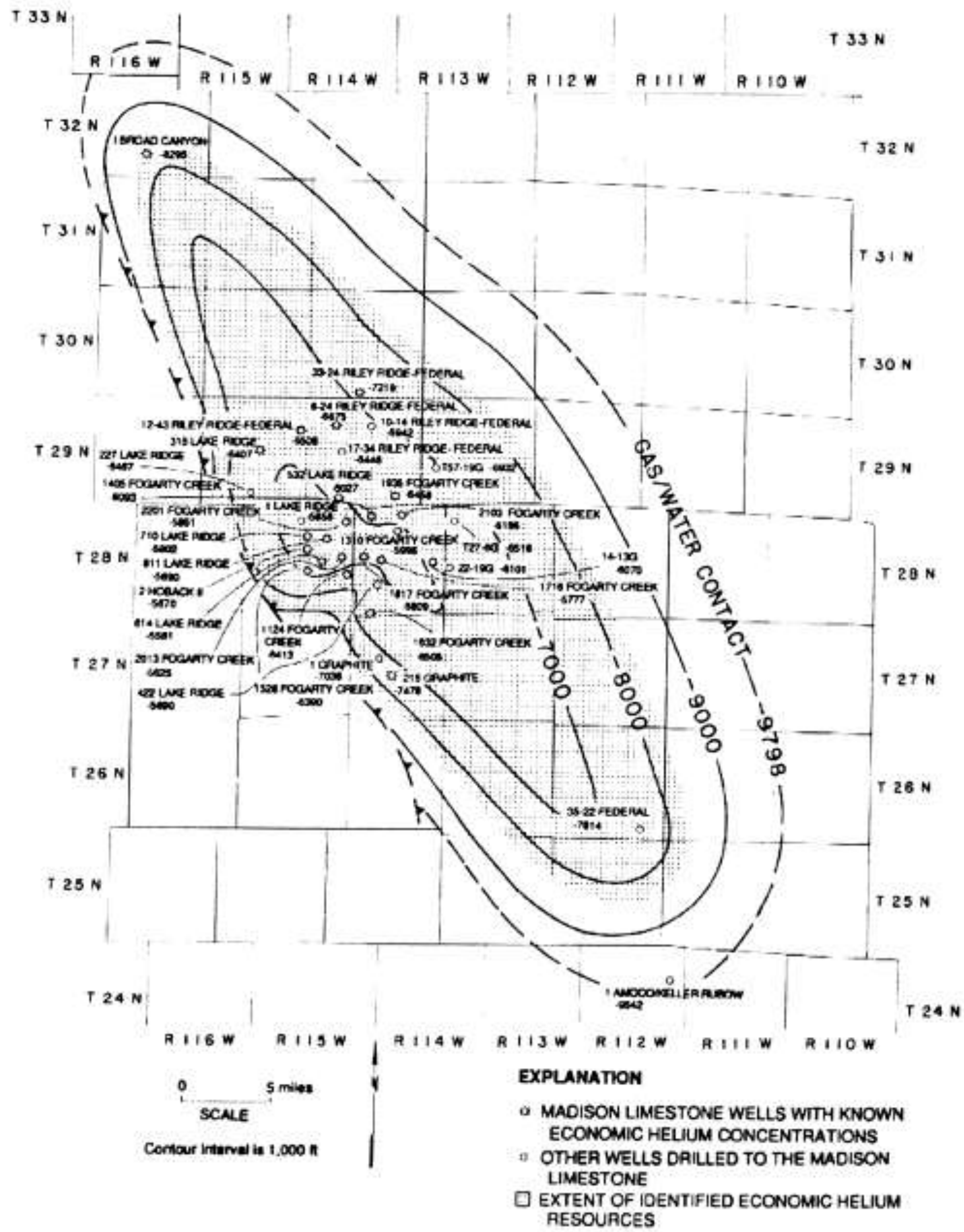


Figure 3-2. Madison structure map (De Bruin 2005).

The reservoir covers more than 1,000 square miles, as shown in Figure 3-2, and contains economical methane and helium gases in a sour gas mixture of CO_2, and H_2S, and water (De Bruin 2005). In the Riley Ridge and LaBarge area, the gases have been trapped and contained for approximately 50 million years due to an overlying structural closure that is as much as 4,000 feet thick in areas (De Bruin 2005; Huang et al. 2007). Sixteen Madison producer wells are located in the crestal portion of the formation, along with the 5 Riley Ridge Unit Madison wells listed in Table 2-8.

3.2.1.2.2 Twin Creek

The Twin Creek is a gray-brown, hard, dense, and thinly bedded limestone with interbedded black and gray calcareous shale (Michael 1960).

3.2.1.2.3 Preuss Formation

Preuss Formation is Jurassic in age and consists of approximately 300 feet of hard, dark gray to red-brown siltstone or silty claystone and brownish to greenish gray, very fine- to fine-grained quartzose sandstone.

3.2.1.2.4 Stump Formation

Stump Sandstone is Jurassic in age and approximately 30 feet of brownish gray, glauconitic, generally hard and tight quartzose calcareous sandstone (Michael 1960).

3.2.1.2.5 Nugget

The Nugget sandstone is Jurassic-Triassic in age (180–220 mya) and is a sandstone unit known for oil and gas production in northeast Utah and southwest Wyoming in structurally favorable locations.

The Nugget is composed of a lower unit of very fine-grained thinly bedded and bioturbated sequences of clayey siltstones-mudstones, limestone, dolomite, and very fine-grained sandstone deposited in small lakes within dune areas. The upper and typically thicker (up to 400 feet) unit is highly cross-stratified fine- to medium-grained sandstone of eolian depositional (wind-blown dune) origins. The cross-stratified facies has porosity in the range of 10% to 20% throughout its extent. The porosity in the local area is approximately 12% and permeability is 70 to 300 millidarcies in the local area (Picard 1977).

3.2.1.2.6 Wasatch Formation

The Wasatch Formation is of middle to lower Eocene age (49–54 mya) and is a sandy gray mudstone containing lenses and irregular beds of muddy sandstone. Locally the upper part contains carbonaceous shale and thin beds of sub-bituminous coal, and on the eastern flank of the Gross Ventre Mountain Range the Wasatch contains a thick conglomerate facies. Measured sections range from 1,780 feet to approximately 7,000 feet in thickness with up to 2,000 feet in thickness in the RBPA (Michael 1960). Weathering and erosion of the Wasatch Formation has resulted in buttes and badlands with distinctive strata colored red and green. The Wasatch generally forms the buttes and mesas characteristic of the topography of the area (BLM 2008b).

3.2.1.2.7 Quaternary System

Unconsolidated Quaternary deposits consist of alluvium, terraces, colluvium, gravels, pediments, and glacial deposits (Love and Christiansen 1985). Alluvial deposits are generally associated with alluvial valleys of the Green River and tributaries such as Fish Creek, Middle Piney Creek, South Piney Creek, and Beaver Creek in the RBPA. In the RBPA, terrace deposits are widespread between the river valleys (Oriel and Platt 1980). The terrace deposits are composed of coarse gravel to fine sand and can be as much as 300 feet thick. The alluvial and terrace deposits contain gravel resources that are mined in various parts of the western Green River Basin (BLM 2008b).

3.2.2 Mineral Resources

The RBPA includes natural gas (methane) and helium gas resource development with associated production of water, CO_2, and/or H_2S. Four productive oil and gas fields occur in the region surrounding the RBPA: Lake Ridge, Riley Ridge, Fogarty, and Tip Top, shown in Map 3-1. The Riley Ridge Unit is the only area for proposed expansion of drilling and lease development in the RBPA at the time of this analysis, but all oil and gas fields are active and shall be part of any analysis of cumulative effects if forseeable future actions are known to BLM. The following is a synopsis of mineral resources of proposed development in the planning area.

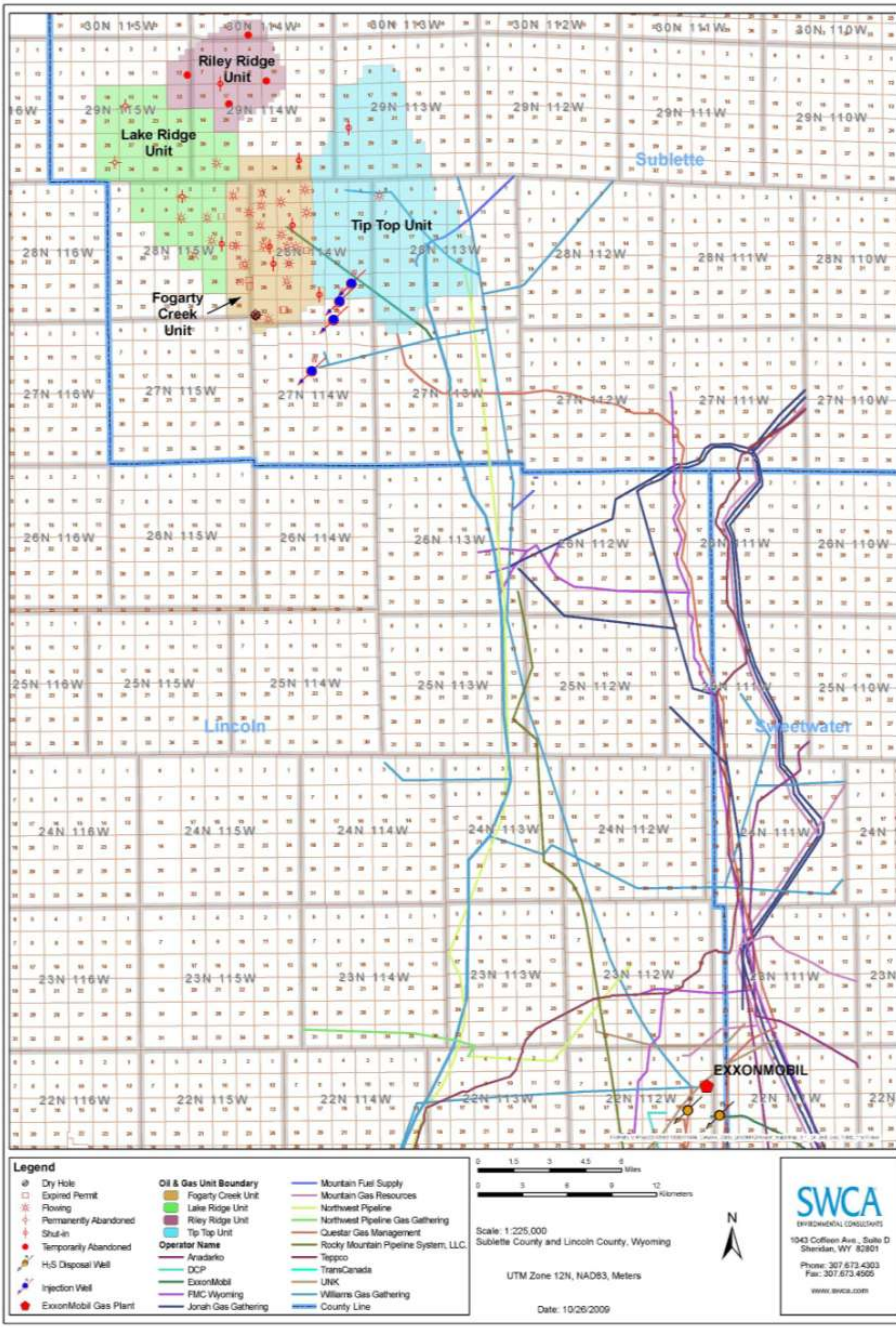
3.2.3 Leasable Resources

3.2.3.1 <u>Fluid Minerals</u>

In total, 594 oil and gas conventional wells are in the RBPA (WOGCC 2009). Of these wells, 91 have been plugged and abandoned as of December 2008. Twelve wells in the RBPA are produced water injections wells. Two existing H_2S and CO_2 disposal wells are permitted for the Madison Formation, and the four produced water injection wells are permitted in the area targeting the Nugget Formation.

The reservoirs currently in development and production in the area, such as the Madison, Nugget, and Fort Union, are proven hydrocarbon reservoirs (WOGCC 2008). Structural deformations of the past, such as anticlines, have created favorable conditions for hydrocarbons to migrate from their original source rock and into structural traps. Oil and gas migrates into more porous reservoir rocks or can be sealed in a reservoir by a confining rock such as impermeable shale. It is also possible that faulting may create both new pathways for migration and structures for trapping. Most of the hydrocarbons in the area are structurally trapped by the Moxa Arch and other small local structures.

The Madison Group reservoir is expected to contain a mixed resource of 69.4% CO_2, 18.0% methane, 7.5% nitrogen, 4.5% H_2S, and 0.6% helium. Gas in place is estimated to be 167 trillion cubic feet (Cimarex 2008).



Map 3-1. Oil and gas fields, existing wells, and pipeline infrastructure in the RBPA (WOGCC 2009).

Nine coalbed natural gas (CBNG) wells have been drilled into coalbeds (five on federal minerals and four on fee minerals). The wells in the Riley Ridge Unit area are between 3,400 and 4,100 feet deep in the Mesaverde Group. The total CBNG production in the area was 9,746 mcf. The CBNG production is considered non-economic in the RBPA (WOGCC 2009).

The Bear River Formation, Muddy Sandstone, Frontier Formation, Lance Formation, and Almy Formation are important oil and gas producing zones in the Big Piney-LaBarge area (WOGCC 2008).

3.2.3.1.1 Riley Ridge Unit

The 2008 Plan of Development (POD) for the Project submitted by Cimarex proposes development of the Madison Formation within the Riley Ridge Unit. The Madison Formation contains a reserve of methane of approximately 22 trillion standard cubic feet, and a measured helium reserve of approximately 76.5 billion standard cubic feet, more than one half of the total measured reserve in the U.S. (Huang et al. 2007). The national and international importance of the Riley Ridge helium reserve is tracked by the BLM, and is further described by Osvald (2010) in Appendix A A unit agreement determines the unit plan of development and operation, drilling, producing, rental, minimum royalty, and all royalty requirements. The unit agreement is designed in the public interest in the conservation of natural resources and to determine in an equitable and timely fashion the allocation of these resources to the owner of specific mineral rights. Since 100% of the Riley Ridge Unit is federal minerals, the unit is governed by a federal agency: the BLM. The Riley Ridge Unit Agreement has a designated operator, Cimarex Energy, which operates the unit in the interest of all the interest owners. The operator may change from time to time by approval of all the interest owners and BLM. Individual well applications must also be reviewed and approved by WOGCC.

An approved Riley Ridge Unit Agreement is in place to explore, develop, operate, and share in the production of all or part of an oil or gas field or like area without regard to lease boundaries and ownership (WOGCC 1982).

The Riley Ridge Unit is a 16,018.22-acre area and the agreement has been effective since December 23, 1982. The unit has 21 oil and gas wells with 3 of those wells currently producing, 7 wells have been plugged and abandoned, 4 are temporarily abandoned, and 7 are shut in at this time. As of January 30, 2009, the Riley Ridge Unit has cumulative production of 10,618 barrels of oil, 1,133,045 million cubic feet (mcf) of gas, and 459,370 barrels of water (WOGCC 2009).

Based on records available from the WOGCC, the unit is a non-contracting unit to be considered for further oil and gas development of the Madison reservoir at total depths ranging from about 14,000 to 17,000 feet. This unit has proposed production from the Madison Formation, which is a sour gas formation containing H_2S along with methane and other constituents. A listing of the existing Madison wells in the Riley Ridge Unit and their status is provided in Table 2-6.

3.2.3.2 Coal

No coal mine resources have been identified or exploited in the RBPA. Coal beds of the Mesaverde Formation are at a depth of greater than 3,000 feet and considered uneconomical for mining (BLM 2008b).

3.2.3.3 Geothermal

No geothermal resources have been identified in the RBPA (BLM 2008b).

3.2.3.4 Locatable Minerals

No active or closed mining claims exist in the RBPA. The Wasatch Formation is not known or expected to have surficial or sedimentary metal deposits. The clay mineral bentonite is widespread or found in beds that may be greater than 10 feet thick (BLM 2008b).

3.2.3.5 Saleable Minerals

Sand and gravel aggregates exist along stream channels and floodplains in the RBPA. No major claims or production of aggregates have been recorded. Sand and gravel deposits are widespread throughout the local region and Wyoming (BLM 2008b).

3.2.4 Geohazards

3.2.4.1 Seismicity

The Wyoming Overthrust Belt is an area of historical faulting. In the subsurface of the RBPA, drilling operations may cross several known faults as displayed in the cross section provided by Cimarex (Figure 3-1 and Figure 3-2). The following is a geologic illustration, which may be representative of the subsurface at the location of the field development (Figure 3-3).

Western Wyoming is an active tectonic area with Sublette County recording numerous seismic events in the past century; one to five earthquakes per decade were reported in the past 80 years (Case et al. 2002). Thrust faults in the area are depicted in the structure map in Figure 3-4, suggesting the possibility of fault movement directly below the drill site, where the integrity of the well borehole and receiving formations would be at risk of being breeched with possible loss of gas and water.

The Richter magnitude scale was developed as a mathematical device to record the size of earthquakes and the hazards associated with magnitude and intensity (U.S. Geological Survey [USGS] 2009a). The magnitude of an earthquake is determined from the logarithm of the amplitude of seismic energy recorded by seismograph stations at various locations. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value (Table 3-1).

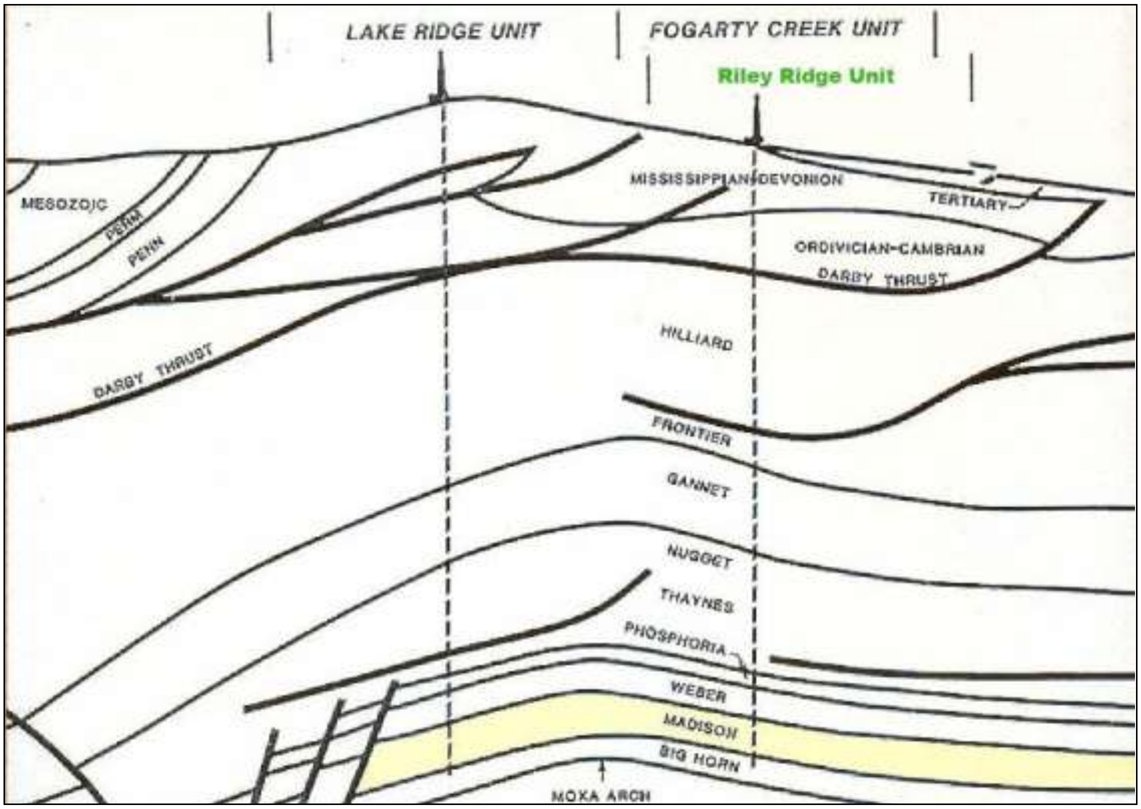


Figure 3-3. Generalized geologic cross section of the area (Cimarex 2008).

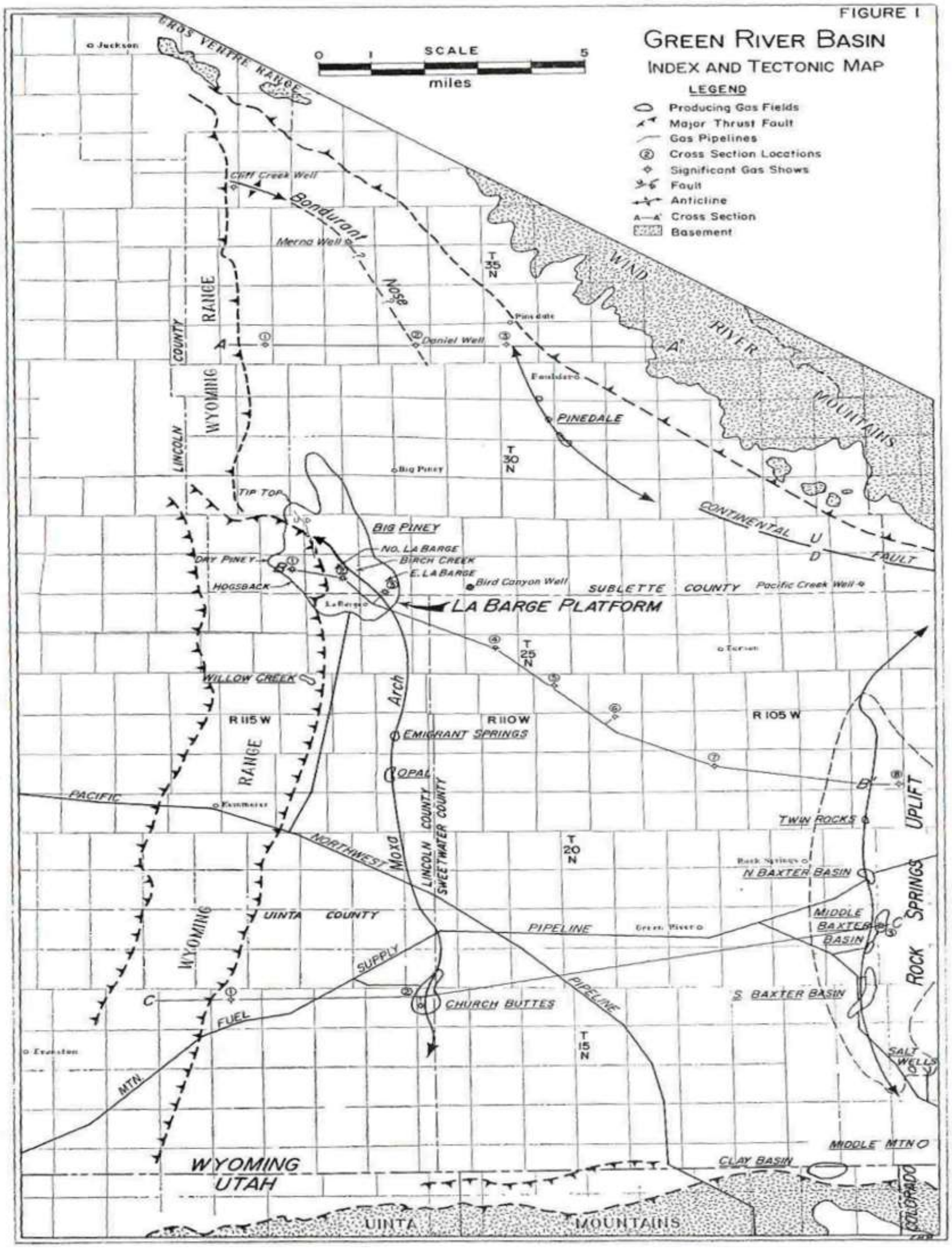


Figure 3-4. Green River tectonic features (Wyoming Geological Association Guidebook 1960).

Table 3-1. The Richter Scale.

Richter Scale (magnitude)	Description	Earthquakes Effects	Worldwide Frequency
Less than 2.0	Micro	Not felt	8,000 per day
2.0–2.9	Minor	Not felt, but recorded	1,000 per day
3.0–3.9	Minor	Often felt, rarely cause damage	49,000 last year
4.0–4.9	Light	Shaking of indoor items, rattling noises, significant damage likely	6,200 last year
5.0–5.9	Moderate	Can cause damage to poorly constructed buildings over small regions; slight damage to well-constructed buildings	800 per year
6.0–6.9	Strong	Can be destructive in areas up to 100 miles across	120 per year
7.0–7.9	Major	Can cause serious damage over large areas	18 per year
8.0–8.9	Great	Can cause serious damage in areas several hundred miles across	1 per year
9.0–9.9	Great	Devastating in areas several thousand miles across	1 per 20 years
10.0+	Epic	Never recorded	Unknown to date

Sources: Wikipedia 2009a, 2009b; USGS 2004.

There have been 18 recorded earthquakes with a magnitude greater than 2.5 on the Richter Scale recorded in or near Sublette County since the 1930s, including three that measured between 4.1 and 4.3 in 1963 and 1971 (Case et. al. 2002). On average, for the western quarter of Wyoming, an earthquake with moderate effects (windows broken, plaster cracked, objects overturned), like those experienced in 1963 and 1971 can be expected to occur about every 1.5 years. The towns of Pinedale, Marbleton, Daniel, and Big Piney and the RBPA face a possible moderate to strong earthquake event, with effects felt up to 100 miles away, according to Case et al. (2002). Estimates of seismic hazards in Sublette County may be underestimated if historic earthquakes are used as the sole basis for analysis, since the historic record is limited. Ground motion probability maps and specific fault analyses give a reasonable estimate of damage potential in Sublette County (Case et al. 2002).

Based on this record of faulting and past tectonic activity, there is the possibility of tectonic activity (earthquakes) of significant magnitude to occur in the region, potentially resulting in structural damage of well facilities, gas plants, and pipelines. Using the USGS (2009a) earthquake probability model, one can estimate the probability of a future earthquake in a particular area with some confidence level.

Figure 3-5 displays a calculated probability for an earthquake of magnitude 6.5 or greater on the Richter Scale to occur in the RBPA and the greater region in the next 50 years. The probability of this event occurring is between 10% to 20%. Probabilities are based on a statistical model since earthquakes are very difficult to predict. An earthquake of this magnitude could occur at any time.

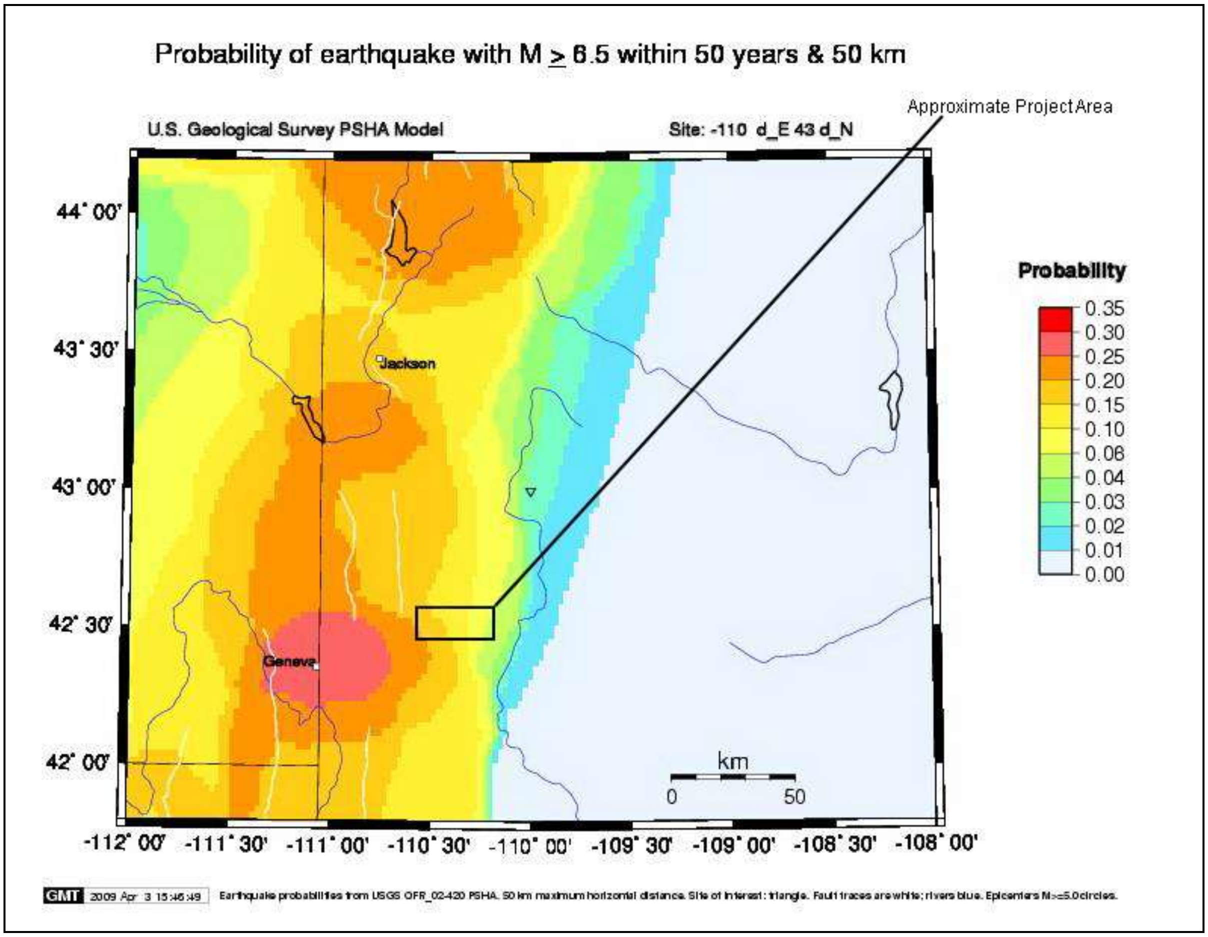


Figure 3-5. Regional earthquake probability (USGS 2009a).

Current earthquake probability maps are used to establish building codes that, when adhered to, would result in negligible damage in buildings of good design and construction, and slight to moderate damage in well-built ordinary structures. Considerable damage could occur if building codes are not followed in tectonically active areas (Case et al. 2002). Estimates of damages can be related to possible infrastructure damages to the proposed RBPA facilities in the event of an earthquake in excess of the building code requirements. Similar standards do not exist for wells, however. Of course all probabilities are creations of statistical processes that seek to represent the proposed risks to scale with the most current data and techniques available.

The RBPA is located in Zone 2 of the Uniform Building Code (UBC) Seismic Zone Map concerning seismic risk to the state of Wyoming (Figure 3-6). Zone 2 has a 90% probability to not have an earthquake event with strong perceived shaking and light damage in the next 50 years (Case et al. 2002). It must be noted that the RBPA is very near the Zone 3 border, where Zone 3 has a 90% probability of not having an earthquake event with very strong perceived shaking and moderate damage in the next 50 years (Case et al. 2002). These zone probabilities of non-occurrences are roughly similar to the probability of Figure 3-5.

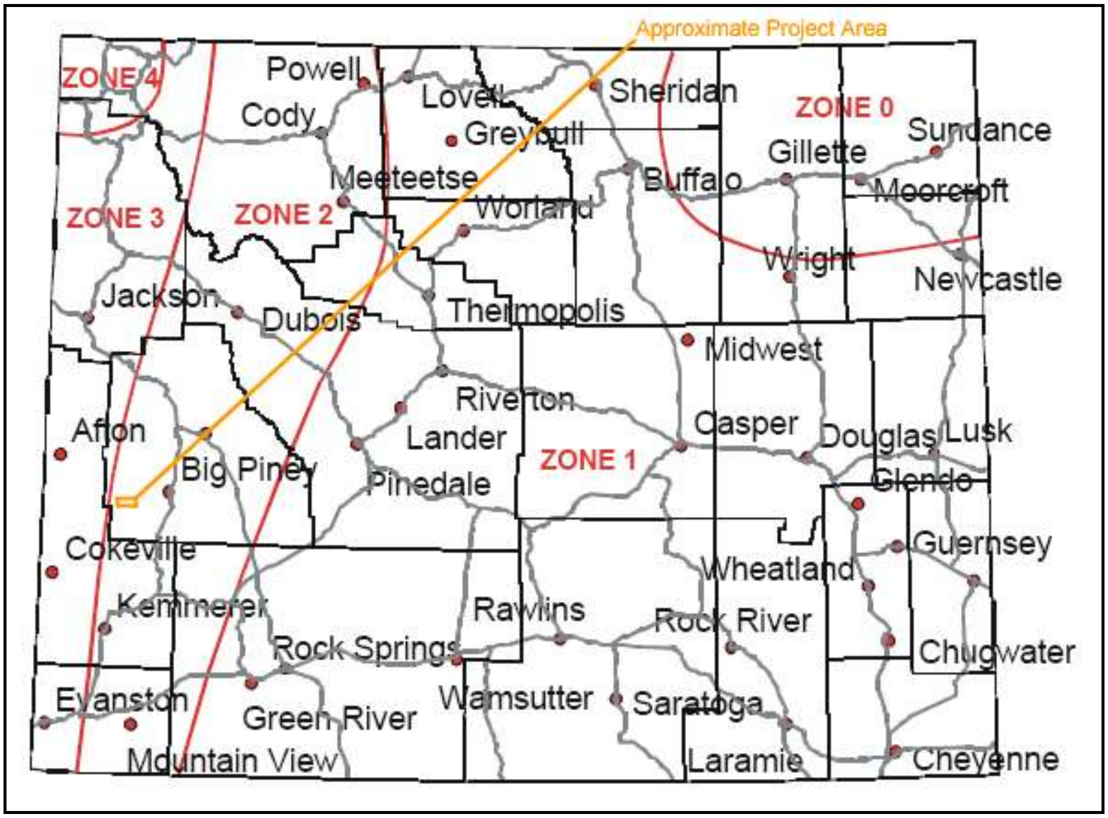


Figure 3-6. UBC seismic zone map (Case et al. 2002).

3.2.4.2 Disposal by Injection

The production of oil and gas reserves is typically accompanied by liquid or gaseous by-products. Returning these by-products to receptive sub-surface geological formations is a recognized procedure to reduce potential contamination of above-ground resources. Injecting fluids into geologic formations could alter local pore pressures and create overpressure that could lead to fractures in the formation structure, allowing the injectate to escape to other formations. Disposal by injection could also place stresses on localized faults, potentially leading to other indirect impacts. In the case where nearby boreholes have poor integrity or if a communicating system of unsealed faults occurs nearby, these features have been known to act as a conduit for cross communication of fluids with other formations or to the ground surface.

In accordance with EPA guidance, the BLM and WOGCC review and decide upon injection applications, and determine the ability of the target formation to safely retain the injectate based on well bore schematics and additional geologic information. BLM will frequently rely on WOGCC as subject matter experts to evaluate data and evidence supplied by an applicant and to determine that the injected gas or water would be held in place by some type of overlying low permeable materials such as shales or evaporates that act as a cap or closure structure. A cap is defined as a lithologic unit capable of impeding upward movement (Nelson et al. 2005). The receiving formation must also be able to receive the injectate without causing pressures that could cause fractures in the rocks and geological structure. This is called the fracture pressure of the formation. Exceeding a formation's fracture pressure can lead to cross contamination of other formations by leakage through fractures, or more rarely, the lubrication and reactivation of faults in the area.

The Nugget Formation and the Madison Formation have potential for geologic injection in the RBPA due to their geologic depth and demonstrated stability and integrity for containing injectate. Both are very deep hydrocarbon-bearing formations, as described in Section 3.2.3.1, and therefore not used as a source of potable water in the region. The Nugget Formation lies approximately 11,310 feet below the surface of the RBPA, an is overlain by approximately 800 feet of anhydride and gypsum in the Twin Creek, and Gypsum Springs formations that separate the Nugget aquifer and all lower reservoirs from potential groundwater aquifers useful for drinking water or discharging to the surface.

These formations have capped and effectively sealed the Nugget Formation since the Jurassic Period, despite geological upheaval and deformity. Another series of salt beds of Triassic, Permian, and Pennsylvanian origin lie between the Nugget Formation and the Madison Formation. These are the Thaynes, Woodside, Dinwoody, and the Tensleep formations, as shown in Figure 3-1. These salt formations are more than 1,000 feet thick and form a lower structural cap on the Nugget and a capping seal on the Madison Formation that prevents upward movement of gases trapped there. The anhydride and gypsum salts that form the structural cap or closures that seal the Madison limestone have the capacity to flow under compression, which effectively seals off any fissures that might leak water and gas should fractures occur from seismic activity or other causes.

The Nugget Formation has been permitted and safely used to accept and retain large volumes of injected produced water from 12 existing water disposal wells in the RBPA. As of April 2009, 38 million barrels of water have been successfully disposed of in four nearby Nugget Formation injection wells without evidence of over-pressurizing the formation (WOGCC 2008). The well locations are plotted on Map 3-1.

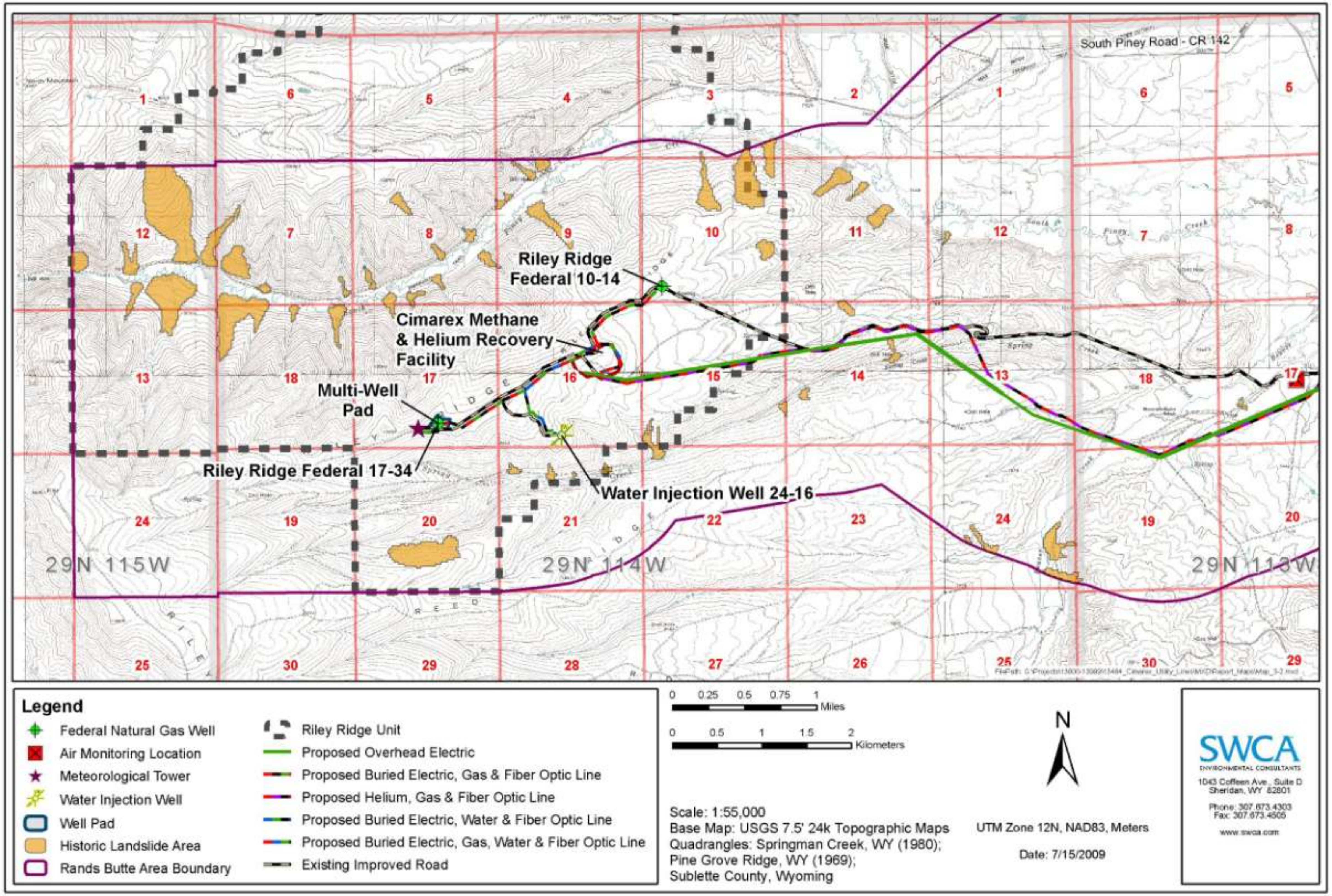
The depth and character of the Madison reservoir allows it to receive and confine injectate, as demonstrated by existing data and modeling. As of September 2008, 23.6 billion cubic feet (bcf) of gas have been safely injected into the Madison (WOGCC 2008).

3.2.4.3 Landslides

Landslides most commonly occur on steep (greater than 25%), unstable slopes with loose sediments. Other factors that promote downslope movement are excessive loading from rainfall or snowmelt, seismic activity, freeze-thaw processes, and undercutting of slopes. The term complex slope movements has been used by the Wyoming State Geological Survey (WSGS) to covey that most slope movements are a combination of basic forms of landslides and sedimentation events, with the most common combination being slump/earth flows (WSGS 2009).

Several complex slope movements have been mapped throughout the RBPA. There have been 59 complex slope movements within the RBPA and 55 (93%) have occurred in the Rands Butte area of the RBPA (WSGS 2009). Slope movement activity in the RBPA is primarily localized in the western portion of the Rands Butte area (Map 3-2), in an area where increased landslide factors such as differentiated topographic relief (slopes greater than 25%), closer proximity to fault zones, and energy from mountain streams exist. The majority of complex slope movements in the western RBPA are on slopes near South Piney Creek and Beaver Creek; however, other multiple flows occur on slopes and drainages throughout the RBPA (WSGS 2009). Riley Ridge is an area of interest in the western portion of RBPA and multiple slumps and multiple earth or debris-laden earth flows have been mapped on the northern and southern slopes of this landform (Map 3-2). Other complex slope movements, including block slides, debris flows, and slump/flow complexes in combination with alluvial cone and alluvial fan sedimentation events have been mapped.

Mapped historical slope movements are important indicators because landslides are more likely to occur in areas where they have occurred in the past. Approximately 592.9 acres, or 3.1% of the Rands Butte Area of the RBPA, may have slope instability hazards, based on mapped slope factors and soil types with historical slope movements (BLM 1984; Munn and Arneson 1998a; WSGS 2009).



Map 3-2. Location of complex slope movements in the western portion of the RBPA.

3.3 SOILS

Management goals and objectives for soils in the RBPA are outlined in the Pinedale RMP ROD (BLM 2008b) and in the Sublette County Federal and State Draft Land Use Policy (Urbigkit 2008). Management goals include preventing or mitigating impacts on soil stability, productivity, and water infiltration to prevent accelerated wind and/or water erosion and chemical degradation of the soil resource to sustain a viable agricultural economy, maintain wildlife populations, and maintain high-quality air and water.

3.3.1 General Soil Survey Information for the RBPA

The RBPA encompasses 73,713 acres of geologic features. Surface geology is described in Section 3.2.1 of this document. Soils of the Rands Butte and Williams Pipeline areas are derived from a wide variety of geologic material, including residuum, alluvium, colluvium, eolian deposits, and glacial till. Soil development has taken place across the landscape of exposed Tertiary shale and sandstone bedrock, resulting in an association of soils with dynamic moisture regimes, shallow depths, elevated clay content, and base-rich mineral soils of the steppes and washes (Munn and Arneson 1998a, 1998b; Soil Survey Staff 1999).

Soil map units from the Soils Map of Wyoming (Munn and Arneson 1998a, 1998b) are listed in Table 3-2. Soils within the RBPA are highly variable on both a regional and local scale, due to significant differences in geology, climate, vegetation, age, and topography that significantly influence soil development in these arid environments (BLM 2008b).

Incomplete soil survey information for the RBPA has limited the soil analysis. Natural Resources Conservation Service (NRCS) soil surveys for the RBPA are preliminary and incomplete. Since these soil surveys are incomplete, the information does not meet National Cooperative Soil Survey (NCSS) standards of quality. The NRCS reserves the right to make changes to this information without notice, therefore the preliminary soil surveys were not used in this analysis.

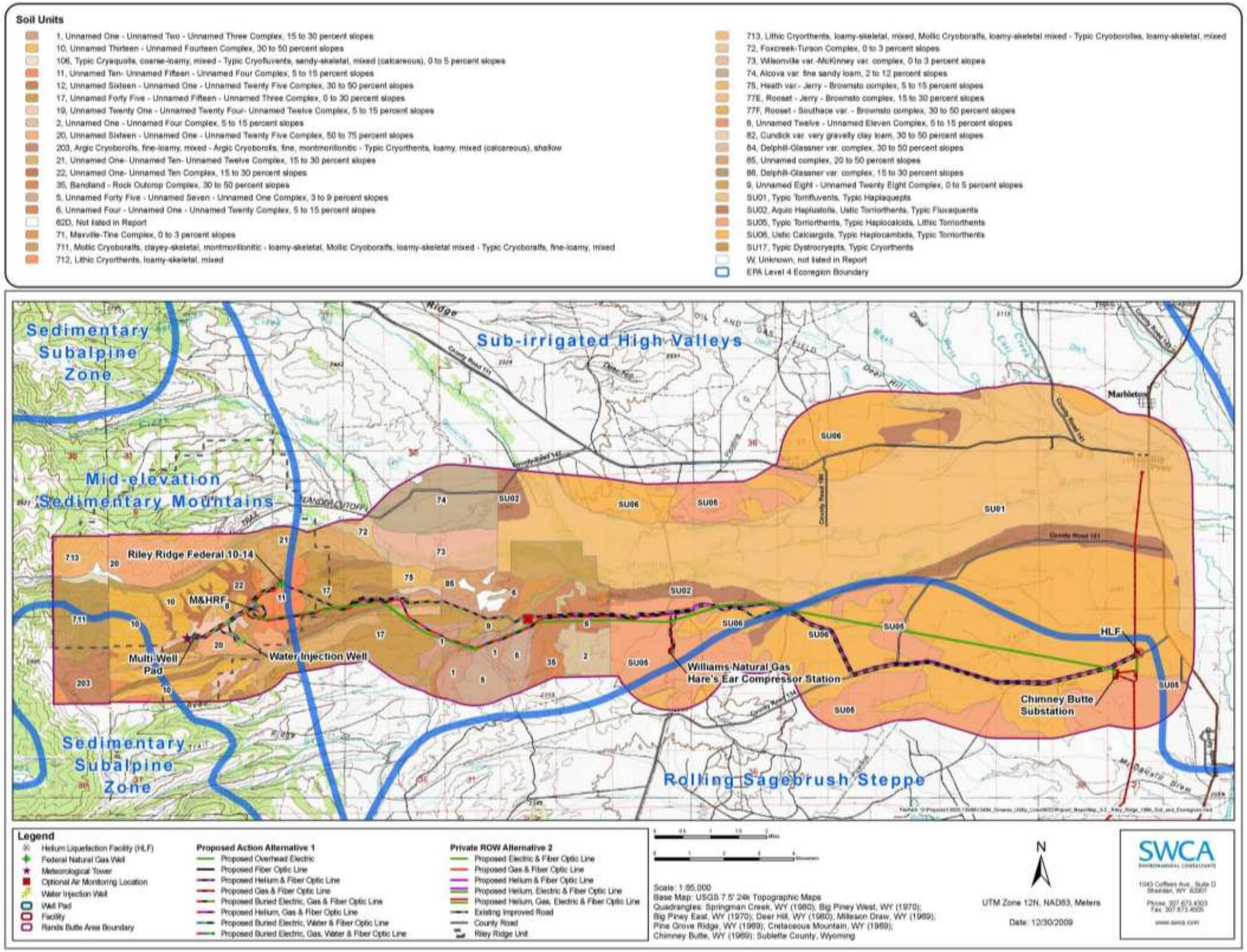
Coarse scale soil mapping of the entire RBPA has been conducted by the University of Wyoming Agricultural Experimental Station (Munn and Arneson 1998a, 1998b), in combination with soil series descriptions from the Environmental Protection Agency (EPA) Ecoregions of Wyoming (Chapman et al. 2004; Soil Survey Staff 2008). In addition, higher resolution soil unit mapping has been previously described in the Riley Ridge Natural Gas Project Soil/Vegetation/Reclamation Technical Report (RRTR) (BLM 1984) and covers approximately 23,983 acres (32%) of the RBPA, primarily in the western portion of the Rands Butte area. Mapping units in the RRTR were designed on the basis of consociations of soil series determined by slope, present erosion, surface texture, stoniness, salinity and alkalinity, internal drainage, and other differentiating characteristics (BLM 1984).

Table 3-2. Soil Families of the Soils Map of Wyoming found in the RBPA.

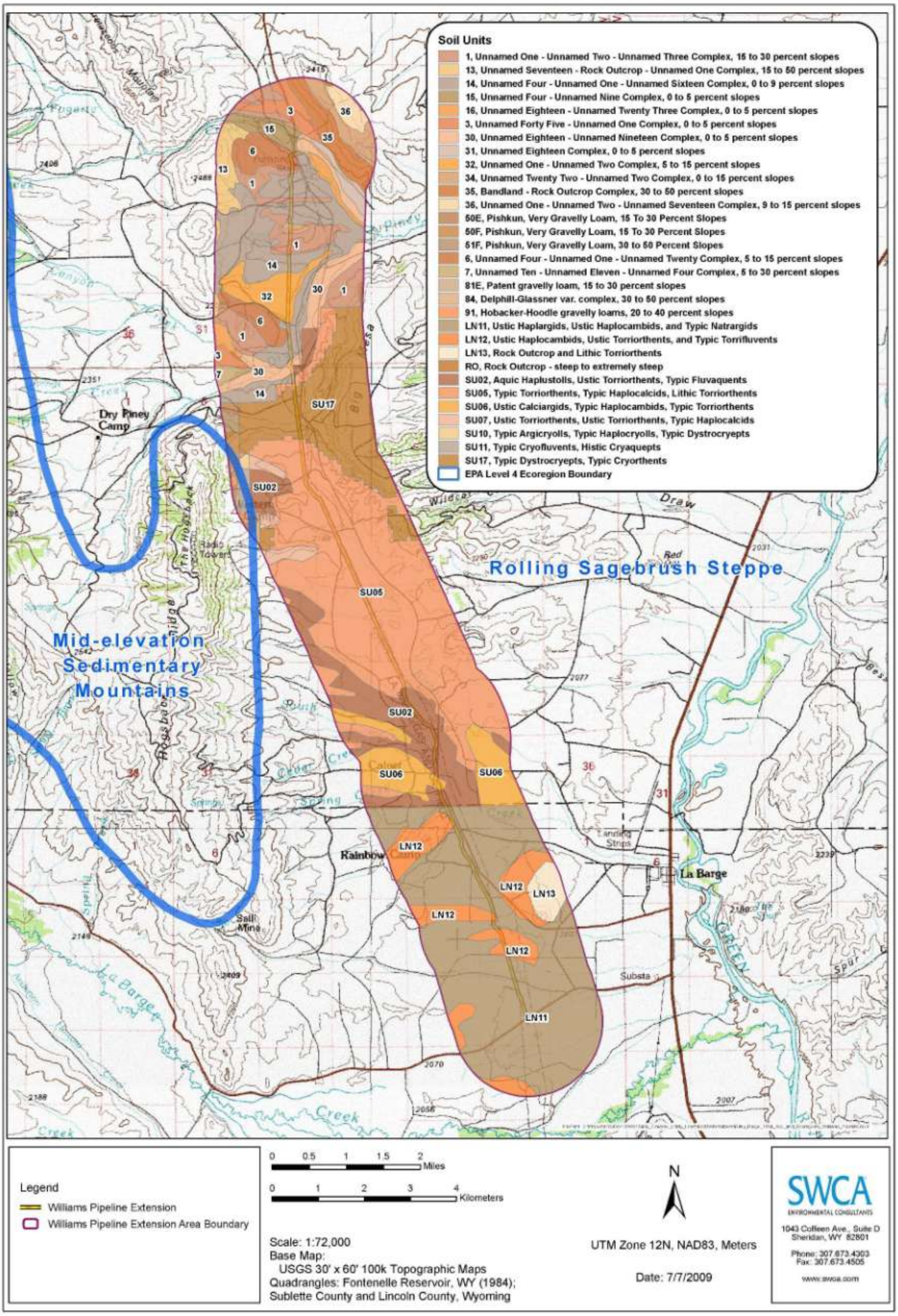
Soil Map Unit	Description
SU01	Typic Torrifluvents, fine-silty and fine, mixed (calcareous), frigid; Typic Haplaquepts, fine-loamy and fine-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid.
SU02	Aquic Haplustolls, coarse-loamy, mixed, frigid; Ustic Torriorthents, fine-loamy, mixed (calcareous), frigid; Typic Fluvaquents, fine-loamy, mixed (calcareous), frigid
SU05	Typic Torriorthents, loamy, mixed (calcareous), frigid shallow; Typic Haplocalcids, coarse-loamy, mixed, frigid; Lithic Torriorthents, loamy-skeletal, mixed (calcareous), frigid
SU06	Ustic Calciargids, loamy-skeletal, mixed, frigid; Typic Haplocambids, loamy-skeletal, mixed, frigid; Typic Torriorthents, loamy-skeletal, mixed, frigid
SU07	Ustic Torriorthents, fine-loamy, mixed (calcareous), frigid; Ustic Torriorthents, loamy, mixed (calcareous), frigid, shallow; Typic Haplocalcids, fine-loamy, mixed, frigid
SU10	Typic Argicryolls, loamy-skeletal, mixed; Typic Haplocryolls, loamy-skeletal, mixed; Typic Dystrocryepts, loamy-skeletal, mixed
SU11	Typic Cryofluvents, fine-loamy over sandy or sandy-skeletal, mixed; Histic Cryaquepts, fine-loamy over sandy or sandy-skeletal, mixed
SU17	Typic Dystrocryepts, fine-loamy and coarse-loamy, mixed; Typic Cryorthents, coarse-loamy and fine-loamy, mixed, shallow; Rock Outcrop
LN11	Ustic Haplargids, fine-loamy, mixed, frigid; Ustic Haplocambids, fine-loamy, mixed, frigid; Typic Natrargids, fine-loamy, mixed, frigid
LN12	Ustic Haplocambids, coarse-loamy, mixed, frigid; Ustic Torriorthents, coarse-loamy, mixed, frigid; Typic Torrifluvents, loamy-skeletal, frigid
LN13	Rock Outcrop and Lithic Torriorthents, loamy-skeletal, frigid

Source: Munn and Arneson 1998a, 1998b

Due to the absence of detailed soil mapping for the entire RBPA, soil map units from the Soils Map of Wyoming (Munn and Arneson 1998a, 1998b; Chapman et al. 2004) were used in combination with mapping units of the RRTR (BLM 1984) to derive soil descriptions for the entire RBPA. This approach was implemented for the general assessment of soils and broad-scale planning of the large RBPA (73,713 acres) with the intent to aid federal agencies, state agencies, and non-government organizations in their research, assessment, management, and monitoring goals. Table 3-3 presents the acreage and percent composition of each soil map unit in the RBPA. Map 3-3 and Map 3-4 show the soil mapping used for analysis in this report. In general, the western portion of the Rands Butte area and the northern portion of the Williams Pipeline area are covered by higher resolution soil mapping (BLM 1984), but only coarse scale data (Munn and Arneson 1998a, 1998b; Chapman et al. 2004) are available for the remainder of the RBPA. Soil map units from the Riley Ridge unit are described in detail in the RRTR soil survey (BLM 1984).



Map 3-3. Soil characteristics within the Rands Butte Area.



Map 3-4. Soil characteristics within the Williams Pipeline Area.

Table 3-3. Acreage and Percent Composition of Soil Map Units within the RBPA.

Soil Map Unit	RBPA (acres)	Rands Butte Area (acres)	% of Rands Butte Area	Williams Pipeline Area (acres)	% of Williams Pipeline Area
1	1,685	958	1.7	727	4
2	520	520	<1.0	0	0
3	246	0	0	246	1.4
5	770	770	1.4	0	0
6	1,236	850	1.5	386	2.1
7	48	0	0	48	<1.0
8	254	254	<1.0	0	0
9	1,428	1,428	2.6	0	0
10	2,010	2,010	3.6	0	0
11	686	686	1.2	0	0
12	646	646	1.2	0	0
13	220	0	0	220	1.2
14	1,377	0	0	1,377	7.6
15	149	0	0	149	<1.0
16	125	0	0	125	<1.0
17	1,932	1,932	3.5	0	0
19	392	392	<1.0	0	0
20	1,425	1,425	2.6	0	0
21	1,237	1,237	2.2	0	0
22	345	345	<1.0	0	0
30	432	0	0	432	2.4
31	90	0	0	90	<1.0
32	314	0	0	314	1.7
34	204	0	0	204	1.1
35	507	216	<1.0	291	1.6
36	111	0	0	111	<1.0
50E	29	0	0	29	<1.0
50F	66	0	0	66	<1.0
51F	33	0	0	33	<1.0
71	195	195	<1.0	0	0
72	161	161	<1.0	0	0
73	877	877	1.6	0	0
74	1,406	1,406	2.5	0	0
75	199	199	<1.0	0	0
77E	82	82	<1.0	0	0
77F	53	53	<1.0	0	0
81E	10	0	0	10	<1.0
82	45	45	<1.0	0	0
84	46	24	<1.0	22	<1.0

Soil Map Unit	RBPA (acres)	Rands Butte Area (acres)	% of Rands Butte Area	Williams Pipeline Area (acres)	% of Williams Pipeline Area
85	295	295	<1.0	0	0
86	1	1	<1.0	0	0
91	20	0	0	20	<1.0
106	57	57	<1.0	0	0
203	510	510	<1.0	0	0
711	830	830	1.5	0	0
712	60	60	<1.0	0	0
713	421	421	<1.0	0	0
SU01	14,330	14,330	25.8	0	0
SU02	3,630	2,232	4	1,398	7.7
SU05	10,595	6,324	11.4	4,271	23.6
SU06	14,406	13,662	24.6	744	4.1
SU07	143	0	0	143	<1.0
SU10	22	0	0	22	<1.0
SU11	61	0	0	61	<1.0
SU17	1,531	1	<1.0	1,530	8.5
LN11	3,893	0	0	3,893	21.5
LN12	934	0	0	934	5.2
LN13	185	0	0	185	1
Rock Outcrop	6	0	0	6	<1.0
Unknown	191	191	<1.0	0	0
Total*	**73,713**	**55,628**	**100**	**18,085**	**100**

* Column totals may not be exact due to rounding.
RBPA = Rands Butte Project Area

3.3.2 Soils Reported in Riley Ridge Technical Report

Approximately 32% (23,983 acres) of soil within the RBPA was described using high resolution soil map units of the RRTR soil survey (BLM 1984). Soil development has proceeded within an area with extremely diverse geomorphology, and as a result, has formed from a wide variety of geologic material, ranging from residuum, eolian deposits, alluvium, and colluvium. These parent materials, along with variable climate, topography, vegetation, and management, produce soils with diverse characteristics (Table 3-4). Soils were grouped by dominant geomorphic group, as defined by the Pinedale RMP and ROD (BLM 2008b), and only apply to soil map units described within the RRTR soil survey (BLM 1984).

Table 3-4. Acreage and Percent Composition of Soils Categorized by Geomorphic Group within the RBPA.

Geomorphic Group	Soil Map Units	Rands Butte Area (acres)	Williams Pipeline Area (acres)	RBPA (acres)
Soils of the Mountains	3, 5, 7, 8, 10, 11, 12, 19, 20, 21, 22, 50E, 50F, 51F, 82, 85, 91, 203, 711, 712, 713	10,777	442	11,219
Soils of the Foothills	2, 13, 14, 17, 32, 36	2,452	2,022	4,472
Piedmonts and Alluvial Fans	15, 71, 74	1,601	149	1,750
Soils of the Uplands	1, 6, 34, 75, 77E, 77F, 81E, 84, 86	1,317	1,349	2,666
Soils of the Flood Plains	9, 16, 30, 31, 72, 73, 106	2,523	647	3,170
Badlands	35	216	291	507
Unknown		191	0	191
Rock Outcrop		0	6	6
Total*		**19,078**	**4,907**	**23,983**

* Column totals may not be exact due to rounding.
RBPA = Rands Butte Project Area

3.3.2.1 Soils of the Mountains

Soils of the mountains comprise 15% of the RBPA covered by the RRTR soil survey (BLM 1984) and are developing on dominant parent materials that include residuum from sedimentary and igneous rock, colluvium from complex mass slope movements, and alluvium and outwash from fans and drainages. Slopes range from nearly level to very steep (0% to 75%) with shallow to deep soils ranging in texture from silty clay to cobbly loam, often with high percentages of coarse fragments. Permeability of soil ranges from moderately slow to moderately rapid and reactivity is slightly acid to moderately alkaline (pH 6.1 to 8.4). Erosion hazards of these soils are slight to severe and the reclamation potential is generally poor to fair. The steep slopes, short growing season, calcareous surface horizons, and high landslide potentials limit management opportunities in these areas.

3.3.2.2 Soils of the Foothills

Soils of the foothills comprise 6.1% of the RBPA of the RRTR soil survey (BLM 1984) and are developing on dominant parent materials that consist of residuum formed over upthrusted sediments and alluvium on footslopes and drainages. The shallow to deep soils are found in rolling to steep (0% to 50% slope) topography, and permeability is very slow to moderately rapid. Geologic overthrusting and resulting mixed exposures have produced variable soil textures that range from clay to very gravelly fine sandy loam. Soils have neutral to moderately alkaline reactivity (pH 6.6 to 8.4) and generally exhibit a calcareous layer near the surface. These soils have slight to severe erosion hazards and the reclamation potential ranges from poor to good. Opportunities to mitigate adverse impacts on soils are limited by the dominance of shallow soils, low precipitation, and moderate to high landslide potential.

3.3.2.3 Piedmonts and Alluvial Fans

Mixed, calcareous alluvial parent materials on the terraces, fans, and piedmonts have formed soils on nearly level to gentle slopes (0% to 12%) and occupy 2.4% of the RBPA covered by the RRTR soil survey (BLM 1984). Generally, features are deep and well-drained, silty clay to gravelly clay loams with mild to strong alkalinity (pH 7.4 to 9.0). Erosion hazards range from low to slight and reclamation potential is good, unless alkalinity is elevated. Limited management features include occasional undercut slopes coupled with alkaline areas in alluvium and cobbly surfaces in glacial moraines.

3.3.2.4 Soils of the Uplands

Upland soils comprise 3.6% of the RBPA covered by the RRTR soil survey (BLM 1984). Residuum found over flat-lying sediments, colluvium of gentle sideslopes, and alluvium and outwash from uplands are the most prominent parent materials. Generally, soils are neutral to moderately alkaline (pH 7.4 to 8.4), ranging from very shallow to deep on nearly level to steep slopes (0% to 50%). Although usually well-drained, areas of shale uplands have elevated clay textures (40% to 50%) resulting in very slow to moderate permeability. Erosion hazards are slight to severe and reclamation potential typically poor to fair. Generally, the soils of this group are formed in shales producing clayey textures, poor infiltration, moderate to rapid runoff, and high potential for slumping.

3.3.2.5 Soils of the Flood Plains

Soils of the flood plains are associated with major drainages and comprise 4.3% of the RBPA covered by the RRTR soil survey (BLM 1984). These nearly level to rolling (0% to 5% slopes) soils derived from alluvium are generally deep and vary in texture from silty clay loam to gravelly sand with calcareous surface layers. Soils range in reactivity from slightly acidic to moderately alkaline (pH 6.1 to 8.4) with moderately slow to rapid permeability. These soils exhibit very little erosion hazards and reclamation potential is good; however, areas of elevated saline or alkaline conditions may limit vegetation productivity.

3.3.3 Soils Map of Wyoming Ecoregions

Approximately 68% of soil within the RBPA was described using coarse-scale soil map units of the University of Wyoming Agricultural Experimental Station (Munn and Arneson 1998a, 1998b), which are subsequently categorized into EPA Ecoregions of Wyoming (Chapman et al. 2004). Further on-site evaluation of soils described using this data is recommended to determine construction suitability and erosion susceptibility.

3.3.3.1 Soils of Sub-irrigated High Valleys

Soils of Sub-irrigated High Valleys developed on coarse-textured alluvial sediments and alluvium derived from sedimentary rocks, floodplains, eolian deposits, glacial till, and slopewash. Soils formed on nearly level to steep slopes (0% to 65%) on fans, hillslopes, plateaus, ridges, and terraces, and cover approximately 26,067 acres of the RBPA. The deeply developed, mixed soils range from very poorly drained to well drained, and general features are mixed with textures ranging from fine-loamy to coarse-loamy. Soils within this ecoregion have temperature regimes that fall between frigid (cool) and cryic (cold), resulting in shorter growing seasons and may be susceptible to freeze periods. This portion of the RBPA includes soil types that are hydric and/or have elevated clay content. Management features that limit mitigation opportunities include occasional steep slopes and short growing seasons coupled with alkaline areas in alluvium, periods of water inundation, and increased clay mineral content.

3.3.3.2 Soils of Rolling Sagebrush Steppe

Soils of Rolling Sagebrush Steppe developed on residuum and eolian deposits found over flat-lying sediments, colluvial slopewash, and alluvial parent materials on a variety of geomorphic features that have formed soils on slopes that are both simple to complex and widely vary from 0% to 80%. These soils cover approximately 23,632 acres of the RBPA and occupy alluvial fans, terraces, dissected fan remnants, fan piedmonts, hillslopes, pediments, plateaus, erosional upland plains, ridges, and buttes. These well-drained to excessively drained soils vary in depth from very shallow to very deep. Features are typically mixed with consistent textures, ranging from fine-loamy to coarse-loamy and gravelly. Soils are characterized as having frigid and cryic temperature regimes and may be susceptible to freeze periods. Some soils of Rolling Sagebrush Steppe have inherent characteristics that affect soil degradation, including increased clay composition and sodium adsorption ratio (SAR). Steep slopes, shallow soils, and excessively drained soils in association with cold climate, clayey soils, and increased SAR limit management and mitigation opportunities in these areas.

3.3.3.3 Soils of Mid-elevation Sedimentary Mountains

Soils of Mid-elevation Sedimentary Mountains developed on parent materials that include residuum from sedimentary and igneous rock, colluvium derived from slopewash from underlying limestone and sandstone, and eolian silts that have been partially reworked by water. The soils are well drained, shallow to very deep, and found on uplands, hillslopes, mountainsides, and ridges with slopes ranging from nearly level to very steep (0% to 75%). Soils are typically mixed and textures range from fine-silty to loamy-skeletal. These soils account for approximately 31 acres of the Williams Pipeline portion of the RBPA. This portion of the RBPA is composed entirely of cryic soils. As was determined for soils in the Sub-irrigated High Valleys ecoregion, these soils may potentially include soil types that contain clayey textures and hydric conditions. Steep slopes, high landslide potentials, shallow soils, abbreviated growing season, elevated clay content, and wet conditions limit reclamation potential to soil impacts in these areas.

3.3.4 Problematic Soil Conditions and Characteristics

Soils in the RBPA exhibit characteristics that are associated with sensitive soils, which are generally limited in their suitability for construction activities and may inhibit successful reclamation. Sensitive soils typically include those occupying steep slopes (greater than 25%) and/or those with physical and/or chemical characteristics that could accelerate the rate of soil erosion from disturbed areas and/or inhibit successful stabilization and reclamation of disturbed sites. Physical and chemical degradation of soils reduces soil quality and is influenced by differences in soil properties, climate, terrain, and management (Laal et al. 2004). The primary factors limiting soil use for construction activities related to oil and gas development are shallow depth to bedrock, low strength, shrink-swell potential, frost action, flooding, and steep slopes (greater than 25%). Reclamation potential is limited by alkalinity and salinity; excess stones, sand, clay, and/or lime; shallow depths; and steep slopes (greater than 25%). Other characteristics that are indicative of soil sensitivity include low moisture-holding capacity, wind erodibility hazard, high soil-erosion factors, slow permeability, and saline soils. Dunal deposits stabilized by desert vegetation are highly sensitive to disturbance (Love and Christiansen 1985) and may occur infrequently in the RBPA.

Steep slopes (greater than 25%) occur frequently in the RBPA and are present within 11% (8,065 acres) of the total area, primarily in the western portion of the Rands Butte area. Along with steep slopes and shallow soils, other susceptible soils within the RBPA include highly erodible, saline, and sodic soils (BLM 2008b). Soil characteristics and limitations are discussed in the following subsections.

3.3.4.1 Highly Erodible Soils

Highly erodible soils are characterized by the detachment of topsoil and transport of surface soil layers resulting from various actions of water, wind, and gravity (Laal et al. 2004), which increases tremendously when the vegetative community is disturbed by construction or any other disturbance that reduces the amount of vegetative cover (BLM 2008b). Highly erodible soils generally occupy steep slopes (greater than 25%) and/or have physical and/or chemical characteristics that accelerate the rate of soil erosion. In addition, erosion increases the likelihood that silt and sediment are transported into nearby streams, thereby degrading water quality and impacting downstream environments. Highly erodible soils, characterized by their susceptibility to water, wind, and gravity erosion, may be found within the RBPA.

3.3.4.2 Saline Soils

Saline soils are typically derived from parent material dominated by calcium, magnesium, or other non-sodium salts (Laal et al. 2004). Excessive buildup of soluble salts in the root zone during weathering interferes with the biological acquisition of water and nutrients, which results in bare ground due to poor plant emergence and reduced vigor. Soil salinity and salinization of soil can significantly influence erosion and reclamation potential. Because erosion of saline soils can also have significant effects on downstream water quality, saline soils are managed to minimize impacts in these areas and promote the revegetation of previously disturbed areas to the greatest extent possible (BLM 2008b). Due to the high degree of soil development in sedimentary rocks, saline soils may be found within the RBPA.

3.3.4.3 Sodic Soils

Sodium salts dominate the ionic composition of sodic soils, which are defined as having an SAR of 13 or higher (Soil Survey Staff 1993). Sodium causes finer-textured soils to disperse, making them less permeable to plant roots and water infiltration (BLM 2008b). Soil dispersion can also result in reduced water infiltration, greatly increasing the runoff rates, which lead to increased soil erosion and sediment yields. Soils often have a thin layer of less sodic soil above the sodic horizon that, when disturbed or removed, can cause irreversible impacts. Sodic soils are closely associated with soils derived from alluvium due to the well-drained nature of these soils; thus, sodic soils may be found within the RBPA.

3.4 PALEONTOLOGICAL RESOURCES

Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced.

3.4.1 Location and Classification of Paleontological Resources in the RBPA

The RBPA is located near the western margin of the Green River Basin bordering the Wyoming thrust belt. The western margin of the basin is defined by Oyster Ridge, a north–south-trending hogback ridge formed by west-dipping beds of the Cretaceous Frontier Formation (Roehler 1992). According to published geologic mapping (Love and Christiansen 1985), the RBPA is immediately underlain by 12 geologic units. Table 3-5 summarizes the number of acres of these 12 mapped units within the Rands Butte and Williams Pipeline areas separately and in the combined RBPA regardless of land ownership.

According to the Pinedale RMP and ROD (BLM 2008b), the paleontological resource management goal of the PFO is to protect significant fossils and known paleontological resources from damage or destruction, while facilitating the suitable scientific, educational, and recreational uses of fossils.

Occurrences of paleontological resources are closely related to the geologic units in which they are contained, and the potential for finding paleontological resources can be broadly predicted by the presence of the pertinent geologic units at or near the surface. Therefore, geologic mapping can be used as a proxy for assessing the likelihood of occurrences of scientifically significant paleontological resources. Each geologic unit within the RBPA has been classified according to the Potential Fossil Yield Classification (PFYC) System, originally developed by the USFS and recently revised and adopted as policy by the BLM (BLM 2007a). The PFYC System assigns a designation (Classes 1 through 5) to geologic units to denote their paleontological sensitivity for planning purposes. Class 1 geologic units have the lowest paleontological sensitivity and are not likely to contain recognizable fossil remains; Class 5 geologic units have a very high paleontological sensitivity and consistently and predictably produce scientifically significant fossils. All PYFC assignments listed herein were designated by the BLM.

Table 3-5. Acreages of Geologic Units within the RBPA (geologic unit abbreviations from Love and Christiansen 1985).

Geologic Unit[1]	Age	Typical Fossils	PFYC	RBPA		Total
				Rands Butte Area (acres)	Williams Pipeline Area (acres)	
Alluvium and colluvium (Qa)	Quaternary (= Pleistocene and Holocene)	Pleistocene deposits may contain mineralized or partially mineralized remains; Holocene deposits are too young to contain fossils	Class 2	15,733	4,099	19,832
Gravel, pediment, and fan deposits (Qt)	Quaternary (= Pleistocene and Holocene)	Pleistocene deposits may contain mineralized or partially mineralized remains; Holocene deposits are too young to contain fossils	Class 2	20,627	3,402	24,029
Undifferentiated Fontenelle Tongue of the Green River Formation and New Fork Tongue of the Wasatch Formation (Twg)	Middle Eocene	Plants and a locally abundant and diverse vertebrate fauna (fish, reptiles, and mammals)	Class 5	99	1,190	1,289
Undifferentiated Green River and Wasatch Formations (Tgrw)	Middle Eocene	Plants and a locally abundant and diverse vertebrate fauna (fish, reptiles, and mammals)	Class 5	0	826	826
Wasatch Formation, Diamictite and Sandstone (Twd)	Early to Middle Eocene	Unknown	Class 3b	8,520	204	8,724
Wasatch Formation, La Barge and Chappo Members (Twlc)	Middle Eocene and Paleocene	Abundant vertebrates, including reptiles, fish, and mammals	Class 5	9,929	8,283	18,212
Aspen Formation (Ka)	Late Cretaceous	Plants, invertebrates including mollusks and gastropods, and vertebrates (fish)	Class 3a	162	0	162
Gannett Group (Kg)	Early Cretaceous	Invertebrates (ostracods, snails, mollusks) and vertebrates (dinosaurs and other reptiles)	Class 3a	69	0	69

Geologic Unit[1]	Age	Typical Fossils	PFYC	RBPA		Total
				Rands Butte Area (acres)	Williams Pipeline Area (acres)	
Twin Creek Limestone, Preuss Sandstone, and Stump Formation (Jst)	Middle to late Jurassic	Invertebrates (bryozoans, sea urchins, bivalves, ammonites, corals, and crinoids) and vertebrates (icthyosaurs and pliosaurs) known from the Stump Formation only	Class 3a	413	0	413
Nugget Sandstone (JTRn)	Late Triassic and/or early Jurassic	Invertebrates, plants, invertebrate and vertebrate ichnofossils (trackways)	Class 3a	75	0	75
Undifferentiated Three Forks, Jefferson, and Darby Formations and Madison Limestone or Group (MD)	Late Devonian to early Mississippian	Invertebrates in all four formations, and vertebrates (placoderm fish) in the Jefferson Formation	Class 3a	0	14	14
Undifferentiated Middle Cambrian to Late Ordovician (O€)	Middle Cambrian to late Ordovician	Unknown	Class 2	0	68	68

[1] Geologic units are listed in approximate descending stratigraphic order (from youngest to oldest).

PFYC = Potential Fossil Yield Classification

RBPA = Rands Butte Project Area

3.4.2 Records Search Results

Records searches were conducted to 1) determine whether any previously recorded paleontological localities occur within the RBPA; 2) assess the potential for disturbance of these localities during construction; and 3) evaluate the paleontological sensitivity within the RBPA. Eight localities have been previously documented within the RBPA and are located in the Wasatch Formation in areas mapped as undifferentiated La Barge and Chappo members (Love and Christianson 1985). Five of the localities are in the Rands Butte Area and three are in the Williams Pipeline Area. Collected specimens from four of the localities include four families of turtle (Dermatemydidae, Testudinidae, Bataguridae, Trionychidae), one family of lizard (Anguidae), one genus of alligator (*Borealosuchus*), one genus of artiodactyl (*Hexacodus*), one genus of perissodactyl (*Hyracotherium*), and one family of rodents (Ischyromyidae) (University of California Museum of Paleontology [UCMP] unpublished paleontological collections data). Numerous other fossil localities have been recorded within Sublette County in the Wasatch and Green River formations, although geographic coordinates are not available for these occurrences (UCMP unpublished paleontological collections data).

3.4.3 Field Survey Results

The paleontological resource analysis included a field survey of the Proposed Action area of potential effect (APE). Pedestrian and vehicular field surveys were conducted from November 10 through 12, 2008, by SWCA Environmental Consultants (SWCA) paleontologists Georgia E. Knauss and Wendi L. Shaver. As discussed with the PFO Paleontology Resource Coordinator, the pedestrian survey in the PFO area concentrated on areas underlain by geologic units considered to have high paleontologic sensitivity (PFYC Class 5) and was primarily limited to surface exposures of bedrock. The survey area included a 300-foot-wide corridor (150 feet on either side of the centerline) along the proposed transmission line and pipelines/buried fiber optic lines in the Rands Butte Area and the Williams pipeline in the Williams Pipeline Area on land owned by the BLM and the State of Wyoming. Although private land surveys were requested by the BLM, none were conducted because access was not approved by the landowners at the time of the field survey. Based on a geologic map review, aerial photograph review, and vehicular reconnaissance, field surveys were not deemed necessary for the proposed location of the Cimarex M&HRF, the HLF, the AAM&WS, the well pad containing the Madison Formation gas wells and acid gas injection well, and portions of the pipelines and transmission line (underlain by PFYC Class 3 or lower). The vegetated portions of the APE underlain by highly paleontologically sensitive (PFYC Class 5) formations were visually inspected (to check for localized unvegetated areas) from the vehicle.

Two significant fossil localities (081110-GEK-01, 081111-GEK-01) and one non-significant fossil occurrence were newly documented during the field survey. Both of the significant fossil localities were found on State of Wyoming trust land during surveys conducted at the request of the BLM. However, the necessary authority to collect fossils from these lands was not provided; therefore, no fossils were collected during the field survey. Crocodilian scutes and miscellaneous unidentifiable bone fragments were documented at locality 081110-GEK-01 in Section 16, T29N, R112W. A vertebrate fossil microsite, locality 081111-GEK-01, was documented in Section 16, T29N, R113W. This site is highly fossiliferous and a number of fossils were observed on the ground surface, including turtle shell pieces representing at least three taxa (Trionychidae, Kinosternoidea, *Anosteira* sp.), turtle limb bones, one fragmentary mammal tooth, gastropod and other invertebrate shells, and crocodilian scutes. Immediately adjacent to locality 081111-GEK-01, a non-significant fossil occurrence consisting of petrified wood was documented. The occurrence of these fossil localities indicates the likelihood of subsurface fossils in these areas.

This section includes management recommendations for each PFYC Class (2, 3, and 5), and summaries of the paleontology and contextual geology of each of the 12 geologic units within the RBPA. The mitigation recommendations outlined below follow BLM management guidelines regardless of land ownership.

3.4.4 PFYC Class 5 Geologic Units

PFYC Class 5 units are highly fossiliferous and consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and are at risk of human-caused adverse impacts or natural degradation. Because the probability for impacting significant fossils is high, on-the-ground surveys are usually required prior to authorizing any surface-disturbing activities and specific site mitigation, avoidance, and/or on-site monitoring may be necessary prior to or during construction activities (BLM 2007a, 2008b).

Three geologic units within the RBPA are designated PYFC Class 5 due to the known abundance of fossil remains (see Table 3-5). These units underlie 1% of the Rands Butte Area and 11% of the Williams Pipeline Area, and their paleontology and contextual geology is discussed below. The discussions are listed in approximate ascending stratigraphic order (oldest to youngest).

3.4.4.1 Wasatch Formation, La Barge and Chappo Members

The undifferentiated La Barge and Chappo members of the Wasatch Formation underlie a large portion of the RBPA. The Chappo Member contains few to abundant beds of pisolitic limestone, many containing gastropod nuclei (Oriel 1962). Extensive vertebrate fossil collections from the Chappo Member are indicative of a middle- to late-Tiffanian age (late Paleocene). In total, 33 genera and 39 species of mammals have been identified from the Chappo type locality and include multituberculates, marsupials, insectivores, pleisadapids and other early primates, phenacodonts, arctocyonids, hyopsodonts, mesonychids, vivveravids, and creodonts. This fauna has been interpreted as representing an open woodland, seasonally dry paleoenvironment (Gunnell 1994).

The La Barge Member consists of brightly colored mudstone with small lenses of sandstone and locally present conglomeratic beds with predominant red mudstone beds. The unit is overlain by limestone beds of the Fontenelle Tongue of the Green River Formation. Gazin (1965) reported 40 mammal species in 31 genera that were used to characterize the La Barge fauna. The majority of the fauna is represented by perissodactyls and condylarths but also includes a high diversity of primates, carnivores, and rodents (Breithaupt 1990).

3.4.4.2 Undifferentiated Fontenelle Tongue of the Green River Formation and New Fork Tongue of the Wasatch Formation

The early Eocene-age fluvial Wasatch Formation interfingers with and underlies the early and middle Eocene-age lacustrine Green River Formation (Roehler 1991a). Both of these formations exhibit rapid lateral facies changes, abrupt thickness changes, intraformational unconformities, and gradational contacts (Roehler 1991b). At least two of the interfingering tongues, the Fontenelle Tongue of the Green River Formation and the New Fork Tongue of the Wasatch Formation, underlie portions of the middle part of the RBPA near the center of the Rands Butte Area and at the north end of the Williams Pipeline Area. Few vertebrate fossils have been discovered from the Fontenelle Tongue of the Green River Formation, whereas fossils known from the New Fork Tongue include fish, reptiles, and mammals. Perissodactyl and condylarth fossils indicative of the "Lostcabinian" North American Land Mammal sub-age are the most abundant mammalian remains in the New Fork Tongue (West 1978).

3.4.5 PFYC Class 3 Geologic Units

Fossils in PFYC Class 3 units vary in significance, abundance, and predictable occurrence (3a), or their potential is unknown (3b). Because of the variability in fossil potential, management strategies for Class 3 units include a broad range of options including pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources (BLM 2007a, 2008b).

Six geologic units within the RBPA are designated PYFC Class 3 by the BLM due to the moderate or unknown occurrence of fossil remains (see Table 3-3). These units underlie 34% of the Rands Butte Area and 47% the Williams Pipeline Area, and their paleontology and contextual geology is discussed below in approximate ascending stratigraphic order (oldest to youngest).

3.4.5.1 Undifferentiated Three Forks, Jefferson and Darby Formations, and Madison Limestone or Group

The marine Three Forks, Jefferson, and Madison formations are undifferentiated within the RBPA and are exposed along the eastern edge of the Williams Pipeline Area. The Three Forks Formation contains a variety of marine invertebrate fossils that have been useful for biostratigraphic studies (Korn and Titus 2006). The most scientifically important fossils found in this formation are soft-bodied hydrozoans with preserved tentacle impressions from the Garnet Mountains of Montana (Gutschick and Rodriguez 1990). While no vertebrate fossils are apparently documented from the Three Forks Formation, the Jefferson Formation has produced at least three types of placoderms (armored fish) (Denison 1968). In addition to relatively uncommon vertebrate fossils, the Jefferson Formation contains a diverse invertebrate fauna. The Madison Limestone contains invertebrate fossils that include corals, algae, and brachiopods.

3.4.5.2 Nugget Sandstone

The late Triassic and/or early Jurassic Nugget Sandstone was deposited in near-shore marine and eolian dune environments and underlies a small area at the western edge of the Rands Butte Area along the Wyoming Thrust Belt (Love and Christiansen 1985; Doelger 1987). A variety of fossils are known from the Nugget Sandstone; however, the taxonomic diversity of the fossil assemblage is low. Ostracods (Doelger 1987) and a vertebrate track site (Hamblin et al. 2000) have been reported from Wyoming and Utah. No vertebrate body fossils have been reported from the Nugget Sandstone.

3.4.5.3 Undifferentiated Twin Creek Limestone, Preuss Sandstone, and Stump Formation

The middle Jurassic Twin Creek Limestone, middle to late Jurassic Preuss Formation, and middle to late Jurassic Stump Formation are exposed in the western portion of the Rands Butte Area along the Wyoming Thrust Belt. These rocks are not differentiated on the Wyoming State geologic map (Love and Christiansen 1985).

All three undifferentiated formations are known to contain invertebrate fossils, although vertebrate fossils are known only from the Stump Formation. An overview of the paleontology and stratigraphy of the Twin Creek Formation was published by Imlay (1967), who reported a number of invertebrate taxa including seven new species. Additional work within the Twin Creek Formation includes studies on bryozoans (Cuffey and Ehleiter 1984), a description of a new sea urchin (Philip 1963), and a study on the feeding methods of bivalves (Wright 1974). It appears that only the Wolverine Canyon Member of the Preuss Sandstone has produced fossils, and thus far these have all been discovered in Idaho (Imlay 1952). The Stump Formation does contain a sparse invertebrate fauna, including ammonites, corals, and crinoids. Ichnofossils and vertebrate fossils (icthyosaurs and pliosaurs) have been collected from south of the RBPA in northeastern Utah (Bilbey et al. 1990; Bilbey et al. 2004).

3.4.5.4 Gannett Group

The early Cretaceous Gannett Group is divided into five formations in Wyoming in stratigraphic ascending order: the Ephraim Conglomerate, Peterson Limestone, Bechler Conglomerate, Draney Limestone, and Smoot Formation. Rocks of this group are exposed in the Wyoming Thrust Belt along the western margin of the Rands Butte Area.

While the Gannett Group has produced numerous invertebrate and some vertebrate fossils, they are relatively rare. Invertebrates have been identified from all the formations comprising the Gannett Group, while vertebrates have only been documented from the Ephraim Conglomerate (Mansfield 1952) and possibly from the Smoot Formation (Dorr 1985). Microinvertebrate fossils including ostracods and charophytes and macroinvertebrate fossils including snails and mollusks were reported by Eyer (1969) in his detailed review of the Gannett Group. Additional work on microinvertebrates was concentrated on foraminifera from the Ephraim Conglomerate. The vertebrate fossils documented by Dorr (1985) include dinosaur and reptile bone fragments that are believed to have come from the upper portion of the Gannett Group, likely the Smoot Formation. Additional dinosaur fossils, possibly saurian, were reported by Mansfield (1952) from the Ephraim Conglomerate.

3.4.5.5 Aspen Shale

In the Rands Butte Area, the Late Cretaceous Aspen Shale is exposed along the western edge in the Wyoming Thrust Belt. Exposures of the formation continue out of the Rands Butte Area to the north and south. This marine to lacustrine unit contains both plant and animal fossils. LaRocque and Edwards (1954) published a detailed stratigraphic column and discussion of the fossils including mollusks, gastropods, plants, and fish from a location northwest of the RBPA. Most of the fossils from this unit are invertebrates, and vertebrates are uncommon and poorly preserved.

3.4.5.6 Wasatch Formation, Diamictite and Sandstone Facies

The diamictite and sandstone facies of the Wasatch Formation underlie a large portion of the western third of the Rands Butte Area and a very small area along the western edge of the Williams Pipeline Area. Large boulders and blocks that form clasts in this unit are most commonly derived from the Mesozoic formations, and grain morphology is extremely variable in terms of size, shape, angularity, and orientation (Oriel 1962). The lithology of this unit reflects a high energy depositional environment, and such conditions are often unfavorable for fossil preservation. No records of fossils from this unit were located during the research for this EA.

3.4.6 PFYC Class 2 Geological Units

PFYC Class 2 units are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils; therefore, the probability for impacting vertebrate fossils or scientifically significant invertebrate or plant fossils is low. Mitigation of paleontological resources during ground-disturbing activities is not likely to be necessary. Localities containing important resources may exist, but would be rare and managed on a case-by-case basis (BLM 2007a, 2008b).

Three geological units in the RBPA are classified as PYFC Class 2 due to the low potential for fossil remains (see Table 3-3). These include Quaternary-age surficial deposits of alluvium and colluvium, gravel, pediment, and alluvial fans; and undifferentiated rocks of middle Cambrian to late Ordovician age. PFYC Class 2 units underlie 65% of the Rands Butte Area and 42% of the Williams Pipeline Area. Because paleontological resources are unlikely to be affected within these units, they are not considered further in this EA.

3.5 GROUNDWATER AND SURFACE WATER RESOURCES

This section identifies the existing water resources within the RBPA that could be affected by the Project. Specific subjects discussed in this section include surface water and groundwater sources, water storage, water availability, water quality, and future demands for water resources. Modifications of hydrological conditions within the watershed may impact riparian, wildlife, and fishery resources, as well as future water availability.

3.5.1 Surface Water Introduction

The surface water resources in the RBPA would be managed and protected according to existing federal and state law and policies regarding the use, storage, and disposal of the resource during the operation of the Project. Current federal regulations regarding water quality are regulated within 40 CFR, *Protection of the Environment.* Water quality is protected under the Federal Water Pollution Control Act (as amended), otherwise known as the Clean Water Act (CWA). The CWA has developed rules for regulating discharges of pollutants into waters of the U.S. and also regulates water quality standards for surface waters. The CWA has also made it unlawful to discharge any pollutant from a point source into any navigable waters of the U.S., unless a permit has been obtained from the National Pollution Discharge Elimination System (NPDES) program. The State of Wyoming has received primacy of the NPDES program and administers the surface water discharge permitting program under the Wyoming Pollutant Discharge Elimination System (WYPDES) program.

The WDEQ Water Quality Division administers water quality standards for surface water under the authority of regulations promulgated pursuant to Wyoming Statute (WS) 35-11-101 through 1507. The statute is titled the Environmental Quality Act and is the basis for WDEQ rules pertaining to water quality and includes Chapters 1 through 23.

Surface water resources within Wyoming have been altered by irrigation diversions and construction of irrigation canals throughout the region. Water appropriation and beneficial use of the water resources within the state is administered by the Wyoming State Engineer's Office (WSEO). Wyoming water law is based on the Doctrine of Prior Appropriation where the first person to put the water to beneficial use has first right, and water rights in Wyoming are regulated by priority date. The WSEO statutory authorities are defined in WS Title 41, Chapters 3 through 12 (WSEO 1977).

The surface water resource use and protection is administered under the following federal and state laws:

- Clean Water Act of 1972, as amended (33 USC 1251 et seq.)
- Federal Land Policy and Management Act of 1976 (43 USC 1711–1712)
- National Environmental Policy Act of 1972 (42 USC 4321)
- Safe Drinking Water Act of 1974, as amended (42 USC 300 et seq.)
- Wyoming Water Quality WS 35-11-101–1507
- Wyoming Water Appropriations WS Title 41, Chapters 3–12

3.5.2 Surface Water Resources

The surface water resources of the RBPA are part of the larger Upper Green River Basin. The basin is drained by the Green River and is the primary drainage basin within southwest Wyoming. The headwaters of the Green River are on the west slope of the Wind River Mountain Range. The Green River flows in a southerly direction to its confluence with the Colorado River south of Green River, Utah. The Green River Basin is the largest tributary of the Colorado River (Wyoming Water Development Commission [WWDC] 2001).

The surface water resources within the RBPA include Beaver Creek, Piney Creek (middle and south branches), Fish Creek, and Spring Creek. Other streams including the north branch of Piney Creek enter the RBPA near its confluence with the Green River. The majority of the stream flow within the RBPA originates in the Wyoming Range, a mountain range of the Rocky Mountains located in western Wyoming. Runoff generated in the headwaters of the streams that run through the RBPA generally flow in an easterly direction until they drain into the Green River near the eastern boundary of the RBPA (BLM 2008b). Numerous irrigation canals and ditches have been constructed within the stream valleys for diversion of irrigation water. These canals divert flow from the valley's streams and transport water during the irrigation season to a specific place of use. The canals and point of use of the water is permitted through the WSEO.

The majority of the annual precipitation in the area falls during the winter months as snow in the Wyoming Range. As a result, a significant portion of the annual runoff occurs in the form of snowmelt during the spring and early summer months. Lower-elevation snowmelt may also contribute to surface runoff but is generally limited to early spring flows due to lower snow accumulations and warmer temperatures than in the higher-elevation regions. Spring and summer thunderstorms can also generate significant amounts of runoff within the RBPA. These storms may produce large surface water flows and possible flood events within the drainage. However, they can be spatially variable and unpredictable. Groundwater sources may contribute to surface water flows during periods when groundwater levels are elevated to the level of the stream channels.

3.5.2.1 Characteristics of Surface Water Systems

The RBPA is divided into 14 hydrologic subwatersheds as defined by USGS sixth-order (12-digit) Hydrologic Unit Codes (HUCs). The HUCs are delineated from specific topographic and hydrologic properties present in the basin where water within each watershed basin would flow to an output point at the terminus of the subwatershed. The specifics of the HUCs are detailed in Table 3-6.

Table 3-6. Sixth-order HUCs within the RBPA.

HUC-12 Digit	HUC Name	Area (acres)
140401010804	Lower North Piney Creek	30,920
140401010805	Deer Hill Draw	25,570
140401010806	Middle Piney Creek	41,710
140401010807	South Piney Creek-Green River	33,520
140401010808	Lower Beaver Creek-Green River	35,900
140401010809	Upper Beaver Creek-Green River	22,050
140401011001	Green River-Spring Creek	30,120
140401011002	Dry Basin Draw	29,890
140401011003	Dry Piney Creek	35,490
140401011004	Fogarty Creek	16,810
140401011005	Green River Bird Draw	25,940
140401011009	Green River Chappel Creek	36,010
140401011010	Birch Creek	16,520
140401011104	La Barge Creek-Burdick Creek	36,100

The RBPA has two distinct topographical regions: the mountainous forested region of the western portion of the RBPA and the sage-dominant plains region of the eastern portion. The elevation within the RBPA ranges from about 9,800 feet in the west end to approximately 6,800 feet in the east end.

3.5.2.2 Surface Water Flow

Stream flow within the RBPA is dependent on specific properties unique to the surface water drainages. These physical properties include the geology, topography, vegetative cover, size, and climate. Major contributions to stream flows in the RBPA include snowmelt, direct precipitation, overland flow, baseflow, and diversions from surface reservoirs or canals. Extractions that reduce surface water flow within the RBPA include evapotranspiration (ET), infiltration, and irrigation diversion to canals, reservoirs, and agricultural fields.

The perennial streams within the RBPA originate in the mountainous areas to the west. Streams flow perennially when annual precipitation, including the annual snowmelt, along with baseflow contributions from groundwater exceeds the extractions referenced above.

Many of the streams in the RBPA are ephemeral in nature and flow only in response to rainfall/runoff events. Ephemeral streams in the RBPA may be dry for most of the year, and a single storm may account for a large percentage of the streams' total yearly runoff. Flow in the streams is dependent on timing and location of the rainfall or snowmelt events along with localized climactic conditions.

Research showed no evidence that any stream flow gauging stations have ever been operated within the RBPA; therefore, limited stream flow data is available. Streams that have been sampled by the WDEQ for water quality data have had stream flow measured or estimated during sampling events. The RBPA is located within a semiarid region with an average annual precipitation total of approximately 10.6 inches (BLM 2008b) (Table 3-7). Precipitation within the basin increases with elevation and occurs mostly as snowfall during the winter. Average annual snowfall is about 57.9 inches.

Table 3-7. Precipitation Values for the Pinedale Basin.

Climate Parameter	30-Year Average (1971–2000)	Parameter Values in Water Year					
		2001	2002	2003	2004	2005	2006
Total Precipitation (inches in Water Year)	10.58	5.45	6.26	8.00	11.29	11.78	6.94
Total Snowfall (inches October–April)	57.87	43.54	34.91	49.01	58.89	53.02	42.48

Source: BLM 2008b.

The majority of the annual runoff in streams draining the mountainous areas occurs during spring and early summer as a result of seasonal snowmelt. Stream flows generally peak during June but may vary from year to year depending on local weather conditions and yearly snow pack. Late summer, fall, and winter flows are generally derived from baseflow except when storm-produced rainfall contributes additional runoff. Minimum stream flow generally occurs in the January through March period when precipitation is accumulating as snow and minimal melting is occurring. Baseflow is generally sustained by regional groundwater discharge through the shallow aquifer system. Streamflow within the RBPA may be further influenced by irrigation diversions, releases from storage reservoirs, and irrigation return flows back to the surface water system.

ET losses in the basin occur directly by evaporation and transpiration from water, soil, and plant surfaces. Throughout the Pinedale Basin the annual ET averages from 39 to 45 inches, an amount that greatly exceeds annual precipitation (WWDC 2001). The highest ET rates generally occur during the months of June, July, and August when climatic inputs have the greatest impact upon ET. ET typically decreases during the colder winter months but can remain high due to intense solar radiation, low relative humidity, and rapid wind movement.

Other surface water losses occur to infiltration and seepage in alluvial deposits and other geologic substrates. These losses are particularly significant along stream channel and reservoir interfaces. Additional infiltration losses may occur during irrigation season if surface water is applied to crops in excess of ET rates.

3.5.2.3 Surface Water Uses

Agricultural use of water in the Green River Basin focuses primarily on irrigation of forage crops for livestock, most commonly alfalfa and grass hay. Small grain production, such as wheat or barley, is very limited in extent and does not comprise more than 3% of the irrigated acres in any portion of the Green River Basin (WWDC 2001). If water is available for the irrigation of agricultural lands, the application of water would usually continue into late summer and fall.

Sources of water include the Piney Creek drainage, Beaver Creek, Spring Creek, and numerous springs and draws. Surface water uses within the RBPA include domestic, irrigation, industrial, oil and gas, reservoir storage, stock water, and miscellaneous and temporary uses (Table 3-8). The WDEQ has designated a "Class of Use" for all surface waters in Wyoming based on potential beneficial use of each water source and the ability of the water to support existing aquatic organisms. The WDEQ has published the "Wyoming Surface Water Classification List" that lists the classification of all surface waters in the state (WDEQ 2001). The surface waters in the RBPA have been checked against this list, and the results are presented in Table 3-8. The surface waters within the RBPA are either Class 2AB or 3B.

Class 2AB waters are those known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands where a game fishery and drinking water use is otherwise attainable. Unless it is shown otherwise, these waters are presumed to have sufficient water quality and quantity to support drinking water supplies and are protected for that use (WDEQ 2007). Class 3B waters are intermittent and ephemeral streams and tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies (WDEQ 2007).

Table 3-8. WDEQ Beneficial Use Classification for Surface Waters within the RBPA.

Stream Segment	WQ Sample Site	Classification
La Barge Creek	Yes	2AB
Dry Piney Creek	Yes	2AB
South Piney Creek	Yes	2AB
Beaver Creek	Yes	2AB
Spring Creek		2AB
Fish Creek		2AB
M Piney Creek	Yes	2AB
N Channel M Piney Creek		2AB
N Piney Creek	Yes	2AB
Fogerty Creek		3B
Birch Creek		3B

WQ = water quality

An abbreviated listing of water rights is identified for industrial use by the WSEO Water Rights Database. More detailed information on the water rights can be found on the WSEO website at http://seo.state.wy.us/wrdb/index.aspx.

Eleven stock or irrigation reservoirs are permitted with the WSEO in the RBPA. A series of small natural alpine ponds is also near the southern RBPA boundary in Sections 20 and 21, T29N, R114W. These ponds are in the headwaters of Spring Creek.

3.5.2.4 Surface Water Quality

Stream flows derived from snowmelt and precipitation events come in contact with soil and rock material during hydrologic movement. These waters are in contact with the parent material for limited periods of time and have limited amounts of dissolved minerals within the medium. Concentrations of suspended sediments and dissolved materials are usually lower in the upper portion of the streams and increase as the streams flow toward lower elevations. Streams that originate in the higher elevations are typically of calcium bicarbonate type waters, while streams that flow across the lower elevation are generally sodium sulfate type waters. This occurs because the parent material in contact with stream flow dissolves in the water and is transported with the surface water system (BLM 2008b).

The WDEQ is responsible for the development and implementation of the surface water quality standards for Wyoming. Chapter 1 of the Water Quality Rules and Regulations contains numerical and narrative standards to establish effluent limits. The quality of water in the rivers and streams within the RBPA is protected for designated uses in accordance with the State of Wyoming's water quality standards.

Physical characteristics of water include chemical and physical properties specific to a water sample. Surface water sample results may be compared directly with established water quality standards set by the WDEQ for the determination of surface water meeting designated water quality standards and beneficial uses. No data were found from within the RBPA during a search of the EPA Storage and Retrieval (STORET) Water Quality Database for the Upper

Green River watershed (EPA 2009a); therefore, water quality can only be approximated in the RBPA. However, standards for specific priority pollutants and the average value for water quality sample results from sampling sites nearest the RBPA are listed in Table 3-9.

Table 3-9. Water Quality Sampling Average Results, with Priority Pollutant Standards.

<table>
<tr><th>Parameter</th><th>Priority Pollutant</th><th colspan="4">Human Health, Fish, and Drinking Water Standard (mg/L)</th><th>Water Quality Sampling Average (mg/L)[1]</th></tr>
<tr><td colspan="7">Ionic</td></tr>
<tr><td>Alkalinity</td><td></td><td colspan="4"></td><td>187.18</td></tr>
<tr><td>Ammonia</td><td>Yes</td><td colspan="4">Varies by temperature and pH (see WDEQ 2001)</td><td>0.13</td></tr>
<tr><td>Calcium</td><td></td><td colspan="4"></td><td>32.85</td></tr>
<tr><td>Chloride</td><td></td><td colspan="4">1</td><td>5.60</td></tr>
<tr><td>Iron</td><td>Yes</td><td colspan="4">0.3</td><td></td></tr>
<tr><td>Magnesium</td><td></td><td colspan="4"></td><td>6.26</td></tr>
<tr><td>Nitrate (NO_3)</td><td>Yes</td><td colspan="4"></td><td>0.24</td></tr>
<tr><td>Nitrite (NO_2)</td><td>Yes</td><td colspan="4"></td><td></td></tr>
<tr><td>pH</td><td></td><td colspan="4">6.5–9.0</td><td>8.25</td></tr>
<tr><td>Phosphorus</td><td></td><td colspan="4"></td><td>0.01</td></tr>
<tr><td>Potassium</td><td></td><td colspan="4"></td><td>0.85</td></tr>
<tr><td>Selenium</td><td>Yes</td><td colspan="4">2</td><td>0.0008</td></tr>
<tr><td>Silicia</td><td></td><td colspan="4"></td><td>0.0048</td></tr>
<tr><td>Sodium</td><td></td><td colspan="4"></td><td>4.29</td></tr>
<tr><td>Sulfate</td><td></td><td colspan="4"></td><td>94.02</td></tr>
<tr><td colspan="7">Physical</td></tr>
<tr><td>Hardness</td><td></td><td colspan="4"></td><td>221.65</td></tr>
<tr><td rowspan="3">Dissolved Oxygen</td><td rowspan="3">Yes</td><td colspan="2">Cold Water – 7-day Mean</td><td colspan="2">Warm Water – 7-day Mean</td><td rowspan="3">8.74</td></tr>
<tr><td>Early Life Stage</td><td>Other Life Stage</td><td>Early Life Stage</td><td>Other Life Stage</td></tr>
<tr><td>9.5</td><td>5.0</td><td>6.0</td><td>4.0</td></tr>
<tr><td>Flow (cfs)</td><td></td><td colspan="4"></td><td>37.26</td></tr>
<tr><td>Specific Conductance</td><td></td><td colspan="4"></td><td>582.55</td></tr>
<tr><td>Turbidity</td><td></td><td colspan="4"></td><td>4.94</td></tr>
<tr><td>Water Temperature, °C</td><td></td><td colspan="4"></td><td>11.04</td></tr>
</table>

[1] Water quality averages for Upper Green River watershed HUC from EPA STORET (EPA 2009a) and USGS National Water Information System (USGS 2009b) data systems.

°C = degrees Celsius
cfs = cubic feet per second
mg/L = milligrams per liter

The WDEQ produces a biannual CWA Section 305(b) report that is submitted to the EPA to detail the quality of waters in the state. The CWA also requires the WDEQ to complete a Section 303(d) list of all waters in the state that do not meet their assigned beneficial use, which are therefore designated as impaired. The EPA requires the state to submit the 303(d) list of impaired or threatened water bodies every two years. The EPA then requires the state to address the impairment through the development of a total maximum daily load (TMDL) for the water body (WDEQ 2006).

Surface water quality in the RBPA is generally of good enough quality to support its designated beneficial uses. The WDEQ's 2006 303(d) list did not show any waters within the Upper Green River drainage that are not meeting their designated beneficial uses.

3.5.3 Groundwater Resources

This section identifies the existing groundwater resources within the region and specifically the groundwater resources within the RBPA. Subjects discussed include groundwater sources and availability, water quality, and future demands. Groundwater resources within the basin to date have remained largely undeveloped in the RBPA with most uses associated with domestic use.

The groundwater resources of the RBPA would be managed and protected according to existing federal and state law and policies regarding the use, storage, and disposal of the resource during the operation of the Project. Current federal regulations regarding water quality are regulated within 40 CFR, *Protection of the Environment*, and water quality is protected under the CWA. The EPA has developed drinking water standards for any public water supply system under the CWA called the Safe Drinking Water Act and the Ground Water Rule. These rules apply to water systems that serve at least 25 people for at least 60 days per year. The water quality standards do not apply directly to individual domestic wells, but the water quality standards may be used as guidelines for domestic water quality assessment. The State of Wyoming does not have primacy for the Safe Drinking Water Act and the responsibilities for drinking water safety in Wyoming are shared between the EPA Region 8 and the WDEQ Water Quality Division.

The towns of Marbleton and Big Piney have a public system that is supplied by groundwater wells (WWDC 1994). As required by the Safe Drinking Water Act, the State of Wyoming has developed a Source Water Assessment and Protection document (WDEQ 2000), which was approved by the EPA. Because Wyoming does not have primacy status in regards to the Safe Drinking Water Act, the completion of source water assessments for any public water system is not considered mandatory but is a voluntary program.

The WDEQ has received primacy for the Underground Injection Control (UIC) Program from the EPA. Under Section 1425 of the Safe Drinking Water Act, the WOGCC has been given primacy for permitting and regulating Class II injections wells. The UIC Class II wells would inject oil and gas production wastewater into subsurface aquifer formations. The WDEQ has primacy for all other classes of injection wells within the state (Classes I, III, IV, and V).

Domestic wastewater treatment and disposal through the use of individual systems (septic) is administered by the WDEQ. However, the Sublette County Sanitation District has local approval authority of small system designs and installation throughout the county.

Groundwater use and protection is administered under the following federal and state laws:

- Federal Land Policy and Management Act of 1976 (43 USC 1711-1712);
- National Environmental Policy Act of 1972 (42 USC 4321);
- Safe Drinking Water Act of 1974, as amended (42 USC 300 et seq.);
- Wyoming Water Quality WS 35-11-101–1507;
- Wyoming Water Appropriations WS Title 41, Chapters 3–12;
- WOGCC UIC Class II Injection Wells Rule 405;
- WDEQ Water Quality Rules and Regulations, Chapter 11, Introduction and General Requirements, Part D, Septic Tank and/or Soil Absorption Systems and Other Small Wastewater Systems (WDEQ 1987); and
- WDEQ Water Quality Rules and Regulations, Chapter 12, Design and Construction Standards for Public Water Supplies.

3.5.3.1 Groundwater Aquifers

Most of the groundwater aquifer information that is available is based on the Green River Basin as a whole, and little specific information is available for the RBPA. Therefore, this discussion of groundwater aquifers focuses on the Green River Basin as a whole. The Green River Basin is one of five regional groundwater basins defined within Wyoming (Spatial Data and Visualization Center [SDVC] 1998). The RBPA is located within the Upper Green River Basin in an area north of the Fontenelle Reservoir.

The Green River Basin Water Plan (WWDC 2001) has defined eight major aquifer systems within the basin. These aquifers are identified by the geologic formations that underlie the Green River Basin. The Green River Basin aquifer systems in Wyoming consist of both confined and unconfined conditions that can be composed of sandstone, limestone, and siltstone structures. The eight major water-bearing systems, in descending order, are:

1) Quaternary-age sands and gravels associated with major river courses;
2) Tertiary-age Wasatch-Fort Union aquifers;
3) Mesaverde-Adaville aquifers;
4) Frontier aquifer;
5) Upper Jurassic-Lower Cretaceous age aquifers;
6) Sundance-Nugget aquifer system;
7) Paleozoic-age aquifer system (including the Madison Limestone); and
8) Flathead aquifer.

In spatial relationship within the basin, the isolated and localized Quaternary-aged aquifers within the stream valley alluvium generally occur along rivers and major drainages. These unconsolidated deposits of silt, sand, and gravel occur as floodplains, stream terraces, and alluvial fans and are generally unconfined. Most of these shallow aquifers have limited groundwater production within the RBPA.

The Green River Basin contains of up to 43,000 feet of Paleozoic-, Mesozoic-, and Cenozoic-era origin sediment (WWDC 1994). The upper hydrologic unit of the Green River Basin is composed of upper Cretaceous and Tertiary rocks, which function as a regional aquifer. The groundwater within the Big Piney/Marbleton area has been reported as being derived from the Tertiary-age sedimentary strata of the Wasatch and Green River formations (WWDC 1994), which are part of the Wasatch-Fort Union regional aquifer. The formation has been reported to be a 1,000-foot-thick sequence of sandstone, siltstone, silty claystone, and conglomerate with individual beds 2 to 25 feet thick. The Wasatch Formation is reported as being hard to differentiate from the underlying Fort Union Formation because of similarity both in lithology and in depositional history (Bartos and Ogle 2002). Well yields that draw water from the upper hydrologic unit have a typical hydraulic yield of approximately 200 gallons per minute or less.

Below the hydrologic Wasatch unit is a thick formation (4,000–6,000 feet) of Cretaceous marine rocks that comprise a regional aquitard (SVDC 1998). This aquitard isolates the upper regional aquifer from a much deeper lower Mesozoic- and Paleozoic-aged aquifer system consisting primarily of limestone and sandstones. The limestone and sandstone materials of this system comprise the lower hydrologic unit. The lower unit is considered a productive aquifer, which has significant well yields, but because of the great depth to the aquifer it has not been developed to any extent for domestic drinking water. The Project would inject production water into the Jurassic-aged Nugget Sandstone, a regional sandstone sheet, at a depth of about 12,000 feet. The Nugget Sandstone has been reported as being a series of eolian deposited sequences of sand dunes and interdunal deposits with an average thickness of 200 feet and is highly permeable, with a porosity of greater than 15% (Webel 1977). The Madison Limestone, from which the production water and the natural gas product would be derived, is part of this lower aquifer unit.

3.5.3.2 Groundwater Recharge

Recharge to shallow alluvial aquifers occurs directly from precipitation, irrigation seepage, and through direct connection to the surface waters in the valley floor. This connection may result in a losing stream where water from the stream discharges directly to the shallow aquifer or a gaining stream where the shallow aquifers supply recharge directly to the surface water system. The gaining/losing relationship may change throughout the basin depending on the location of the stream within the basin and the time of the year as surface water/groundwater elevations adjust to precipitation and base flow change. The recharge amount has been estimated to be approximately 50,000 to 100,000 acre-feet annually.

As discussed in previous sections, most of the basin’s annual precipitation occurs in the upper elevations as snow; because of this, larger amounts of recharge occur in the upper portions of the basin. From the recharge area, groundwater within the RBPA would generally flow eastward given that the strata have a gentle eastward down-gradient slope towards the Big Piney and Marbleton area (SVDC 1998).

3.5.3.3 Groundwater Use

The Tertiary aquifer system present within the Green River Basin includes a number of water-bearing formations, including the Green River, Wasatch, Battle Springs, and Fort Union formations. The towns of Big Piney and Marbleton use the Green River and Wasatch formations, respectively, for their water supply systems (WWDC 1994).

The population of the Green River Basin has been estimated to be 61,100, of which approximately 49,600 reside in municipal service areas (WWDC 2001) with the remaining basin population is serviced by private water systems or domestic wells. The municipal systems within the basin derive their water from either surface water connection or groundwater sources. The towns of Big Piney and Marbleton, which are the closest municipal areas to the RBPA, derive their municipal supply from groundwater sources (SDVC 1998). The town of Marbleton uses a reported 291,000 gallons per day (gpd) for an estimated population of 700, while the town of Big Piney uses an average of 185,000 gpd for an estimated population of 475. Marbleton has also been shown to operate at or very close to the water system's maximum capacity.

Groundwater has had limited development and is used mainly for domestic and industrial uses near the RBPA (WWDC 2001). There are 211 groundwater well permits in or near the RBPA of which 59% are listed as being used for domestic or stock usage. Twenty-one additional wells are permitted as municipal wells owned by the towns of Marbleton and Big Piney. Specific aquifer characteristics such as well depth, yield, and static water level tend to vary considerably over this area. As of May of 2009, the US EPA does not identify any sole source aquifers in southwestern Wyoming (EPA 2009b). The WSEO reports well depth varies from 0 to 1,500 feet, with an average depth of 220 feet (WSEO 2009). The range and average depth of groundwater wells of specific types is shown in Table 3-10.

In general, limited information is available on well yield, aquifer properties, water quality, and recharge and discharge relationships for groundwater resources in the Green River Basin. Table 3-10 lists the number and types of wells permitted with the WSEO in the RBPA, along with the range of depths that are reported.

3.5.3.4 Springs and Seeps

Numerous springs are present within the RBPA. Five of the springs have water rights that have been filed with the WSEO. With the recharge area for the local aquifer within the Tertiary aquifer system and confining conditions present within the aquifer, a spring may develop wherever the aquifer material is exposed at the surface.

3.5.3.5 Groundwater Quality in the Green River Basin

WDEQ has developed groundwater quality standards to protect existing and future groundwater uses (WDEQ 2005). The standards are available on the WDEQ website at http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf.

Table 3-10. Permitted Wells in the RBPA.

Well Permitted Use	Number	Range of Depth (feet)	Average Depth (feet)	Probable Aquifer
Commercial	2	195–375	285	Wasatch
Domestic	86	0–460	139	Wasatch
Domestic-Stock	12	0–170	119	Wasatch
Industrial	8	337–975	702	Wasatch
Irrigation	2	95–162	128	Wasatch
Miscellaneous	39	90–1,500	288	Wasatch
Monitoring	6	15–25	25	Wasatch
Municipal	21	120–1,016	562	Wasatch
Oil-Stock-Industrial-Domestic	1	41	41	Wasatch
Stock	24	0–790	185	Wasatch
Stock-Irrigation	3	260	260	Wasatch
Test	1	Unknown	Unknown	Wasatch
Utility-Domestic	1	122	122	Wasatch

Searches of the USGS National Water Information System database (USGS 2009b) for groundwater sampling events reveals limited groundwater sampling has occurred within the Green River Basin and Sublette County, with very limited data near the RBPA. Data were retrieved for major cations, major ions, dissolved solids, pH, and several other parameters that serve as useful indicators of the quality of water. An additional search of the EPA STORET water quality database for Sublette County does not return any groundwater quality results from wells within the county.

According to water quality results from the Big Piney and Marbleton report (WWDC 1994), the groundwater produced by the municipal wells, except for the Big Piney Number 1 well, is relatively soft with mineral content dominated by sodium and bicarbonate. Some wells in the Marbleton system exceed EPA standards for sodium, total dissolved solids (TDS), and fluoride. The groundwater from the Wasatch and Fort Union aquifers is generally of good quality with lower levels of mineral content. The Wasatch Formation groundwater quality ranges from a sodium bicarbonate type with TDS of less than 500 milligrams per liter (mg/L), to a sodium sulfate-bicarbonate type with TDS of up to 1,500 mg/L (BLM 2008b). The Fort Union Formation waters have generally higher TDS values, near 2,000 mg/L. This level may make Fort Union waters only suitable for stock water.

The EPA has established drinking water standards, both primary and secondary, as required by the Safe Drinking Water Act and the CWA. These regulations specify maximum contaminant levels and secondary standards for specific contaminants. The maximum contaminant levels are health-based, while the secondary standards are cosmetic (e.g., skin discoloration) or esthetic effects (e.g., taste). The standards are listed within Table 3-11.

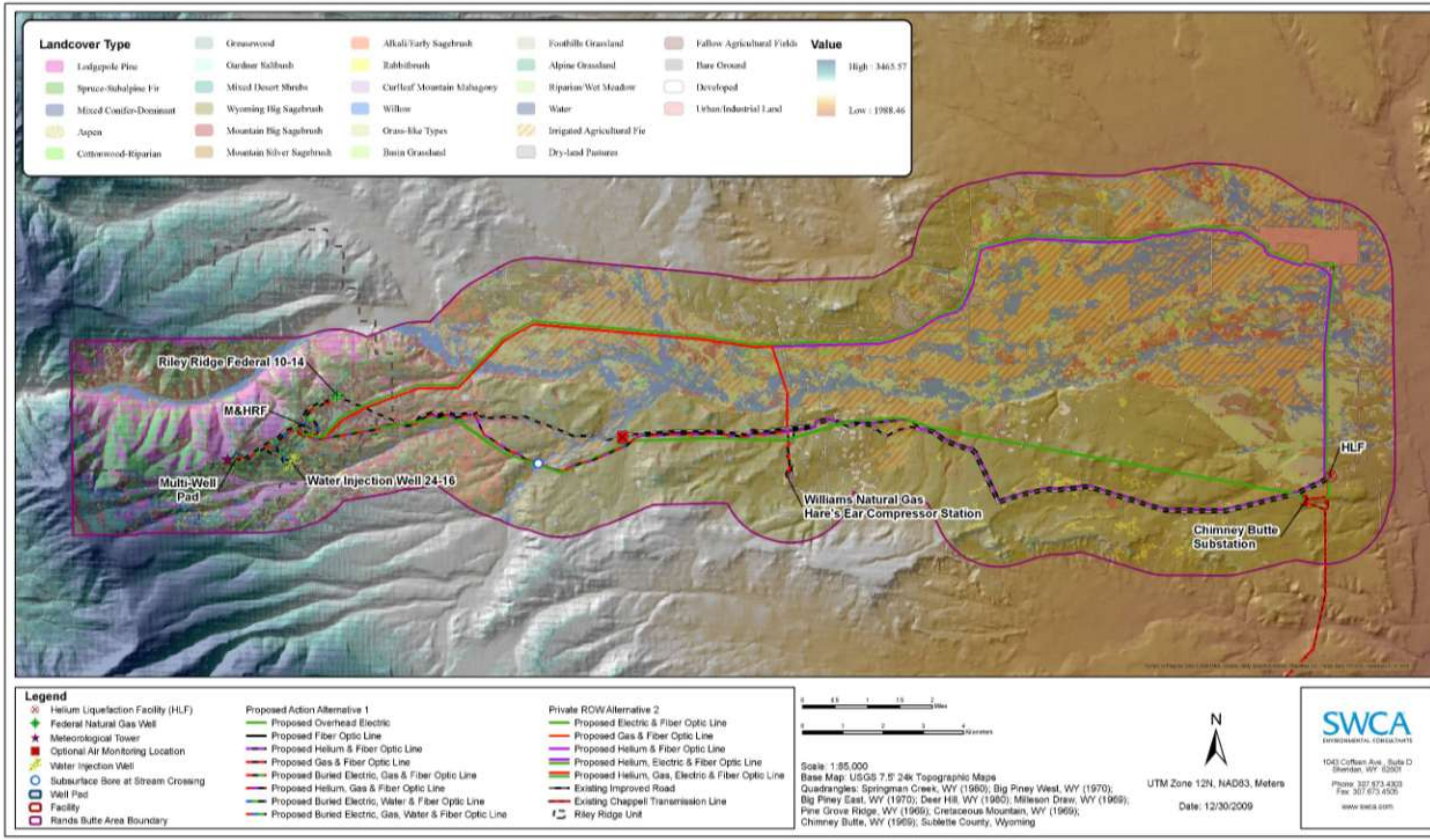
Table 3-11. Groundwater Quality Parameters with Primary and Secondary EPA Standards.

Parameter	Primary Standard (mg/L)	Secondary Standard	Water Sampling Average (Basin-wide)[1]
Alkalinity	–	–	187.18
Ammonia	–	–	0.13
Calcium	–	–	5.73
Chloride	–	1.00	5.60
Fluoride	4.00	2.00	0.88
Iron	–	0.30	128.30
Magnesium	–	–	–
Nitrate (NO_3)	10.00	–	0.06
Nitrite (NO_2)	1.00	–	–
pH	–	6.50–8.50	8.26
Phosphorus	–	–	–
Potassium	–	–	1.10
Selenium	0.05	–	–
Silicia	–	–	–
Sodium	–	–	216.36
Sulfate	–	250.00	204.25
TDS	–	500.00	–

[1] Water quality averages for watershed HUC from EPA STORET (EPA 2009a) and USGS National Water Information System data systems (USGS 2009b).
mg/L = milligrams per liter
TDS = total dissolved solids

3.6 VEGETATION RESOURCES AND NOXIOUS WEEDS

Vegetation community maps of the Rands Butte Area and Williams Pipeline Area were created from Wyoming Geographic Information Science Center's landcover type dataset for the SW Wyoming, Pinedale and Green River Wyoming Game and Fish Department Regions (Rodemaker and Driese 2007) (Map 3-5). The vegetation data covers both public and private land and represents the most current spatial vegetation layers available in Sublette County. Landcover types and their aerial coverages are summarized in Table 3-12 and Table 3-13. Vegetation community descriptions were derived from the RRTR (BLM 1983).



Map 3-5. Vegetation cover types within the RBPA.

Table 3-12. Landcover Types in the Rands Butte Area.

Landcover Type	Acres in Rands Butte Area	Percent of Rands Butte Area
Lodgepole Pine	2,009	3.6%
Spruce-Subalpine Fir	815	1.5%
Mixed Conifer	156	0.3%
Aspen	736	1.3%
Cottonwood Riparian	395	0.7%
Greasewood	727	1.3%
Gardner Saltbush	47	0.08%
Mixed Desert Shrubs	141	0.2%
Wyoming Big Sagebrush	21,581	38.8%
Mountain Big Sagebrush	3,350	6.0%
Mountain Silver Sagebrush	415	0.7%
Alkali/Early Sagebrush	605	1.0%
Rabbitbrush	342	0.6%
Curlleaf Mountain Mahogany	66	0.1%
Willow	5,228	9.4%
Grass-like Types	329	0.5%
Basin Grassland	330	0.6%
Foothills Grassland	1,073	1.9%
Alpine Grassland	228	0.4%
Riparian/Wet Meadow	3,683	6.6%
Water	17	0.03%
Irrigated Agriculture	8,911	16.0%
Dry-land Pastures	522	0.9%
Fallow Agricultural Fields	345	0.6%
Bare Ground	473	0.8%
Developed	3,019	5.4%
Total	**55,543**	**100.00**

Table 3-13. Landcover Types in the Williams Pipeline Area.

Landcover Type	Acres in Williams Pipeline Area	Percent of Williams Pipeline Area
Greasewood	458	2.5%
Gardner Saltbush	38	0.2%
Mixed Desert Shrubs	899	4.9%
Wyoming Big Sagebrush	10,527	58.3%
Mountain Big Sagebrush	101	0.5%
Mountain Silver Sagebrush	13	0.07%
Rabbitbrush	951	5.2%
Curlleaf Mountain Mahogany	675	3.7%
Willow	24	0.1%
Basin Grassland	5	0.02%
Foothills Grassland	30	0.2%
Riparian/Wet Meadow	93	0.5%
Water	2	0.01%
Irrigated Agriculture	201	1.1%
Dry-land Pastures	24	0.1%
Fallow Agricultural Fields	10	0.05%
Bare Ground	372	2.0%
Developed	3,614	20.0%
Total	**18,037**	**100.00**

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis)* is the predominant vegetation type in the RBPA. The Wyoming big sagebrush vegetation community is characterized by a mosaic distribution of sagebrush stands ranging from moderate to high density. Other shrub species that occur within the sagebrush community include rabbitbrush (*Chrysothamnus* spp.), winterfat (*Krascheninnikovia lanata*), Gardner saltbush (*Atriplex gardneri*), and occasionally black greasewood (*Sarcobatus vermiculatus)*. The understory is comprised of perennial grasses. The Wyoming big sagebrush community accounts for 38.8% of the Rands Butte Area and 58.3% of the Williams Pipeline Area. The Wyoming big sagebrush community is distributed evenly across the Williams Pipeline Area and is concentrated in the lower elevations and drier sites in the eastern and southern portions of the Rands Butte Area. This community provides forage for livestock and big game, as well as nesting cover and forage for sage-grouse.

Interspersed among the Wyoming big sagebrush community are stands of rabbitbrush, Gardner saltbush, mixed desert shrubs, and dryland pastures. Rabbitbrush is found on sunny, open sites and is particularly common on disturbed sites. The mixed desert shrubs community comprises less than 1% of the Rands Butte Area and 4.9% of the Williams Pipeline Area. This community consists of scattered low dunes dominated by horsebrush (*Tetradymia canescens*), spiny hopsage (*Grayia spinosa*), rabbitbrush, Wyoming big sagebrush, and Indian ricegrass (*Achnatherum hymenoides*).

Greasewood, willow (*Salix* spp.), riparian wet meadow, cottonwood-riparian, and irrigated agricultural fields occur mainly along the Green River, South Piney Creek, and Middle Piney Creek. Greasewood is often found in the bottoms of dry washes and on steep slopes above drainages. Shrubs often form a continuous or intermittent linear canopy in and along drainages. The dominant understory in the riparian community species are willows and herbaceous species including sedges (*Carex* spp.) and rushes (*Juncus* spp.). In some areas, the overstory is primarily plains cottonwood (*Populus deltoides*) and Russian olive (*Elaeagnus angustifolia*).

Lodgepole pine (*Pinus contorta*), spruce (*Picea engelmanii*)-subalpine fir (*Abies lasiocarpa*), mixed conifer, aspen (*Populus tremuloides*), mountain big sagebrush (*A. t.* ssp. *vaseyana*), mountain silver sagebrush (*A. cana*), and alpine grassland communities occur mainly in the higher elevations in the western portion of the Rands Butte Area. The lodgepole pine community often does not contain much of an understory and is dependent on fire for regeneration. This community accounts for 3.6% of the Rands Butte Area and is mainly found on north-facing slopes interspersed with the spruce-subalpine fir community.

Subalpine fir and Engelmann spruce (*Picea engelmannii*) are co-dominant species in the spruce-subalpine fir community. Associated species include limber pine (*Pinus flexilis*), lodgepole pine, and Douglas-fir (*Pseudotsuga menziesii*). These stands provide browse and cover for numerous wildlife species.

The mixed conifer community comprises less than 1% of the Rands Butte Area and consists mainly of Douglas-fir, Engelmann spruce, subalpine fir, and lodgepole pine with a diverse understory of shrubs and forbs.

Aspen forests comprise 1.3% if the Rands Butte Area. Aspen stands provide forage for wildlife and livestock. The understory component of aspen stands includes snowberry (*Symphoricarpos* spp.), creeping juniper (*Juniperus horizontalis)*, Idaho fescue (*Festuca idahoensis)*, bluebunch wheatgrass (*Pseudoroegneria spicata)*, various bluegrass (*Poa* spp.) and needlegrass (*Stipa* spp.) species, as well as Oregon grape (*Mahonia repens*) and lupine (*Lupinus* spp.).

Mountain big sagebrush and mountain silver sagebrush are interspersed with the mixed conifer, aspen, and lodgepole pine forests. Together, they comprise 6.7% of the Rands Butte Area.

The alpine grassland community is found in the southwestern corner of the Rands Butte Area. Tufted hairgrass (*Deschampsia caespitosa)*, Drummond's rush (*Juncus drummondii)*, northern singlespike sedge (*Carex scirpoidea)*, Parry's rush (*Juncus parryi)*, arctic willow (*Salix arctica)*, and grouse whortleberry (*Vaccinium scoparium)* are the common species associated with this vegetation type.

Foothills grassland, basin grassland, and grass-like types are dispersed throughout the Williams Pipeline Area and throughout the central and eastern portions of the Rands Butte Area. Combined, these communities comprise 3% of the Rands Butte Area and less than 1% of the Williams Pipeline Area. These communities may vary considerably in species composition; however, they are dominated by perennial grasses, such as Indian ricegrass, needle and thread (*Hesperostipa comata*), Sandberg bluegrass (*Poa secunda*), and thickspike wheatgrass (*Elymus lanceolatus*). Common forbs are Hood's phlox (*Phlox hoodii*), buckwheat (*Eriogonum* spp.), scarlet globemallow (*Sphaeralcea coccinea*), stemless goldenweed (*Stenotus acaulis*), and pepperweed (*Lepidium* spp.). Basin grasslands are found at lower elevations than foothills grasslands.

The bare ground community type comprises 0.8% of the Rands Butte Area and 2% of the Williams Pipeline Area. Bare ground consists mainly of sparsely vegetated dunes or rock outcrops. These areas typically contain sensitive soils and may provide habitat for rare plant species. These communities are low production areas and thus are not valuable for forage and cover; however, they may contain areas of rock outcrops, which can provide nesting and perching habitat for raptors. Although not abundant, rock outcrops and barren surfaces are widely distributed throughout the RBPA.

The developed landcover type consists of highways, county roads, gravel-surfaced roads, oil and gas developments, buried or exposed pipelines, and urban/industrial lands. This landcover type does not represent surface disturbance that has taken place since the completion of the WYGISC landcover dataset.

3.6.1 Noxious Weeds and Invasive Plants

Noxious weeds are defined in EO 13112 as those "species whose introduction does or is likely to cause economic or environmental harm or harm to human health." EO 13112, "Invasive Species," was signed by President Clinton in 1999 to prevent the introduction of invasive species, to provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause. The Wyoming State Legislature enacted the Wyoming Weed and Pest Control Act in 1973 for the purpose of controlling designated weeds and pests. According to the Wyoming Cooperative Agricultural Pest Survey, there are 25 state-designated noxious weeds, four county-designated weeds in Sublette County, and three county-designated weeds in Lincoln County (Wyoming Weed and Pest Council [WWPC] 2008). A list of noxious weeds species potentially present within the RBPA was obtained from personal communication with Deej Brown (Brown 2009) who is the Weed Management Coordinator at the BLM PFO. Other weeds both noxious and invasive may be present in the RBPA and would be reported and treated according to the weed management plan with the PFO. The list of potential species is provided in Table 3-14. Black henbane (*Hyoscyamus niger*) is the only species that is on the Sublette or Lincoln county noxious weed lists according to the WWPC (2008).

Table 3-14. Potential Invasive Plants in the RBPA.

Common Name	Scientific Name	Wyoming Noxious Weed List
Cheatgrass	*Bromus tectorum*	
Canada thistle	*Cirsium arvense*	X
Musk thistle	*Carduus nutans*	X
Black henbane	*Hyoscyamus niger*	

Source: WWPC 2008.

Weeds often establish in disturbed areas and are primarily present in the RBPA and Williams Pipeline Area along roads, areas previously disturbed by oil and gas development, and in heavily grazed areas. Noxious weeds can be aggressive and can often out-compete native species. Potential sources of invasion include gravel obtained from outside the RBPA and Williams Pipeline Area, soil carried to the area on vehicles, or the use of non-weed-free certified seed during reclamation.

3.7 WETLANDS, RIPARIAN RESOURCES, AND FLOODPLAINS

3.7.1 Riparian and Wetland Communities

Riparian and wetland areas are transition zones between terrestrial and aquatic systems where substrates are at least periodically saturated with water (Cowardin et al. 1979). Because of their proximity to available surface and subsurface water, plant species, soils, and topography of riparian and wetland areas differ considerably from those of adjacent uplands. These areas have highly productive soils that promote a lush and diverse vegetative community composition, which is important for wildlife, livestock, and agricultural production.

Riparian plant communities are contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent water bodies such as rivers, streams, ponds, and lakes. Riparian areas are influenced by available waters but do not have the substrate saturation of frequency or duration needed to develop wetland conditions. Wetlands are often found associated within the riparian community. To develop wetland conditions, areas must be permanently or periodically saturated with water in proximity to the soil surface for a period of time during the growing season sufficient for the development and proliferation of hydrophilic vegetation and to promote anaerobic soil conditions. The soils in wetlands are formed under conditions of saturation, flooding, or ponding. Wetlands have vegetation that consists of macrophytes that are adapted to water-saturated soils and low soil oxygen (anaerobic).

Under the federal definition of wetlands, areas must meet three criteria to be classified as a wetland: wetland hydrology, hydrophytic vegetation, and hydric soils. Wetlands that meet these three criteria are subject to regulation by the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA (33 CFR 1251 et seq.) and EO 11990. Wetlands may be deemed as regulated or "waters of the U.S." under the CWA or not regulated or "not waters of the U.S." based on factors clarified in the USACE and EPA post-Rapanos memorandum guidance issued on December 2, 2008 (Rapanos v. United States, 126 S. Ct. 2208 [2006]). The regulatory status of wetlands and other waters of the U.S. is determined by the USACE and EPA using this most recent guidance. Riparian areas, rivers, intermittent and ephemeral streams, and wetlands may be afforded protections under the CWA following the 2008 post-Rapanos memorandum guidance.

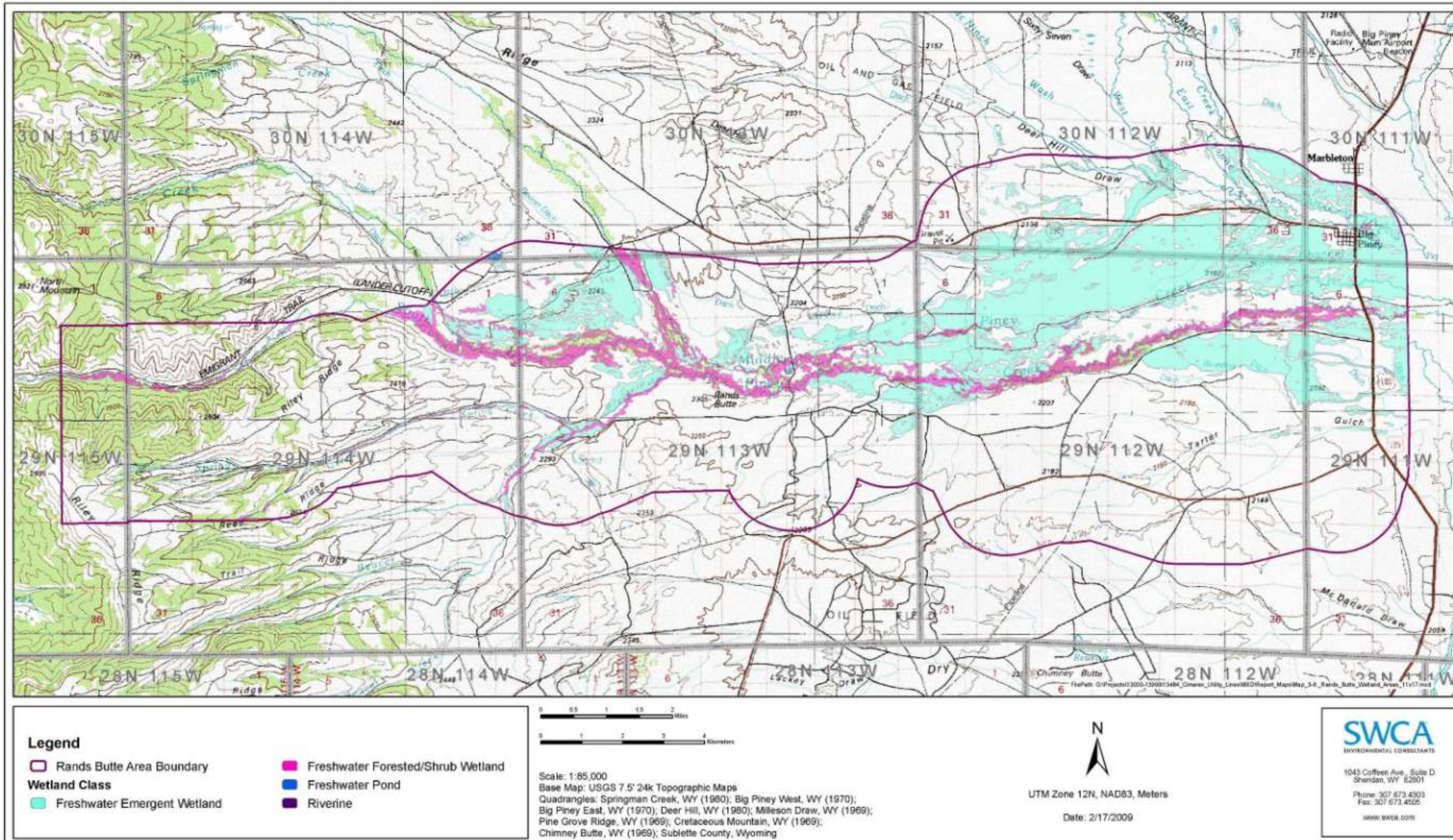
Jurisdictional waters of the U.S. within the RBPA may include special aquatic sites, wetlands, actively flowing open water stream channels, dry ephemeral drainages with channels that exhibit an ordinary high water (OHW) mark, stock tanks, impoundments, and other open waters. These habitats are important for wildlife, livestock, and agricultural production and the condition of these areas can greatly impact water quality and stream function. A number of riparian areas within the RBPA have been surveyed by BLM PFO to assess proper functioning condition (PFC) on BLM-administered lands between 1994 and 1999 (BLM 2009b). PFC is a state of resiliency that would allow a riparian-wetland system to remain stable during a 25- to 30-year flow event, sustaining that system's ability to produce values related to both physical and biological attributes, such as fish and wildlife habitat, forage, and erosion control. PFC itself is not intended to be a long-term monitoring tool; instead, it is meant to be part of inventory and monitoring protocol. PFC can provide a view of how well riparian wetland areas are functioning and whether restoration of those areas would be needed. Riparian wetland areas are given a rating of PFC, functional at risk (FAR), or non-functional (NF). If a riparian wetland area is given a rating of FAR, then a determination of trend toward PFC (upward) or away from PFC (downward) is usually made. Table 3-15 outlines grazing allotments within the RBPA that have riparian habitats and their PFC as determined by the BLM PFO.

Table 3-15. PFC for Streams Surveyed in the Project Area (BLM 2009b).

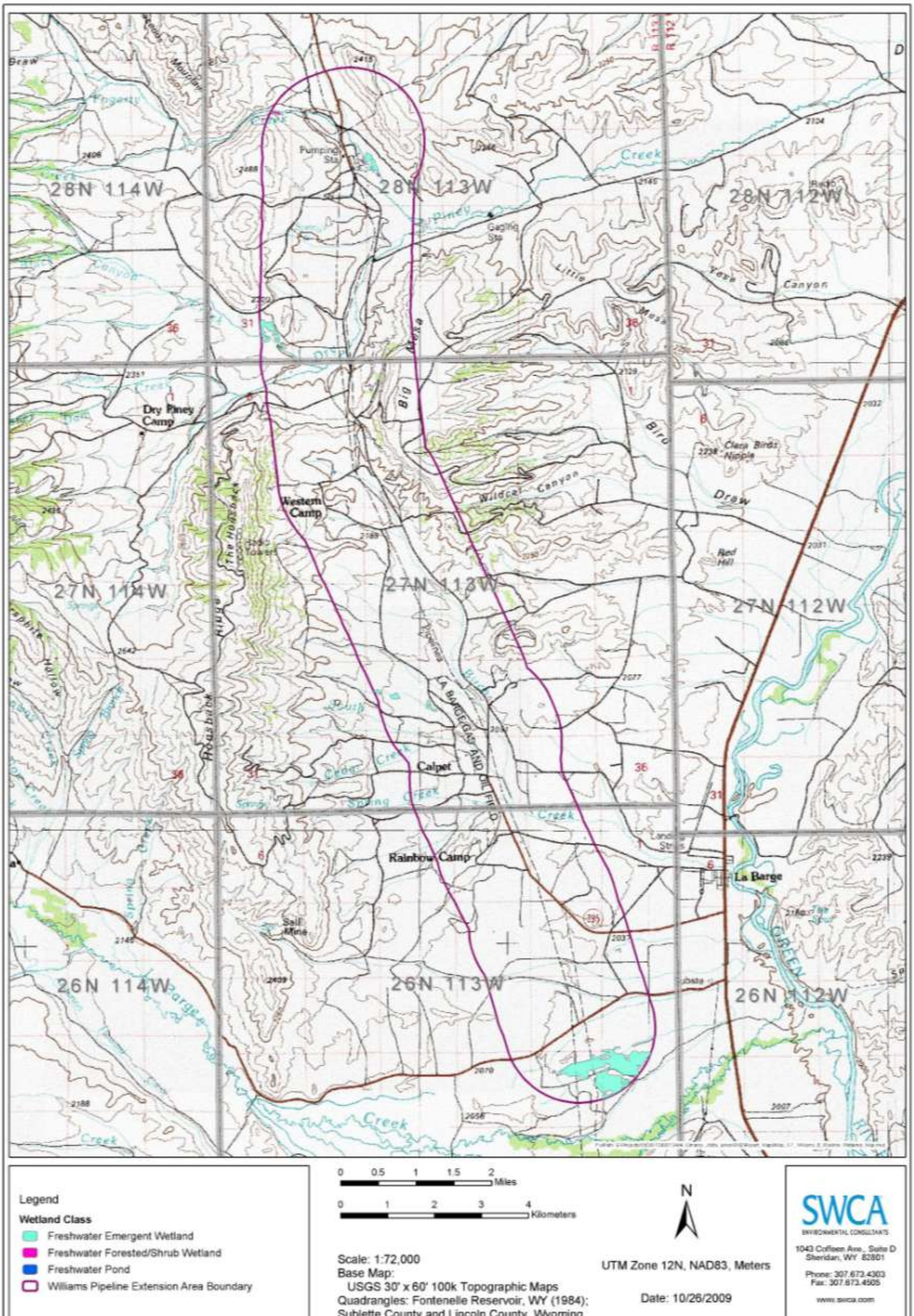
Stream Name	Allotment Name	PFC (miles)	FAR (miles)			NF (miles)
			Up[1]	N/A[1]	Down[1]	
Beaver Creek	South Piney Ranch Individual	0.72	-	-	-	-
Beaver Creek	South Piney Individual	0.28	-	1.54	-	-
Dry Piney Creek	North LaBarge Common	-	2.34	-	-	-
Fogarty Creek	North LaBarge Common	-	-	0.35	-	-
South Piney Creek	South Piney Ranch Individual	1.89	-	-	-	-
South Piney Creek	South Piney Individual	0.67	-	1.54	-	-
Spring Creek, South Fork	North LaBarge Common	-	-	-	1.51	-
Spring Creek, Main	North LaBarge Common	0.04	-	2.57	-	-

[1] Up, N/A, and Down refer to apparent trend
FAR = functional at risk
NF = non-functional
PFC = proper functioning condition

Table 3-16 summarizes the cover types of waters of the U.S. wetland designations within the RBPA that are identified on existing USFWS National Wetlands Inventory (NWI) maps (USFWS 2009a). Map 3-6 and Map 3-7 display the NWI-mapped wetlands in the RBPA. The NWI uses the Cowardin et al. 1979 classification system based on vegetative composition to determine wetland classifications. NWI data are typically very coarse, and wetland perimeters, locations, and descriptions may be inaccurate. Also, some wetlands may not be mapped yet in NWI, which makes its use permissible for planning but not suitable for environmental compliance under the CWA. To accurately determine wetland compositions and extents, comprehensive wetland delineations within the immediate RBPA or areas of potential surface disturbances would be completed prior to Project initiation.



Map 3-6. Cover types of waters of the U.S. in the Rands Butte Area alignment, based on NWI.



Map 3-7. Cover types of waters of the U.S. in the Williams Pipeline Area alignment, based on NWI.

Table 3-16. Cover Types of Waters of the U.S. in the RBPA, Based on NWI.

Wetlands Cover Type	Acres
Palustrine Freshwater Emergent	10,184.41
Palustrine Freshwater Forested	1.73
Palustrine Freshwater Scrub/Shrub	2,467.09
Freshwater Pond	66.69
Total	**12,719.92**

3.7.1.1 Palustrine Freshwater Emergent

The palustrine freshwater emergent wetland class occupies 10,184.41 acres, or 80.07% of the wetlands in the RBPA. Freshwater emergent wetlands are characterized by erect, rooted, herbaceous aquatic plants, excluding mosses and lichens (Cowardin et al. 1979). These wetlands are usually dominated by perennial plants, which are present for most of the growing season. Agricultural activities such as hay production and livestock grazing are common in these wetland types. Dominant species may include meadow foxtail (*Alopecurus pratensis*), obligate or facultative wet sedges, scratchgrass (*Muhlenbergia asperifolia*), cattails (*Typha* spp.), bluegrasses, reed canarygrass (*Phalaris arundinacea*), and bulrushes (*Scirpus* spp.). Other wetland habitats possibly found within the freshwater emergent wetland classification include the wetland fen. Fens are peat or organic matter forming wetlands that receive nutrient and water influxes primarily from groundwater sources as compared to precipitation. Fens have complex soil structures and functionalities capable of supporting a more diverse plant and animal community compared to other wetland habitats. Fens are typically associated with short growing seasons and low annual average temperatures. Fens are different than bogs because they are less acidic and have higher nutrient levels. Vegetative composition of fens in the RBPA would typically include grasses, sedges, rushes, and wildflowers. Soil composition in wetland fens would be distinctive and highly organic compared to other wetlands in the RBPA.

3.7.1.2 Palustrine Freshwater Forested

The palustrine freshwater forested wetland class occupies 1.73 acres, or <0.01% of the wetlands in the RBPA. Forested wetlands are characterized by woody vegetation that is at least 19 feet tall and are found along hydrologic features such as rivers and streams in mountainous areas that support distinct plant compositions that are dependent on saturated soils.

3.7.1.3 Palustrine Freshwater Scrub/Shrub

The palustrine freshwater scrub/shrub wetland class occupies 2,467.09 acres, or 19.4% of the wetlands in the RBPA. Scrub/shrub wetlands are typically dominated by woody vegetation less than 20 feet tall, such as shrubs, samplings, or small and stunted trees. Dominant trees and shrubs in this type of wetland habitat include cottonwoods, willows, tamarisk (*Tamarix* sp.), silver buffaloberry (*Shepherdia argentea*), black hawthorn (*Crataegus douglasii*), and boxelder (*Acer negundo*). Other herbaceous species include redtop (*Agrostis gigantean*), Baltic rush (*Juncus balticus*), and sedges.

3.7.1.4 Freshwater Pond

The freshwater pond wetland class occupies 66.69 acres, or <1% of the RBPA wetlands. It contains both natural surface impoundments and anthropogenic areas (i.e., stock ponds and other excavated areas) that maintain surface water year-round except in times of drought. In times of drought, the water table may remain at or very near the surface depending on proximity to the vadose zones.

3.8 THREATENED AND ENDANGERED SPECIES AND SPECIAL STATUS SPECIES

This section describes the occurrence of threatened and endangered species that may occur within the RBPA. The Endangered Species Act (ESA) (16 USC 1531–1543) protects listed threatened, endangered, proposed, and candidate plant and animal species and their critical habitats.

Section 7 of the ESA requires that actions authorized, funded, or carried out by federal agencies are not likely to jeopardize the continued existence of proposed, candidate, threatened, or endangered species, or result in the destruction or adverse modification of their critical habitats. This process ensures that federally listed, candidate, and proposed species receive full consideration in the decision-making process prior to implementing the Proposed Action.

3.8.1 USFWS Threatened, Endangered, and Candidate Species

The ESA species listed for Lincoln and Sublette counties (USFWS 2008a) were reviewed and their status assessed for the RBPA (Table 3-17). No federally listed species are known to regularly occupy the RBPA, but those that may potentially occur or be impacted by the Proposed Action are discussed in more detail below. Rationale for eliminating ESA species from further discussion is also provided.

Whooping crane (*Grus americana*), piping plover (*Charadrius melodus*), interior least tern (*Sternula antillarum*), pallid sturgeon (*Scaphirhynchus albus*), and western prairie fringed orchid (*Platanthera praeclara*) are found in the Platte River drainage system, which is not connected to the RBPA. Therefore, these species would not be affected by the Proposed Action and are not analyzed further. Kendall Warm Springs dace (*Rhinichthys osculus thermalis)* is restricted to the Kendall Warm Springs, a tributary to the Green River within the Bridger-Teton National Forest approximately 60 miles upstream from the RBPA and, thus, also would not be affected by the Proposed Action. Blowout penstemon (*Penstemon haydenii*) is only known in Wyoming from northern Carbon County, and no suitable habitat exists in the RBPA.

The portion of the 1-mile buffer within the Bridger-Teton National Forest on the RBPA's western border is designated critical habitat for Canada lynx (Lynx canadensis) (USFWS 2009b).

Table 3-17. USFWS Threatened, Endangered, and Candidate Species Listed for Lincoln and Sublette Counties, Wyoming.

Species	Status	Primary Habitat Association	Status in RBPA
Mammals			
Black-footed ferret *Mustela nigripes*	Endangered	White-tailed prairie dog towns greater than 200 acres in size with a burrow density greater than 20 active burrows per hectare	Not known to occur in the RBPA. Within historic range. Prairie dog towns are limited and not conductive for reintroduction efforts.
Canada lynx *Lynx canadensis*	Threatened	Boreal forest landscapes	Observation in RBPA in 1985. Potentially suitable habitat present. Unlikely to occur.
Gray wolf *Canis lupus*	Threatened; Experimental Population, Nonessential	Greater Yellowstone ecosystem	Not known to occur in the RBPA. Suitable breeding habitat not present. May occur as a migrant.
Grizzly Bear *Ursus arctos horribilis*	Threatened	Greater Yellowstone ecosystem	Not known to occur in the RBPA. May occur as a migrant.
Birds			
Whooping crane *Grus americana*	Endangered	Platte River system	Not present. No water depletion of Platte River system.
Piping plover *Charadrius melodus*	Threatened	Platte River system	Not present. No water depletion of Platte River system.
Interior least tern *Sternula antillarum*	Endangered	Platte River system	Not present. No water depletion of Platte River system.
Yellow-billed cuckoo *Coccyzus americanus*	Candidate	Unfragmented mature cottonwood-willow riparian	Not known to occur in the RBPA. No suitable breeding habitat present. May occur as a migrant.
Greater Sage-grouse *Centrocercus urophasianus*	Candidate	Sagebrush	Present.
Fish			
Kendall Warm Springs dace *Rhinichthys osculus thermalis*	Endangered	Kendall Warm Springs	Not present. Endemic to Kendall Warm Springs.
Pallid sturgeon *Scaphirhynchus albus*	Endangered	Platte River system	Not present. No water depletion of Platte River system.

Species	Status	Primary Habitat Association	Status in RBPA
Colorado pikeminnow *Ptychocheilus lucius*	Endangered	Colorado River system	Not present. Downstream populations.
Fish (continued)			
Bonytail *Gila elegans*	Endangered	Colorado River system	Not present. Downstream populations.
Humpback chub *Gila cypha*	Endangered	Colorado River system	Not present. Downstream populations.
Razorback sucker *Xyrauchen texanus*	Endangered	Colorado River system	Not present. Downstream populations.
Plants			
Blowout penstemon *Penstemon haydenii*	Endangered	Sand dunes and blowouts	Only known population in Carbon County. No suitable habitat.
Western prairie fringed orchid *Platanthera praeclara*	Threatened	Platte River system	Not present. No water depletion of Platte River system.
Ute ladies'-tresses orchid *Spiranthes diluvialis*	Threatened	Seasonally moist soils and wet meadows of drainages below 7,000 feet elevation	No known populations in PFO. Potentially suitable habitat present. Unlikely to occur.

Source: USFWS 2008a.
PFO = Pinedale Field Office
RBPA = Rands Butte Project Area

3.8.1.1 Black-footed Ferret

The black-footed ferret (*Mustela nigripes*) is listed as endangered by the USFWS, with nonessential experimental population status given to reintroduced populations (USFWS 2008b). Black-footed ferrets are largely extirpated from the wild primarily due to range-wide decimation of the prairie dog ecosystem (Kotliar et al. 1999). Ferrets inhabit extensive prairie dog complexes, typically composed of several smaller colonies located in proximity to one another that provide a sustainable prey base. Surveys within the PFO from 2001 to 2008 did not confirm ferret presence, although evidence of at least historical use (e.g., skulls identified as black-footed ferret) was found (BLM 2008b).

The *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act* (USFWS 1989) stated that ferrets require white-tailed prairie dog (*Cynomys leucurus*) towns or complexes greater than 200 acres in size, and towns of this dimension may be important for ferret recovery efforts. No known white-tailed prairie dogs towns of this size occur in the RBPA (see discussion in Section 3.8.2, BLM Sensitive Species). The USFWS (2004) recommends ferret surveys within the Big Piney Prairie Dog Complex (T29–31N, R109–111W) that overlaps a portion of the RBPA. The remainder of the RBPA has been block cleared for further need to conduct ferret surveys. However, if white-tailed prairie dog towns were found within the RBPA and were potentially affected by the Proposed Action, they are segregated from other towns in the vicinity by existing development and do not meet the requirements for ferret reintroduction or need for block clearance (USFWS 2004; BLM 2008b). Therefore, it is unlikely that prairie dog towns in the RBPA could support black-footed ferrets.

3.8.1.2 Canada Lynx

The range of the Canada lynx extends from Alaska, throughout much of Canada, and south to the boreal forests in the northeastern United States, the Great Lakes, the Rocky Mountains, and the Cascade Mountains. In the Southern Rocky Mountain region, lynx reside in montane spruce-fir forests between 8,000 and 12,000 feet elevation (USFWS 2000) overlapping the range of snowshoe hare (*Lepus americanus*), their preferred prey. Much of the lynx habitat in this region occurs as islands of coniferous forest surrounded by shrub-steppe (Ruediger et al. 2000). Lynx occasionally pass through non-critical habitats, such as shrub-steppe, to disperse between mountain ranges.

In Wyoming, the northwestern mountains contain the best contiguous lynx habitat, while habitat in the remainder of the state is highly fragmented and isolated (Meaney and Beauvais 2004). Lynx occupy the Salt River, Wyoming, Teton, Wind River, Gros Ventre, and Absaroka mountain ranges. Lynx have been documented in Sublette County and within the RBPA; however, the most recent observations were from 1985 (Wyoming Natural Diversity Database [WYNDD] 2007a). Critical habitat for lynx has been designated for the Greater Yellowstone Area, which includes 1,857 acres of the Bridger-Teton National Forest that is within the 1-mile buffer at the western end of the RBPA (USFWS 2009b).

3.8.1.3 Gray Wolf

The gray wolf (*Canis lupus*) uses a variety of habitats that support a large prey base including montane and low-elevation forests, grasslands, and desert scrub. Breeding populations of gray wolves are presently restricted to the Upper Great Lakes, northern Rocky Mountains, potentially the Northwest, and throughout Canada and Alaska. Gray wolves were reintroduced into the Greater Yellowstone Area in 1995 and 1996 as part of a nonessential, experimental population (the Northern Rocky Mountain Distinct Population Segment [NRM]) under the ESA. The species was delisted from the ESA in February 2008 (USFWS 2008b); however, the legal defensibility of the delisting was challenged and the U.S. District Court for Montana issued a preliminary injunction order on July 18, 2008, followed by a vacatur and remand order on October 14, 2008 (USFWS 2009c) reinstating ESA protections for gray wolves in the northern Rocky Mountains. The Idaho and Montana portions of the NRM were again delisted while the Wyoming portion remained threatened under the ESA according to a press release on January 14, 2009, which would take effect 30 days after publication of that ruling in the Federal Register; however, a memorandum from the Office of the President of the United States on January 20, 2009, directed the withdrawal of all regulations not already published in the Federal Register for further review (USFWS 2009c). On April 2, 2009, the USFWS published a final rule on the NRM delisting wolf populations in Idaho and Montana, while retaining wolves in Wyoming as a non-essential, experimental population under the ESA (USFWS 2009c). In Wyoming, this species in primarily known in the northwest in the Greater Yellowstone Ecosystem, although several packs do occur outside this area (Jimenez et al. 2009). There are monitored packs within the PFO management area but their ranges are outside of the RBPA (BLM 2008b; Jimenez et al. 2009). The Big Piney pack occurs near the RMPA and consists of seven adults with an unknown home range size (Jimenez et al. 2009). In winter of 2009 unconfirmed observations of wolves were made in the RBPA, leading to the conclusion that wolves from nearby packs may occasionally pass through or even hunt within the RBPA.

3.8.1.4 Grizzly Bear

The grizzly bear has been documented in a variety of habitats which contain the following: 1) an abundance of their preferred foods—i.e., whitebark pine (*Pinus albicaulis*) seeds, army cutworm moths (*Euxoa auxiliaries*), large ungulates (newly born young and winter kills), and spawning cutthroat trout (*Oncorhynchus clarki*) (Mattson et al. 1991); 2) sufficient cover for bedding and security (Moody et al. 2002; USFWS 1993); and 3) denning locations (USFWS 1993).

Currently there are five remnant populations remaining below the Canadian border: the Cabinet-Yaak population in extreme northwest Montana and northeast Idaho, the Selkirk population in extreme northwest Idaho and extreme northeast Washington, the northern Cascades population in Washington, the Northern Continental Divide Ecosystem (NCDE) population in north central Montana, and the population of the Greater Yellowstone Area (GYA) in eastern Idaho, southwestern Montana, and northwestern Wyoming (Servheen 1999). In Wyoming, the grizzly bear's range includes Grand Teton National Park, Yellowstone National Park, and portions of adjacent national forest and private lands to the south and east extending to the eastern edge of the Absaroka Mountains, the western portion of the Owl Creek Mountains, south in the Gros Ventre Range to the Pinnacle Peak area, and south in the Wind River Range to the Green River Lakes area (Moody et al. 2002; Schwartz et al. 2002).

On March 29, 2007, the Yellowstone Distinct Population Segment (DPS) was found to be recovered and the Yellowstone DPS was delisted (USFWS 2007a) and management of this population was returned to the states. In Wyoming, the grizzly bear was managed under the Wyoming Grizzly Bear Management Plan (Moody et al. 2002) from 2002 to September 21, 2009. However, on September 21, 2009, the ESA protections were reinstated for the Yellowstone DPS.

The BLM-PFO and the RBPA are not within the Primary Conservation Area (PCA) for grizzly bear; however, the areas are within the Grizzly Bear Data Analysis Unit (derived by the WGFD) and are considered an ecosystem transitional zone containing the southernmost portion of known grizzly bear activity in the Greater Yellowstone Ecosystem (Moody et al. 2005).

3.8.1.5 Yellow-billed Cuckoo

In 2001, the USFWS found that listing of the Western United States Distinct Population Segment (WDPS) of yellow-billed cuckoo (*Coccyzus americanus*) was warranted but precluded by higher priority listing activities (USFWS 2001, 2007a). The yellow-billed cuckoo WDPS is defined as all U.S. populations west of the Continental Divide. In Wyoming, this includes the entirety of the PFO. This range definition matches that of the taxonomic subspecies *C. a. occidentalis* (western yellow-billed cuckoo) and for this EA information sources referring to western yellow-billed cuckoo are used in proxy when specific information for the WDPS is lacking.

Breeding habitat requirements of the yellow-billed cuckoo WDPS include large tracts of riparian areas containing an extensive deciduous, primarily cottonwood (*Populus* spp.), overstory and dense understory layer, primarily willow below approximately 7,000 feet elevation (USFWS 2007b). In Wyoming, Nicholoff (2003) recommends minimum management requirements per breeding cuckoo pair of riparian cottonwood forests at least 25 acres in size and 100 meters wide, and containing at least 2.5 acres of dense shrubby understory with diverse vegetation heights.

The western subspecies is considered rare in Wyoming and has been found primarily along waterways in the lower Green River Basin (Bennett and Keinath 2001; Wiggins 2005). Cuckoos have been documented in the PFO, and specifically along the Green River at Seedskadee National Wildlife Refuge, but no nest sites have been recorded (BLM 2008b). No suitable breeding habitat exists for western yellow-billed cuckoo in the RBPA and it is unlikely to occur as a migrant due to its rare status in western Wyoming.

3.8.1.6 Greater Sage-grouse

In March 2010, the USFWS found that listing of the greater sage-grouse (*Centrocercus urophasianus*), range wide, was warranted but precluded from listing under the ESA by higher priority listing activities (USFWS 2010). In 2008, Governor Freudenthal of Wyoming issued EO 2008-2 that identified core areas critical to maintaining sage-grouse breeding populations in the state. WY BLM sage-grouse Key Habitat Areas correspond to the State of Wyoming's core areas (BLM 2010). No sage-grouse core areas occur within the RBPA (WGFD 2009e). The nearest core areas are located approximately 2 miles north of the RBPA.

The RBPA contains suitable greater sage-grouse habitat for breeding, nesting, and brood-rearing. The sage-grouse depends almost exclusively on healthy sagebrush, with an understory of grasses and forbs, for year-round survival. Braun et al. (1977) indicate that most hens nest within 2 miles of a lek, but more recent studies suggest many hens nest farther away and distance may increase in disturbed areas (Connelly et al. 2004). Winter habitats of sage-grouse are dominated by sagebrush, which provides shelter and food. Shrub density and height can influence habitat selection by sage-grouse in the winter (Connelly et al. 2004).

Suitable nesting and winter habitats based on vegetation and documented use have not been mapped within the RBPA. Therefore, potential sage-grouse habitat is considered to be occupied leks with a surrounding 2-mile buffer for purposes of this EA. Not all areas within this buffer may be suitable, and suitable habitat could extend beyond this buffer.

According to WGFD annual monitoring data (WGFD 2009a; 2008), one occupied lek is present within the RBPA, and the 2-mile buffer of presumed suitable nesting and winter habitat around seven additional leks intersects portions of the RBPA, although the actual leks fall outside of the RBPA boundary (WGFD 2009a). The total available greater sage-grouse habitat for these eight leks is estimated at approximately 12,520.1 acres within the RBPA. There are currently 1,031.1 acres of current disturbance from oil and gas, roads, and urban industrial development within greater sage-grouse habitat in the RBPA (Rodemaker and Driese 2007). In mid-April of 2010, subsequent to the issuance of the EA for public review and comment two previously unknown leks were discovered in the RBPA approximately 4 miles east of the M&HRF. The leks were initially discovered through aerial (helicopter) surveys for leks. They were verified through a second aerial reconnaissance and two on-the-ground site visits by a BLM biologist. This discovery increases the total number of leks within or intersecting the RBPA from 8 leks to 10 leks and increases the number of occupied leks within an 11-mile radius from 28 to 30. The 2-mile radius of these leks will increase the known sage-grouse habitat in the RBPA from 12,520.1 acres to 16,490.9 acres and the acres of existing disturbance associated with roads and industrial development within sage-grouse habitat in the RBPA from 1,031.1 acres to 1,186.5 acres.

The ten leks overlapping the RBPA are part of the Calpet/Deer Hill sage-grouse evaluation area which contains four lek complexes being monitored and evaluated by the Upper Green River Basin Sage-Grouse Working Group (Upper Green River Basin Sage-Grouse Working Group 2007). Within the 4 lek complexes, there were 14 historic and/or currently occupied leks reported in 2008. The Upper Green River Sage-Grouse Conservation Plan reports that, as of 2007, the long-term trend in male lek attendance was increasing in two lek complexes, but decreasing in the other two lek complexes (Upper Green River Basin Sage-Grouse Working Group 2007).

Per the BLM Greater Sage-grouse Habitat Management Policy (BLM 2010) there are 28 occupied sage-grouse leks within an 11-mile radius of the Proposed Project (WGFD 2009a). The 28 occupied leks are contained within 14 lek complexes (Upper Green River Basin Sage-Grouse Working Group 2007). Ten of these leks are located within core areas north of the RBPA. The closest lek within core areas is located approximately 8.1 miles north of the Proposed Project.

3.8.1.7 Colorado River Fishes

The Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail chub (*Gila elegans*) are all listed as endangered by the USFWS. These fishes are all endemic species of the Colorado River system. The construction of dams, alterations in flow regimes, loss of surface water, groundwater pumping, degradation of riparian vegetation, changes in land use practices, mining, and the introduction of various non-native species have put these fishes at risk (USFWS 2006). Endangered Colorado River fishes do not occur in the RBPA and there is no designated critical habitat within the RBPA. These species do occur downstream in the Green, Yampa, and Colorado rivers. South Piney, Spring, and Beaver creeks, which drain the RBPA, are perennial tributaries to the Green River. Potential pollution, sedimentation, and water depletions occurring within the RBPA are concerns for downstream populations of endangered Colorado River fishes.

3.8.1.8 Ute Ladies'-tresses Orchid

The threatened Ute ladies'-tresses orchid (*Spiranthes diluvialis*) is found in seasonally moist soils and wet meadows in Wyoming at elevations under 7,000 feet. In Wyoming, this plant is found mostly on low, flat floodplain terraces or abandoned oxbows adjacent to small perennial streams or rivers. Known populations in Wyoming are limited to Converse, Goshen, Laramie, and Niobrara counties. Potentially suitable habitat may occur in the RBPA in wet meadows along South Piney, Spring, and Beaver creeks. However, this species is unlikely to occur in the RBPA because there are no documented populations in Sublette County (WYNDD 2007a) and no known populations exist on public lands in the PFO (BLM 2008b).

3.8.2 BLM Sensitive Species

In addition to species listed under the ESA, the BLM Wyoming State Office has established a list of sensitive species that warrant special attention on BLM-administered lands (BLM 2002), and the PFO has updated its sensitive species list in the current RMP and ROD (BLM 2008b). BLM sensitive species are those that could become endangered or extirpated in the state. BLM sensitive species known to occur in the PFO were reviewed to determine potential presence in the RBPA (Table 3-18). Species that potentially may occur or be impacted by the Proposed Action are discussed in more detail below. Gray wolf and yellow-billed cuckoo are previously discussed in Section 3.8.1.

Table 3-18. BLM Special Status Species for the PFO.

Species	Primary Habitat Association	Potential for Occurrence
Mammals		
Long-eared myotis *Myotis evotis*	Conifer and deciduous forests, caves, and mines	Yes
Pygmy rabbit *Brachylagus idahoensis*	Dense sagebrush stands with sandy soils	Yes
White-tailed prairie dog *Cynomys leucurus*	Basin-prairie shrub and grasslands	Yes
Idaho pocket gopher *Thomomys idahoensis*	Shallow soils in sagebrush steppe and grasslands	Yes
Gray wolf *Canis lupus*	Greater Yellowstone ecosystem	Yes
Grizzly bear *Ursus arctos horribilis*	Montane environments	No - outside known range
Birds		
Trumpeter swan *Cygnus buccinator*	Lakes, ponds, rivers with aquatic vegetation	Yes
White-faced ibis *Plegadis chihi*	Marshes, wet meadows	Yes
Bald eagle *Haliaeetus leucocephalus*	Mature trees near an aquatic or terrestrial prey base	Known
Northern goshawk *Accipiter gentilis*	Old-growth coniferous and deciduous forests	Yes
Ferruginous hawk *Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops	Yes
American peregrine falcon *Falco peregrinus anatum*	Tall cliffs	Yes
Mountain plover *Charadrius montanus*	Areas of flat topography and vegetation < 6 inches	Yes

Species	Primary Habitat Association	Potential for Occurrence
Birds, continued		
Long-billed curlew *Numenius americanus*	Grasslands, plains, foothills, wet meadows	Yes
Yellow-billed cuckoo *Coccyzus americanus*	Unfragmented mature cottonwood-willow riparian	Yes
Burrowing owl *Athene cunicularia*	Prairie dog colonies, grasslands, basin-prairie shrub	Yes
Loggerhead shrike *Lanius ludovicianus*	Sagebrush	Yes
Sage thrasher *Oreoscoptes montanus*	Sagebrush	Yes
Brewer's sparrow *Spizella breweri*	Sagebrush	Yes
Sage sparrow *Amphispiza belli*	Sagebrush	Yes
Amphibians		
Boreal toad *Bufo boreas boreas*	Pond margins, wet meadows, riparian areas	Known
Northern leopard frog *Rana pipiens*	Beaver ponds, permanent water in plains and foothills	Yes
Columbia spotted frog *Rana luteiventris*	Ponds, sloughs, small streams	Yes
Fish		
Bluehead sucker *Catostomus discobolus*	Bear, Snake, and Green rivers systems, all waters	Not present; potential for effects to downstream populations
Flannelmouth sucker *Catostomus latipinnis*	Colorado River system, large rivers, streams, and lakes	Not present; potential for effects to downstream populations
Northern Leatherside chub *Lepidomeda copei*	Bear, Snake, and Green rivers systems, clear, cool streams and pools	Not present; potential for effects to downstream populations
Roundtail chub *Gila robusta*	Colorado River system, mostly large rivers, also streams and lakes	Not present; potential for effects to downstream populations
Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri*	Yellowstone River system, clear mountain streams	Not present; outside known range; no water depletion
Fine-spotted Snake River cutthroat trout *Oncorhynchus clarki* spp.	Snake River system; introduced into Colorado River system	Known introduced population

Species	Primary Habitat Association	Potential for Occurrence
Fish, continued		
Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*	Colorado River system, clear mountain streams	Known
Plants		
Meadow pussytoes *Antennaria arcuata*	Moist meadows, seeps, or springs surrounded by sage/grassland; 4,900–7,900 feet elevation	Yes
Trelease's racemose milkvetch *Astragalus racemosus* var. *treleasei*	Shale or barren clay slopes, sparsely vegetated sage; 6,500–8,200 feet elevation	Yes
Cedar Rim thistle *Cirsium aridum*	Barren, gravelly slopes, sandy-shaley draws; 6,700–7,200 feet elevation	Yes
Large-fruited bladderpod *Lesquerella macrocarpa*	Gypsum-clay or barren hills, clay flats; 7,200–7,700 feet elevation	Yes
Beaver Rim phlox *Phlox pungens*	Sparsely vegetated slopes; 6,000–7,000 feet elevation	Yes
Tufted twinpod *Physaria condensata*	Sparsely vegetated shale slopes, ridges; 6,500–7,000 feet elevation	Yes

Source: BLM 2008d:Appendix 9.

3.8.2.1 Long-eared Myotis

The long-eared myotis (*Myotis evotis*) inhabits much of temperate western North America at elevations between 5,000 and 9,800 feet. The long-eared myotis inhabits much of its historic range; however, it has declined in abundance and distribution throughout its range. The species inhabits coniferous or oak (*Quercus* spp.) forests and woodlands including juniper (*Juniperus* spp.), ponderosa pine (*Pinus ponderosa*), and spruce-fir near rocky bluffs or canyons. The long-eared myotis bat is generally found foraging over rivers, streams, and ponds within forested areas. During the summer, the species roosts in a variety of structures including tree cavities, under loose bark, and in rock crevices. The long-eared myotis is vulnerable to the effects of pesticides and other environmental contaminants that destroy their prey base and are concentrated in their fat reserves. The long-eared myotis has been documented within the PFO (Cerovski et al. 2004), and potentially suitable habitat occurs in the forested area on the western end of the RBPA.

3.8.2.2 Pygmy Rabbit

The USFWS is currently conducting a 12-month status review to determine if listing the pygmy rabbit (*Brachylagus idahoensis)* under the ESA is warranted (USFWS 2008c). The pygmy rabbit is dependent on sagebrush (*Artemesia* spp.) for the majority of its diet and is the only rabbit species in North America that excavates its own burrows. For these reasons, the pygmy rabbit is typically found in dense stands of big sagebrush (*Artemesia tridentata*) growing in deep, loose soils (Green and Flinders 1980). Pygmy rabbits have been recorded recently in areas near the RBPA (WYNDD 2007a), and known populations occur in the PFO (BLM 2008b). Due to the nearby known occurrence and appropriate habitat, pygmy rabbits may occur within the RBPA.

3.8.2.3 White-tailed Prairie Dog

The USFWS is currently conducting a 12-month status review to determine if listing of white-tailed prairie dog (*Cynomys leucurus)* under the ESA is warranted (USFWS 2008d). Central and southwestern Wyoming constitutes the majority of the species' range (Pauli et al. 2006), which also includes northwestern Colorado, northeastern Utah, and south-central Montana. In Wyoming, white-tailed prairie dogs are generally found at elevations ranging between 5,000 and 10,000 feet in desert and shrub grassland. Other sensitive species, such as the burrowing owl and black-footed ferret, rely on prairie dog colonies. No white-tailed prairie dog colonies have been documented in the RBPA. White-tailed prairie dogs have been historically (1893) documented in the RBPA but no recent observations have been made (WYNDD 2007a).

3.8.2.4 Idaho Pocket Gopher

The Idaho pocket gopher (*Thomomys idahoensis*) is a small herbivore that was only recently described as a species separate from the northern pocket gopher (*T. talpoides*). The Idaho pocket gopher usually inhabits high-elevation shrub-steppe, grasslands, and subalpine mountain meadow areas with shallow, rocky soils. Idaho pocket gophers have been documented near Big Piney and may occur within the RBPA (BLM 2008b).

3.8.2.5 Trumpeter Swan

The upper Green River Basin supports a small breeding population of trumpeter swans (*Cygnus buccinators*) (Cerovski 2007). Swans from this population, as well as migrants and wintering birds from outside populations, may use the Green River year-round as long as open water is available. Trumpeter swans require protected, shallow ponds and lakes with islands for nesting. These requirements are not met by any wetland site in the RBPA, so occurrence of this species is expected to be limited to foraging birds within the river corridor or migrants passing through the area.

3.8.2.6 White-faced Ibis

Appropriate nesting habitat of large, deep wetlands with tall, emergent vegetation is not found within the RBPA. The white-faced ibis (*Plegadis chihi*) is a regular migrant throughout the state, however, and small numbers are expected to occur around wetlands and along the Green River and its tributaries during spring and fall migration.

3.8.2.7 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was recently removed from the USFWS list of threatened and endangered species but is considered a BLM sensitive species (USFWS 2007c). Bald eagles are protected under the Bald and Golden Eagle Protection Act (16 USC 668–668d). The bald eagle feeds on fish and carrion and typically roosts in large trees near a water source. Suitable nesting and roosting habitat is located along the Green River. Three bald eagle roost sites and three nests are known for the RBPA.

3.8.2.8 Northern Goshawk

The northern goshawk (*Accipiter gentilis*) occupies a diversity of habitats across its range, from dense coniferous taiga, mixed conifer, and deciduous forests to lush riparian forest (Smith and Keinath 2004a). The northern goshawk generally nests within mature forest stands characterized by a multilayered canopy with an open canopy within 1,312 feet of water

(Reynolds et al. 1994). The density of this species is highly influenced by the cyclical abundance of prey species, especially snowshoe hare and ruffed grouse (*Bonasa umbellus*). Northern goshawks have been confirmed in the PFO (BLM 2008b) and potential habitat occurs in the coniferous forest on the western portion of the RBPA. A nest is present approximately 3 miles south of the western end of the RBPA, and northern goshawks may occasionally hunt within the RBPA.

3.8.2.9 Ferruginous Hawk

Ferruginous hawks (*Buteo regalis*) inhabit open environments such as grasslands, shrub-steppe, and semi-desert shrublands that support abundant populations of prairie dogs, ground squirrels (*Spermophilus* spp.), and jackrabbits (*Lepus* spp.). Ferruginous hawks avoid areas of high human activity, disturbance, and intensive agriculture. They nest in isolated trees, on rock outcrops, on structures such as power poles, hay bales, and on the ground. Throughout the year, ferruginous hawks position themselves near prey concentrations and avoid dense vegetation that limits their ability to detect and attack prey (Travsky and Beauvais 2005). In Wyoming, ferruginous hawks breed across a large portion of the state, and some individuals are year-round residents. Within the PFO, the ferruginous hawk is known to breed in scattered locations, especially areas southwest of Boulder and north of Fontenelle Reservoir. Small numbers are known to winter near Pinedale and in the southeast portion of the planning area (BLM 2008b). Potentially suitable habitat may occur in the RBPA, particularly near active prairie dog towns, although ferruginous hawk nests have not been recorded in the RBPA or in the immediate vicinity.

3.8.2.10 American Peregrine Falcon

Breeding sites for the American peregrine falcon (*Falco peregrinus anatum*) are limited to montane regions of Wyoming. Foraging bouts and migration do occur at lower elevations and the species may be present in the RBPA during those events. The species may be most likely to occur along the Green River where waterfowl and shorebird concentrations provide prey opportunities.

3.8.2.11 Mountain Plover

The mountain plover (*Charadrius montanus*) breeds in grasslands and shrub-steppe habitats of the western Great Plains and Colorado Plateau. Wyoming is host to roughly 25% of the North American breeding population of 8,000 to 10,000 birds (Smith and Keinath 2004b). In western Wyoming, mountain plover is very rare due to limited habitat availability, which generally consists of large prairie dog towns and sparsely vegetated areas on mesa tops. Mountain plover has been recorded in the PFO management area (BLM 2008b), and potential breeding habitat may occur near the RBPA in prairie dog towns.

3.8.2.12 Long-billed Curlew

The long-billed curlew (*Numenius americanus*) inhabits a variety of grassland types ranging from moist meadow grasslands to agricultural areas and to upland grasslands. The long-billed curlew breeds in the Great Plains, Great Basin, and intermontane valleys of the western United States and southwestern Canada. In Wyoming, the long-billed curlew has been documented as breeding in less than 10 locations within the last 15 years (Dark-Smiley and

Keinath 2004). This species is known to inhabit the northern portion of the PFO and has potential to occur in the grassland habitats in the RBPA.

3.8.2.13 Burrowing Owl

Burrowing owls (*Athene cunicularia*) use a wide variety of arid and semiarid environments, with well-drained, level to gently sloped areas characterized by sparse vegetation and bare ground. The burrowing owl is a grassland specialist found in open prairie, grassland, desert, and shrub-steppe habitats, as well as agricultural areas (Martin 1973). The species almost exclusively associates itself with prairie dog and ground squirrel colonies and uses the burrows for nesting and roosting. The burrowing owl is known to nest throughout the central and eastern regions of the PFO (BLM 2008b). No burrowing owl nests have been recorded within the RBPA, although potential nesting habitat exists as prairie dog colonies near RBPA. Burrowing owls have been previously documented within the RBPA and buffer zone (WYNDD 2007a).

3.8.2.14 Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*) has been recorded throughout Wyoming (Keinath and Schneider 2005). For nesting, presence of dense shrubs or trees with open herbaceous areas for foraging nearby seems to be important. This species has been documented north of Fontenelle Reservoir in the PFO management area (BLM 2008b). It is unknown if loggerhead shrikes inhabit the RBPA; however, potentially suitable habitat is present.

3.8.2.15 Sage Thrasher

The sage thrasher (*Oreoscoptes montanus*) is a sagebrush-steppe obligate that relies on large expanses of that habitat type for successful nesting. The breeding distribution of the sage thrasher includes areas between 4,200 and 6,700 feet elevation and has been mapped as occurring in southwestern Wyoming (Buseck et al. 2004). Sage thrashers typically place their nests within or under mature living shrubs with good basal cover. It is unknown if sage thrashers inhabit the RBPA; however, they have been recorded in the PFO management area (BLM 2008b) and suitable habitat does occur in the RBPA.

3.8.2.16 Brewer's Sparrow

The Brewer's sparrow (*Spizella breweri*) is found in areas of dense sagebrush stands that have an average canopy height of less than 5 feet (Hansley and Beauvais 2004a). The Brewer's sparrow nests in areas of medium to tall sagebrush with scant herbaceous cover. Surveys have shown large breeding populations of Brewer's sparrows in southwestern Wyoming. The Brewer's sparrow is known to nest within the PFO management area (BLM 2008b) and suitable habitat is available within the RBPA.

3.8.2.17 Sage Sparrow

The sage sparrow (*Amphispiza belli*) is considered a sagebrush obligate and occurs in large, undisturbed tracts of tall and dense sagebrush. Known breeding distribution of the sage sparrow was mapped in southwestern Wyoming, with the highest densities occurring in Sweetwater County (Hansley and Beauvais 2004b). The sage sparrow is known to occur within the PFO management area and may occur in portions of the RBPA within tall, dense sagebrush.

3.8.2.18 Boreal Toad

Boreal toads (*Bufo boreas boreas*) live in a wide range of habitats in western North America including wetlands, forests, woodlands, sagebrush, meadows, and floodplains in the mountains and valleys. In Wyoming, boreal toads use wet habitats in foothills, as well as montane and subalpine areas from 6,500 to 7,200 feet elevation, and are seldom far from water (McGee and Keinath 2004). In the late spring and early summer, adult boreal toads breed in shallow water edges of ponds and lakes, stream and river edges, oxbow ponds, thermal pools and streams, flooded meadows, ephemeral pools, abandoned and active beaver ponds, reservoirs, and quarries. Terrestrial habitats occupied by boreal toads after the breeding season include a diversity of forested and non-forested wet and dry areas. In early fall, adults and young of year migrate to hibernacula in terrestrial habitat, which are typically burrows from rodents and squirrels (McGee and Keinath 2004). Breeding by this species has been documented at higher elevations within the PFO (BLM 2008b), and WYNDD (2007a) has provided detection occurrences within the RBPA.

3.8.2.19 Northern Leopard Frog

The USFWS is currently conducting a 12-month status review to determine whether listing of the northern leopard frog (*Rana pipiens*) under the ESA is warranted west of the Mississippi River and the Great Lakes region in the United States and south of the international boundary between the United States and Canada (USFWS 2009d). In Wyoming, northern leopard frogs have been found at elevations up to 8,858 feet in the mountains. Northern leopard frogs require a broad range of habitats in proximity due to their complicated life histories. Northern leopard frogs breed in shallow, quiet areas of permanent water bodies and in seasonally flooded areas adjacent to permanent pools or streams with open canopies. Tadpoles require pools with little to no overhead canopy that are reasonably shallow to allow for solar heating of the pool. After breeding, the adults move to upland habitats around breeding pools, such as grassy meadows, to feed. Adults and young of year hibernate under water in pools, streams, and rivers that do not freeze solid. Suspected breeding, summer, and overwintering sites occur within the PFO (BLM 2008b) and suitable habitat may be present in the RBPA within riparian areas.

3.8.2.20 Columbia Spotted Frog

The Columbia spotted frog (*Rana luteiventris*) is associated with permanent water sources and submerged aquatic plants that provide hiding and thermal cover. Both breeding and over-wintering occur at aquatic sites and these sites are generally less than 1,969 feet apart (Patla and Keinath 2005). Columbia spotted frogs are considered rare or absent in southern portions of the Bridge-Teton National Forest (Patla and Keinath 2005). One spotted frog has been documented in the Wyoming Range northwest of the RBPA (WYNDD 2007a) and suitable habitat may be present in the RBPA.

3.8.2.21 Bluehead Sucker

Bluehead suckers (*Catostomus discobolus*) are known to occur in the upper Green River and its tributaries within the PFO management area (BLM 2008b). Bluehead suckers are found in mainstem streams and small to mid-size tributaries to the Upper Colorado River Basin, which have high turbidity and alkalinity, a variety of flow regimes, and water temperatures as high as 82°F. This species is not known or expected to occur within the RBPA; however, they occur in the Green River between Fontenelle Reservoir and Pinedale (WGFD 2009b) and would therefore be subject to potential effects from water depletions or changes to water quality in the RBPA.

3.8.2.22 Flannelmouth Sucker

The flannelmouth sucker (*Catostomus latipinnis*) is native to the entire Colorado River Basin, including the Green, Yampa, Gunnison, San Juan, Little Colorado, and Colorado rivers. Although preferring deep rivers, they occasionally can be found in smaller streams and lakes. The species is found in the Green River in the PFO (BLM 2008b); however, flannelmouth suckers are not known or expected to occur within the RBPA due to lack of suitable habitat, but would be subject to potential effects from water depletions or changes to water quality in the RBPA.

3.8.2.23 Northern leatherside Chub

The USFWS is currently conducting a 12-month status review to determine whether listing of the northern leatherside chub (*Lepidomeda copei*) under the ESA is warranted (USFWS 2009e). Leatherside chubs are found in cooler creeks and rivers with moderate currents and water temperatures ranging from 60°F to 75°F. Leatherside chubs are native to the Snake River drainage in Wyoming and were introduced into the Colorado River drainage. Leatherside chub are not known or expected to occur within the RBPA due to lack of suitable habitat; however, they may be present in the Green River downstream of the RBPA (BLM 2008b) and would therefore be subject to potential effects from water depletions or changes to water quality.

3.8.2.24 Roundtail Chub

In Wyoming, the roundtail chub (*Gila robusta*) is found in the Green and Little Snake river drainages. It mainly inhabits large swift rivers but may occasionally live in small streams and lakes. Within the PFO management area, roundtail chubs have been documented in the Green River between Fontenelle Reservoir and Pinedale (BLM 2008b). This species is not known or expected to occur within the RBPA due to lack of suitable habitat; however, they are present in the Green River downstream of the RBPA (WGFD 2009b) and would therefore be subject to potential effects from water depletions or changes to water quality.

3.8.2.25 Fine-spotted Snake River Cutthroat Trout

Fine-spotted Snake River cutthroat trout (*Oncorhynchus clarki* spp.) are currently considered a form of Yellowstone cutthroat trout. Subspecies designation (*O. c. behnkei*) has been proposed but is not formally recognized (Young n.d.). Snake River cutthroats are found in rivers of cold, clear water with a relatively steep gradient and rubble-boulder substrate. They are native to the Snake River drainage and were introduced into the Colorado River drainage. Snake River cutthroat trout populations occur within the streams in the RBPA, such as Fish, North Piney, and South Piney creeks (WGFD 2009b). Water depletions, sedimentation, and changes to water quality could negatively impact the introduced populations.

3.8.2.26 Colorado River Cutthroat Trout

In Wyoming, the Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) can be found in the Green, Black's Fork, and Little Snake river drainages (WGFD 2005). This species prefers cold, clear water; a relatively steep gradient; and a rubble-boulder substrate. Colorado River cutthroat trout populations occur within the streams in the RBPA, such as Black Canyon, Dry Piney, Fish, North Piney, South Piney, Spring, and Beaver creeks (BLM 2008b; WGFD 2009b), and conservation populations occur within the PFO management area (Hirsch et al. 2006). Water depletions, sedimentation, and changes to water quality could negatively impact this species.

3.8.2.27 Meadow Pussytoes

Habitat for meadow pussytoes (*Antennaria arcuata*) consists of sub-irrigated meadows within broad stream channels between 4,950 and 7,900 feet elevation. Populations occur within the PFO (BLM 2008b), but this plant is not known to occur in the RBPA; however, suitable habitat may be present in the RBPA in wet meadow areas along South Piney, Spring, and Beaver creeks.

3.8.2.28 Trealease's Milkvetch

Trealease's milkvetch (*Astragalus racemosus* var. *treleasei*) occurs mainly on outwash flats and fluted Badlands slopes derived from shale at 6,500 to 7,500 feet elevation (Heidel and Fertig 2003). A regional endemic in Uinta and Sublette counties, all known occurrences of Trealease's milkvetch are on public land. A population of Trelease's milkvetch is located approximately 3 miles south of the Rands Butte portion of the RBPA.

3.8.2.29 Cedar Rim Thistle

Cedar Rim thistle (*Cirsium aridum*) occurs on barren slopes, fans, and draws on whitish-gray sandstone, chalk, or clay substrates. Cedar Rim thistle is a Wyoming endemic and is restricted to Sublette, Fremont, and Sweetwater counties. Cedar Rim thistle has not been documented within the RBPA; however, populations have been recorded approximately 8 miles northeast of the proposed Chimney Butte substation.

3.8.2.30 Large-fruited Bladderpod

Large-fruited bladderpod (*Lesquerella macrocarpa*) occurs within Gardner's schadscale (*Atriplex garneri*) communities on barren shale slopes from 6,800 to 7,700 feet elevation. All known occurrences of this species are on lands managed by the BLM Kemmerer, Pinedale, and Rock Springs field offices. Large-fruited bladderpod has not been documented within the RBPA; however, they have been recorded approximately 11 miles northeast of the proposed Chimney Butte substation.

3.8.2.31 Beaver Rim Phlox

Habitat for Beaver Rim phlox (*Phlox pungens*) typically consists of the sparsely vegetated cushion plant communities on slopes of limestone, sandstone, siltstone, or red-bed clays at 6,000 to 7,400 feet (Fertig et al. 1994). Populations from the Green River Basin differ from the typical Beaver Rim phlox and exhibit a "Ross Butte morph" that may represent an undescribed morph (Fertig 1998). Beaver Rim phlox has not been documented within the RBPA; however, the Beaver Rim area of critical environmental concern (ACEC) contains a population within 0.5 mile south of the M&HRF. The next closest occurrence is approximately 5 miles north of the proposed Chimney Butte substation.

3.8.2.32 Tufted Twinpod

Tufted twinpod (*Physaria condensate*) occurs on dry, rocky calcareous knolls, and ridges in sparsely vegetated cushion plant communities from 6,700 to 7,400 feet (WYNDD n.d.). Known populations for this species are restricted to Lincoln, Sublette, and Uinta counties (WYNDD n.d.). Tufted twinpod has not been documented within the RBPA.

3.9 WILDLIFE AND FISHERIES RESOURCES

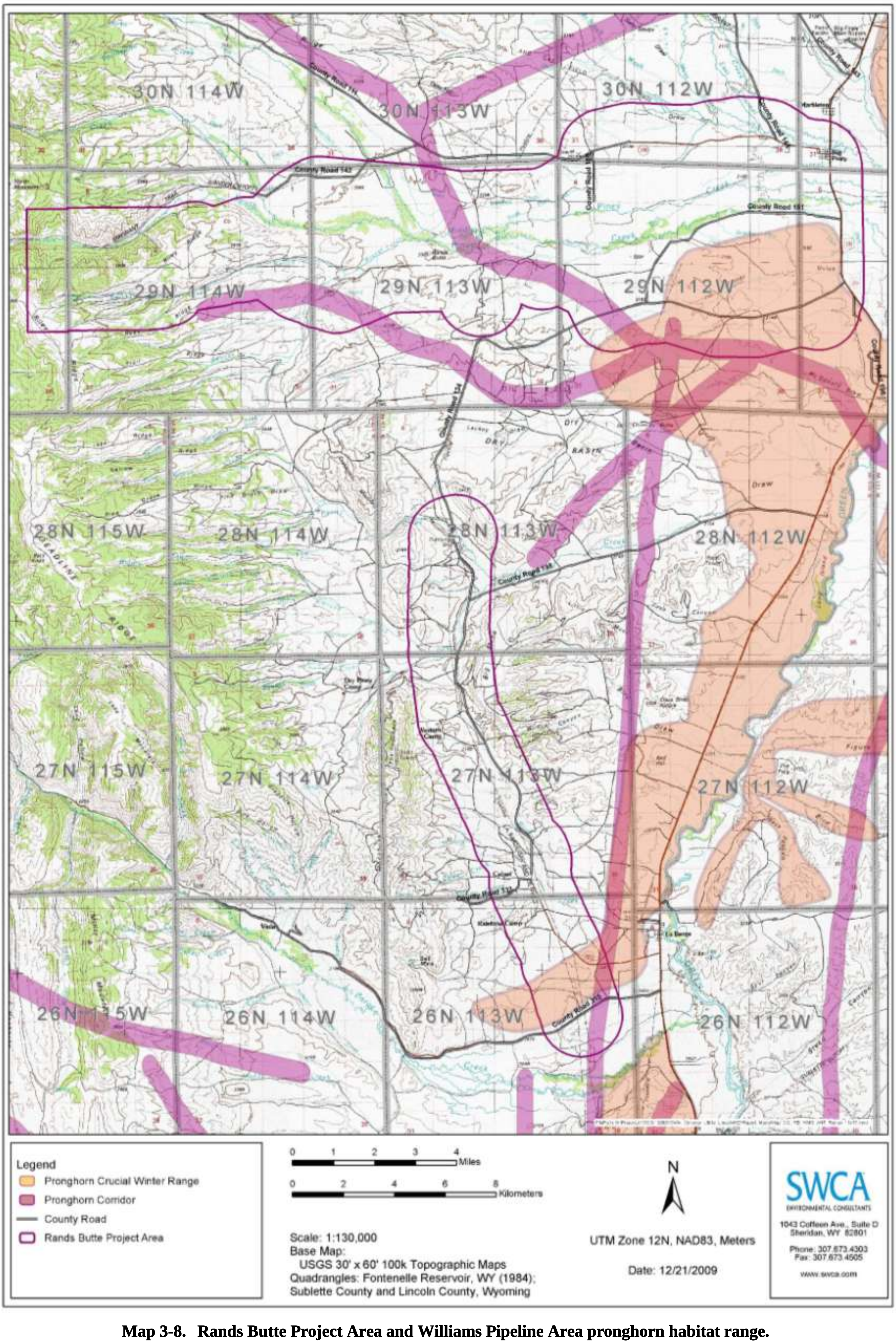
The RBPA includes upland and riparian habitats used by wildlife. The Wyoming Game and Fish Commission (1998) defined important wildlife habitats as “irreplaceable,” “vital,” or “high value.” Habitats relevant to this EA include those defined as “vital,” such as crucial winter ranges, and “high value,” including parturition and winter ranges and Class 2 streams.

3.9.1 Big Game Species

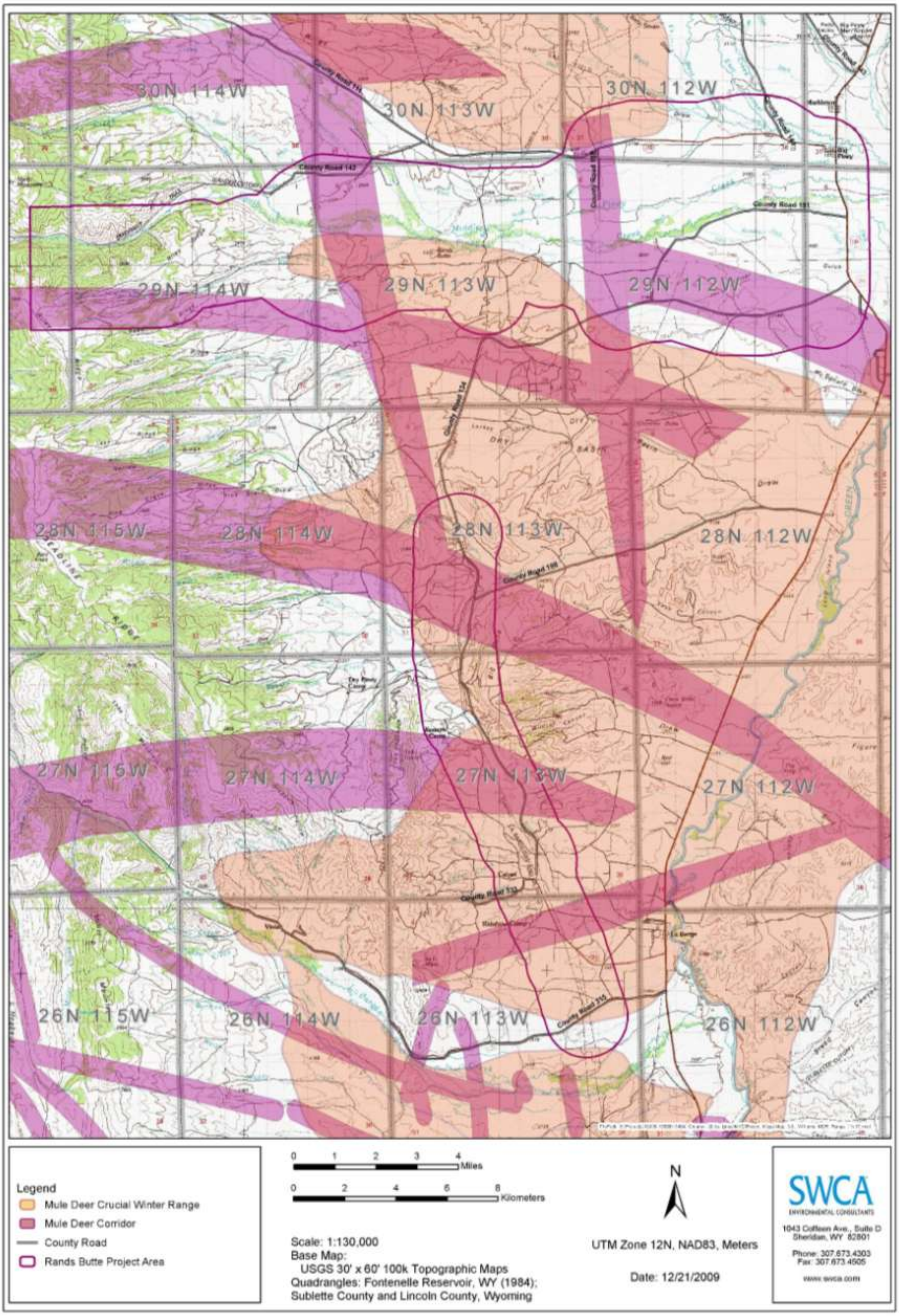
Perennial riparian corridors associated with the Green River drainage and upland shrub-steppe within the RBPA provide habitat for pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), and moose (*Alces alces shirasi*).

Crucial winter range is defined in the PFO RMP and ROD (BLM 2008b) as those areas that are available, relatively intact, and allow wintering for most of the population at population objective levels and in adequate body condition, for 8 or more years out of 10. Spring/summer/fall range is used outside of persisting winter conditions. Winter range is used by substantial numbers of animals only during the winter period defined as November 15 through April 30. Winter range is occupied throughout the year but during winter it is used by additional animals that migrate from other seasonal ranges.

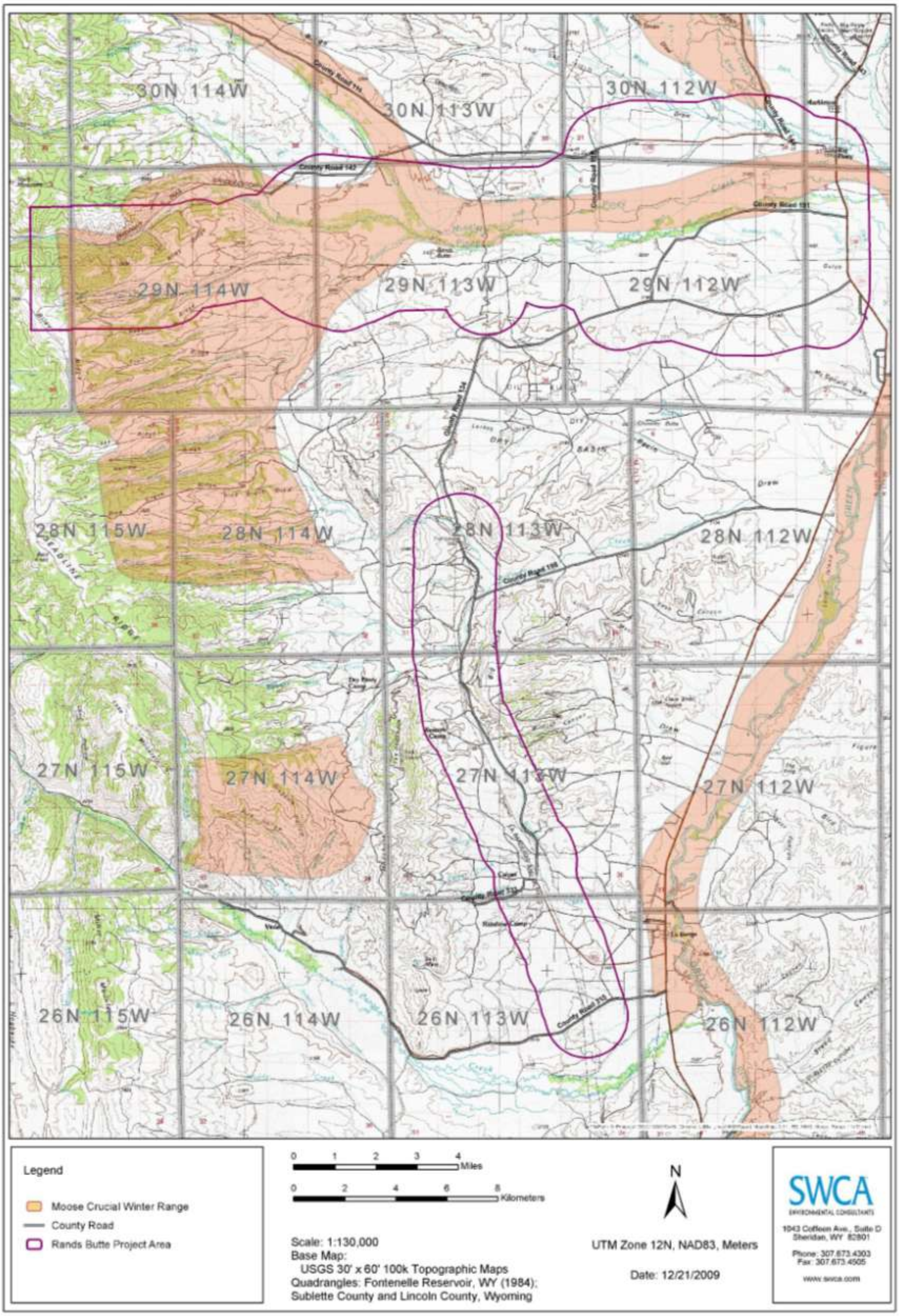
The RBPA is within vital seasonal use areas for elk, mule deer, pronghorn, and moose. Important crucial winter range for pronghorn, mule deer, and moose occurs in the RBPA (Map 3-8 through Map 3-11). Important crucial winter range known as the Riley Ridge Winter Range Complex occurs for elk within the RBPA (Map 3-9). Important pronghorn, mule deer, and elk migration corridors also occur in the RBPA (Map 3-8 through Map 3-10). Elk parturition range is mapped within the western end of the RBPA in T29–30N, R114W. Big game seasonal ranges within the RBPA are quantified in Table 3-19.



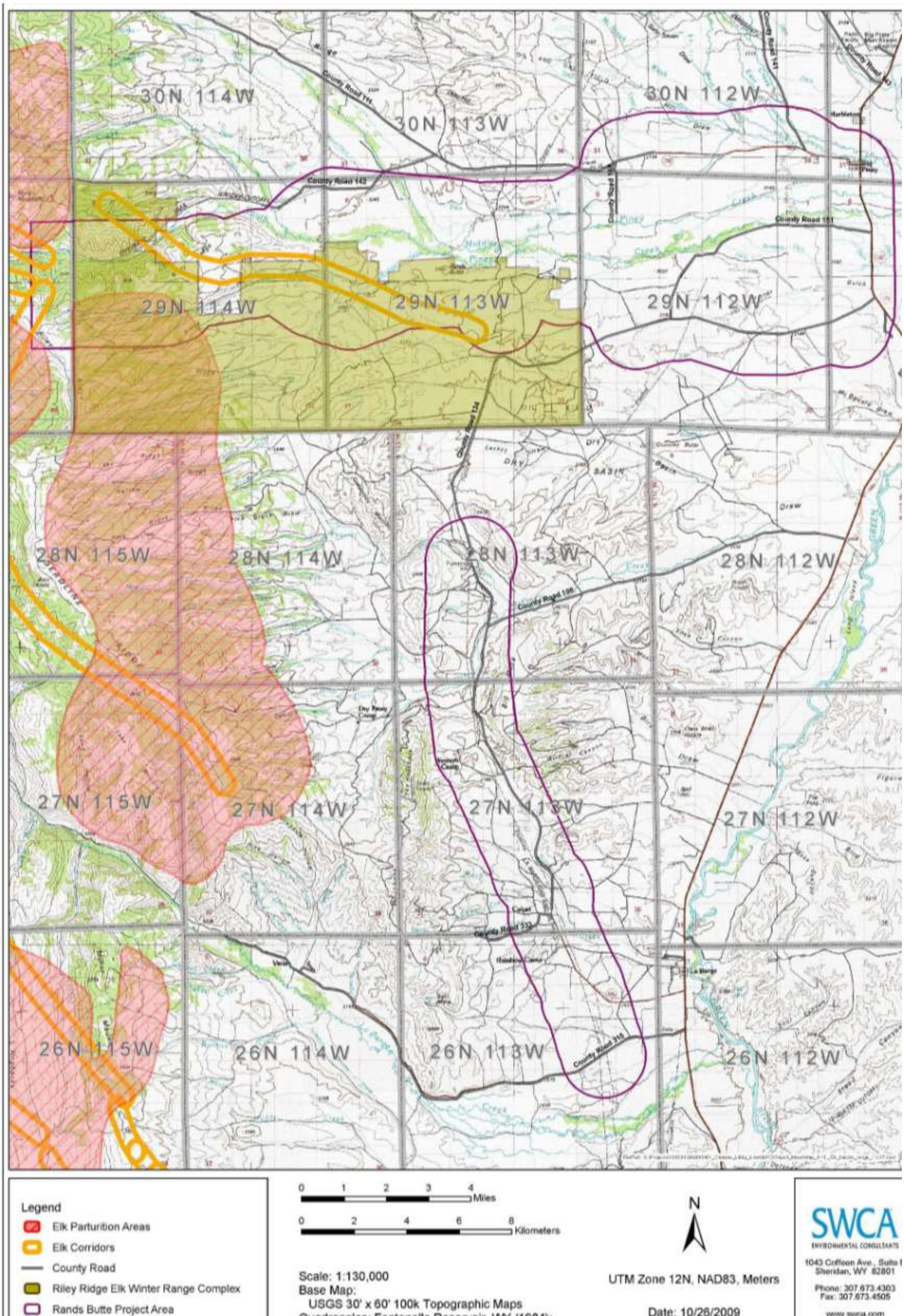
Map 3-8. Rands Butte Project Area and Williams Pipeline Area pronghorn habitat range.



Map 3-9. Rands Butte Project Area and Williams Pipeline Area mule deer habitat range.



Map 3-10. Rands Butte Project Area and Williams Pipeline Area moose habitat range.



Map 3-11. Rands Butte Area and Williams Pipeline Area elk habitat range.

Table 3-19. Estimated Acreages of Big Game Seasonal Ranges in the RBPA.

Species	Seasonal Range	Acres in Herd Unit	Acres in RBPA	Existing Disturbance within Seasonal Range in RBPA[1]
Elk	Riley Ridge Winter Range Complex	31,860	13,631	872
	Migration	44,814	3,289	160
	Parturition	72,109	2,367	164
Mule deer	Crucial Winter[2]	147,611	24,746	3,575
	Migration	142,508	22,013	1,978
Pronghorn	Crucial Winter[2]	64,282	9,885	413
	Migration	53,204	4,812	251
Moose	Crucial Winter	215,268	22,790	889
	Migration	0	0	0

RBPA = Rands Butte Project Area
[1]Existing disturbance calculated from acres of oil and gas development, roads and railroads, and/or urban industrial (Rodemaker and Driese 2007)
[2]Crucial winter is a combination of crucial winter/yearlong and crucial winter GIS layers (WGFD 2009c)

3.9.1.1 Elk

Elk are common throughout the mountainous regions of Wyoming, and generally occupy mountain meadows and forests during the summer and foothills and valley grasslands during the winter. Migration between these areas occurs during the spring and fall seasons and may cover extensive distances. As such, travel corridors and migration routes, including transitional ranges along these routes, are important components of elk habitat. Elk also require cover for hiding, resting, escape, and thermal cover (escaping winter storms and summer heat). Effective hiding and escape cover adjacent to openings is most effective when forested stands are in high contrast to openings (vertical diversity). Forested ridges, saddles, riparian areas, and canyons are preferred for travel and escape routes.

Elk are sensitive to human disturbance, especially during fall rut, early summer calving, and on winter ranges. Elk calves are born in late May or early June when cows are moving from winter to summer ranges. Elk are especially sensitive to people, dogs, and predators during this time. Calving areas usually have the following attributes: slopes of less than 15%; adequate hiding cover; nearby food and water; dense aspen stands with deadfall; and bench habitat in areas of steep topography.

Elk diets consist mostly of grasses and forbs, with grasses being the primary forage in the spring and forbs being the primary forage in the fall. During the winter, elk are distributed in native elk winter range on lower elevation lands and in areas of windswept ridges.

The RBPA is located within Big Piney Elk Herd Unit (106), elk Hunt Area 94, and elk occur throughout the proposed RBPA over various times of the year. The western portion of the RBPA, including the M&HRF, is within elk crucial winter range, known as the Riley Ridge Winter Range Complex, parturition areas, and an elk migration corridor (Smith 2008) (Map 3-11; Table 3-19). The Riley Ridge Winter Range Complex and is one of two remaining native elk winter ranges in the Big Piney Elk Herd Unit (106) (WGFD 2009d). There are 13,631 acres of elk crucial winter within the Riley Ridge Winter Range Complex within the western portion of the Rands Butte portion of the RBPA. From 1995 to 2008, this area supported between 15% and 51% of the elk observed on native winter range in Hunt Area 94 (Table 3-20) (Smith 2008). There are currently 872.4 acres of disturbance from oil and gas, roads, and/or urban industrial development within the Riley Ridge Winter Range Complex in the RBPA (Rodemaker and Driese 2007) (Table 3-19).

Due to the juxtaposition of winter and summer range relative to the RBPA, this area experiences migratory movements as elk move along elevational gradients between their seasonal ranges (Map 3-10; Table 3-19). An identified elk migration corridor travels in a northwest-southeast direction across the Rands Butte portion of the RBPA and connects the northern slopes and ridges of the South Piney Creek drainage to the lower elevation foothills south of Rands Butte, passing along Riley Ridge and across the Beaver Creek drainage.

Table 3-20. Elk Observations in Winter Ranges, 1995–2008.

Winter of	No. of Elk Observed on Native Winter Range (All Hunt Area 94)	No. of Elk Observed on Riley Ridge	% of Observations on Riley Ridge
1995–1996	692	107	15
1996–1997	650	165	25
1997–1998	660	96	15
1998–1999	592	140	24
1999–2000	729	200	27
2000–2001	251	125	50
2001–2002	354	80 to 120	22 to 34
2002–2003	276	113	41
2003–2004	331	92	28
2004–2005	354	100+	28
2005–2006	449	224	50
2006–2007	150	N/D	N/D
2007–2008	332	150 to 171	45 to 51
2008–2009	401	163	41

The population objective for the Big Piney elk herd, which includes elk in Hunt Areas 92 and 94, is 2,400. This population has been above population level objectives for 11 years; in 2007, the herd was estimated at 3,783 elk, 57% over the population objective (Fralick 2008). Average population size between 1994 and 2007 was 2,753 elk (Fralick 2008). In 2006 and 2007, 94% and 85% of the elk counted in the Big Piney herd, respectively, were located on feedgrounds (Fralick 2008). Based on ear tag return data since the 1990s, the WGFD estimates that there is a 15% exchange rate between Elk Herd Units which may affect the population composition and herd size estimates between individual years (Barbknecht et al. 2007).

An abortion and parturition study from 2005 through 2007 (Barbknecht et al. 2007) determined that elk tagged in the Bench Corral feedground gave birth throughout the central Wyoming Range area within the Big Piney Elk Hunt Unit 106, Hunt Areas 92 and 94, and the Afton Elk Herd Unit (Hunt Area 90), which is located immediately west of the Big Piney Elk Herd Unit. Based on the postseason classification summary for the Big Piney Elk Herd Unit 106 from 2003 to 2007, an average of 41% of the elk in the herd unit were within Hunt Area 94 (Fralick 2008). Trend data from 2003 through 2009 indicate that on average 373 elk are found on native winter ranges in Hunt Area 94. An average of 150 elk are found on the Riley Ridge Winter Range Complex (Emmerich 2009a). In the winter of 2005–2006, 29 elk from the Bench Corral feedground were implanted with vaginal radio transmitters (VITs) in order to document abortion/parturition locations (WGFD 2007a). One abortion from a seronegative female was documented on the feedground in 2006; only 4 of the remaining 25 relocated VITs were located on areas delineated by WGFD personnel as parturition habitat, indicating parturition habitat needs to be remapped (Barbknecht et al. 2007). No VITs were located on areas currently inhabited by cattle.

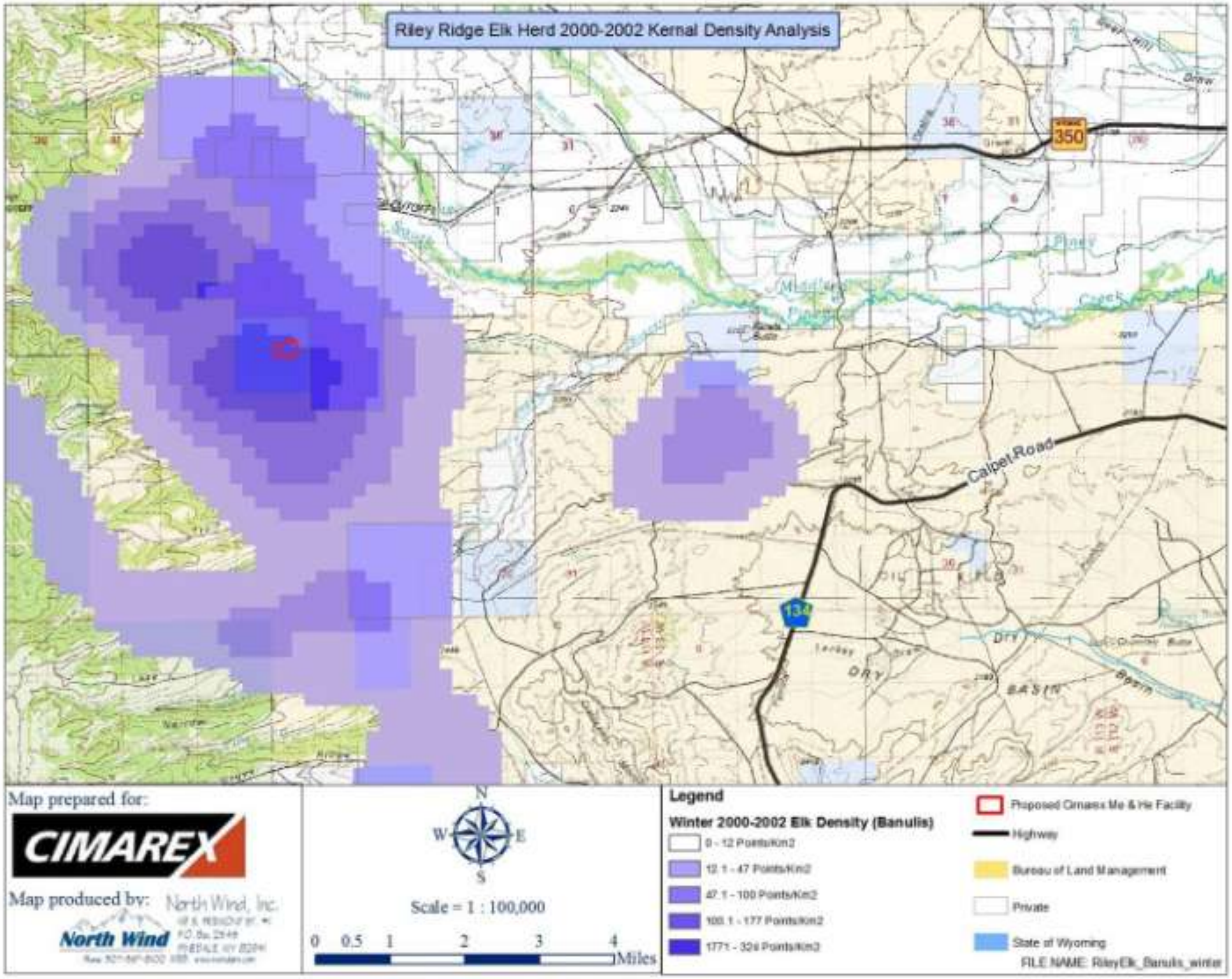
Brucellosis, caused by infection with the bacterium *Brucella abortus*, has sparked controversy because of its persistence in elk and bison (*Bos bison*) within the Greater Yellowstone Ecosystem (GYE) of Wyoming, Montana, and Idaho (Thorne et al. 1978) and its potential threat to domestic livestock (Kistner et al. 1982). Within ungulate species, *Brucella abortus* infection usually occurs orally and results in reproductive failure (usually abortion which occurs most often the first year after infection) and other clinical syndromes (Siello and Mays 1998).

Elk within Hunt Area 94 have been tested for the presence of brucellosis both at feedgrounds and by hunters (Barbknecht et al. 2007). Brucellosis surveillance activities indicate that infection occurs among animals attending feedgrounds depending on the amount of time an elk spends at a feedground; an average of approximately 25% of elk attending feedgrounds are seropositive, that is, show immune response for the disease in their blood (WGFD 2007a). At the Bench Corral feedground, seroprevalence ranged from 12.5% to 21.4% between 2006 and 2007 (WGFD 2007a). At the North Piney feedground, seroprevalence ranged from 10% to 29% between 1990 and 1991 (WGFD 2007a). At the Finnegan feedground, seroprevalence ranged from 0% to 33% between 1982 and 2001 (WGFD 2007a). Hunter surveillance efforts between 1992 and 1994 determined that the proportion of seropositive adult females in the Big Piney Elk Herd Unit 106 was 10% (WGFD 2007a). In 1997, the strain 19 vaccination program was implemented at feedgrounds and resulted in the vaccination of 2,090 elk calves over a 10-year period (WGFD 2007a). Recent testings in winter 2008/2009 resulted in 1 of 42 elk testing positive (2%) for brucella antibodies (Smith 2009).

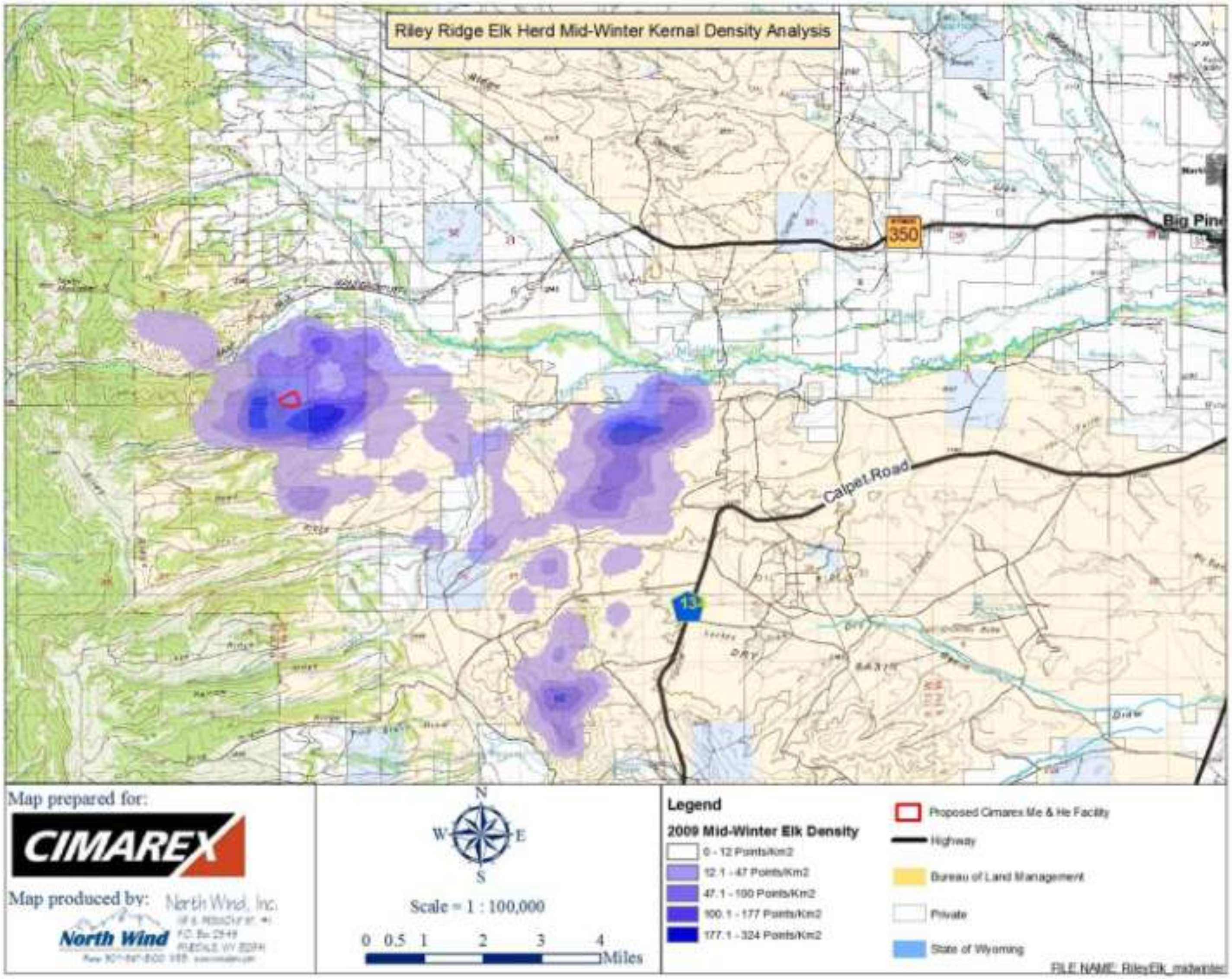
Several additional elk studies have been conducted within the Riley Ridge Area over the past several decades. Hayden-Wing Associates (1990) conducted a study evaluating changes in elk distribution patterns and number of elk sighted between pre-construction, construction, post-construction, and production periods in relation to the development of Exxon's natural gas well field near La Barge. Elk showed varying responses to drilling, post-construction, and production activities with respect to the distance at which they avoided such activities and the distribution of individuals in relation to infrastructure. The well field activities did not have a significant effect on the total numbers of elk using winter range; however, elk distribution changed significantly from pre-construction patterns. Elk distribution was shifted during intensive construction (i.e., drilling) activities. Animals typically occurred beyond 0.5 mile from a well; however, animals stayed within a 1.75- to 2.40-mile area both during construction and production activities, sometimes in areas not previously used during the pre-construction period. It was determined that the presence of visual and auditory barriers around wells and areas of human activity appeared to influence elk distribution, and elk remained relatively closer to human activities when barriers or security cover were available.

Another study was conducted as part of a University of Wyoming Cooperative Wildlife Unit master's project that monitored elk distribution in the Riley Ridge area for three consecutive winters (2000–2002). Although the data have not been analyzed to date, locations were made available (Smith 2008) and show distribution of elk across the entire northern portion of the RBPA (Map 3-12). Winter distribution (November 1–April 30) shows a high density of locations along the northern slopes and ridges of the South Piney Creek drainage, Riley Ridge, Reed Ridge, the upper headwaters of the Beaver Creek drainage, and the foothill areas south of Rands Butte. Locations during parturition (May 1–June 30) shift west toward Piney Ridge, with the densest locations occurring in the upper headwaters of Spring Creek and Beaver Creek and along Riley Ridge, Reed Ridge, and Trail Ridge. During summer, locations occur primarily on the Bridger-Teton National Forest; however, concentrations exist in the upper headwaters of Spring Creek and Beaver Creek. Fall locations depict movement east down the South Piney and Beaver Creek drainages, with concentrations occurring along the north slopes of Riley Ridge and Beaver Creek drainage.

A Kernal Density Analysis of this same data (North Wind, Inc. 2009a) (Map 3-13) indicates that winter densities of 20 elk individuals were highest (177.1 to 324.0 locations/square kilometer) along the western portions of Riley Ridge and Reed Ridge (the proposed M&HRF lies within the northern limits of this concentration area), the ridgeline and south-facing slopes of the South Piney Creek drainage, and the foothill areas south of Rands Butte. Lower densities emanate outward from these areas of high winter elk concentration, and distribution is concentrated in a general northwest to southeast direction between Fish Creek and Lake Ridge (North Wind, Inc. 2009a).



Map 3-12. Riley Ridge Elk Herd 2000-2002 kernal density analysis.



Map 3-13. Riley Ridge Elk Herd 2009 mid-winter kernal density analysis.

In January 2009, 40 elk from the Riley Ridge Winter Range Complex were collared to track movements in relation to the construction of the M&HRF as part of the 2008 MOA with the WGFD (Smith 2008). Early elk location data retrievals from 20 of these individuals indicate that between January 5 and March 17 the highest density of elk locations in the Riley Ridge Area occur immediately to the west and south of the proposed M&HRF (North Wind, Inc. 2009b). These concentrations coincide with the south-facing slopes of the Spring Creek drainage and the western ridgeline of Riley Ridge. Lower densities of elk locations occur in the Spring Creek drainage and along Reed Ridge to the south of the M&HRF, and the eastern portion of Riley Ridge and the southern slopes of the South Piney Creek drainage to the northeast of the M&HRF location (North Wind, Inc. 2009b). The radio-collared elk from the Riley Ridge Winter Range Complex were tested for signs of Brucellosis in the winter of 2009; however, the results of these tests had not been released at the time of this analysis.

Human expansion activities, including urbanization, construction, and/or improvement of roadways, increased use of OHVs, and energy exploration and development, have impacted elk habitat. The disruption of movement corridors has also subjected elk to various pressures. The proliferation of development throughout these movement zones, particularly roadways and areas of increased human activity (i.e., OHV use, energy exploration and development), represents major barriers to elk movement and has been documented as having detrimental effects on ungulate populations (Rowland et al. 2000; Wisdom et al. 2002; Sawyer et al. 2006). Where these movement routes bisect roadways, collisions with motor vehicles become a major factor contributing to elk mortality and in some instances the roads may be barriers to movement across the roadway.

3.9.1.2 Mule Deer

Mule deer are primarily browsers, and big sagebrush is a critical browse species year-round. The mule deer winter diet may be supplemented by mountain mahogany (*Cercocarpus* spp.), rabbitbrush, antelope bitterbrush (*Purshia tridentata*), and serviceberry (*Amelanchier* spp.). The RBPA is within Wyoming Range Herd Unit 131 and Hunt Area 143. The population object for this herd unit is 50,000 and the population was considered stable in 2005 with a population estimate of 27,169 (BLM 2008b). The majority of the RBPA is within mule deer winter range, and the central portion of the RBPA, including the Hare's Ear Compressor Station, is within mule deer crucial winter range (see Map 3-9 and Table 3-19). Mule deer are expected to occur seasonally throughout the majority of the RBPA.

Several seasonal migration routes, as mapped by the WGFD, are located in and near the RBPA. Spring migrations begin in early April and end in June, while autumn migrations begin in late October and end in December. Movement patterns and timing vary, although deer use common migration routes, transition ranges, and parturition ranges (Sawyer et al. 2006). Sawyer et al. (2005) note the importance in protecting migration routes and conserving seasonal ranges in maintaining the mule deer population.

3.9.1.3 Pronghorn

Pronghorn are mainly associated with low, rolling terrain characterized by open grassland and sagebrush communities. Pronghorn preferred habitat generally consists of sagebrush in combination with rabbitbrush and antelope bitterbrush associated with a consistent water source. The RBPA is within the Sublette Herd Unit 401 and Hunt Area 89. In 2005, this population was considered stable with a population objective of 48,000 and an estimate population of 47,900 (BLM 2008b). The eastern portion of the RBPA, including the Chimney Butte Substation and Helium Plant, is within pronghorn crucial winter range (see Map 3-8 and Table 3-19). Both summer and winter habitat is present within the RBPA, and pronghorn are expected to inhabit the area year-round.

The Sublette Herd covers 10,700 square miles. Hunting seasons generally run from mid-September to late October. A survival study of the herd estimated an annual survival rate for the hunted Sublette Herd of 79%, 76%, and 70% for 2003/2004, 2004/2005, and 2005/2006, respectively (Grogan and Lindzey 2007). The survival estimates without harvest were 82%, 83%, and 85% for those years. In addition to hunter harvest, mortalities were caused by vehicle collisions and fence entanglement.

The WGFD has documented migration corridor occurrence for the Sublette Herd in and around the RBPA (see Map 3-8 and Table 3-19). Sawyer et al. (2005) document seasonal migration of radio-collared pronghorn from their winter range in the Green River Basin to summer ranges in Grand Teton National Park and the Gros Ventre River drainage. Pronghorn leave winter ranges in late March or early April and arrive at summer ranges by late May or early June. Autumn migrations occur between October and December. Sawyer et al. (2005) note the equal importance of summer, transition, and winter ranges in maintaining healthy populations of pronghorn.

3.9.1.4 Moose

Moose are generalist browsers and eat willow, antelope bitterbrush, Douglas-fir, serviceberry, subalpine fir (*Abies lasiocarpa*), mountain ash (*Sorbus* spp.), whitebark pine, cottonwoods, sedges, rushes, and blue spruce (*Picea pungens*). In Wyoming, moose generally use forested areas and associated habitats including lacustrine and palustrine riparian areas dominated by willow, mixed mountain shrub communities, and aspen. The RBPA is in Sublette Herd Unit 105 and Hunt Area 25. In 2005, the population trend was up with a population objective of 5,500 and an estimate population of 3,926 (BLM 2008b). The majority of the RBPA is not suitable moose habitat; however, the riparian corridor along South Piney Creek and Beaver Creek, as well as the aspen groves along the foothills of the Wyoming Range, are considered crucial winter range (see Map 3-11 and Table 3-19). The western portion of the RBPA falls within the crucial habitat area, including the M&HRF. Moose are expected to occur seasonally within the western portion of the RBPA.

3.9.2 Small Mammals

Within the sagebrush community, common small mammals expected include desert cottontail (*Sylvilagus audubonii*), white-tailed jackrabbit (*Lepus townsendii*), Wyoming ground squirrel (*Spermophilus elegans*), white-tailed prairie dog, and badger (*Taxidea taxus*). Perennial riparian corridors may provide habitat for additional water-loving species, such as meadow vole (*Microtus pennsylvanicus*), beaver (*Castor canadensis*), and muskrat (*Ondatra zebethicus*).

3.9.3 Reptiles and Amphibians

Twelve species of reptiles and amphibians inhabit the PFO (BLM 2008b; Emmerich 2009b). Those associated with dry shrublands in the RBPA include northern sagebrush lizard (*Sceloporus graciosus graciosus*), eastern short-horned lizard (*Phrynosoma douglasii brevirostre*), and greater short-horned lizards (*P. hernandesi hernandesi*). Amphibians and reptiles likely to occur within riparian corridors and within or near permanent and ephemeral wetlands of the RBPA not previously discussed include tiger salamander (*Ambystoma tigrinum*), boreal chorus frog *(Pseudacris maculata)*, and intermountain wandering gartersnake (*Thamnophis elegans vagrans*).

3.9.4 Birds – Non-special Status Species

Migratory bird species are protected under the Migratory Bird Treaty Act (16 USC 703–712), which prohibits taking, killing, or possessing migratory birds. The RBPA contains nesting and foraging habitat for several migratory bird species not of special status designation (i.e., federally listed or BLM sensitive species). These likely include upland species common to shrub-steppe of central Wyoming, such as horned lark (*Eremophila alpestris*), vesper sparrow (*Pooecetes gramineus*), and Brewer's blackbird (*Euphagus cyanocephalus*). Breeding raptor species may include golden eagle (*Aquila chrysaetos*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and prairie falcon (*F. mexicanus*), while rough-legged hawk (*B. lagopus*) and merlin (*F. columbarius*) may be present in winter and during migration.

Common bird species within riparian zones may include several breeding and migrant waterfowl, greater sandhill crane (*Grus canadensis tabida*), great blue heron (*Ardea herodius*), song sparrow (*Melospiza melodia*), and Bullock's oriole (*Icterus bullockii*).

3.9.5 Fishes

Thirteen perennial streams within the RBPA support fish: Beaver Creek, North Fork Beaver Creek, South Fork Beaver Creek, Middle Fork Beaver Creek, Trail Ridge Creek, Fish Creek, Middle Piney Creek, North Piney Creek, South Piney Creek, Spring Creek, Black Canyon Creek, Dry Piney Creek, and Pinegrove Creek. All 13 streams are tributaries of the Green River. These waters are moderately productive coldwater fisheries and are primarily managed as trout fisheries. Beaver, North Fork Beaver, South Fork Beaver, Middle Fork Beaver, Trail Ridge, Fish Creek, North Piney, Spring, Black Canyon, Dry Piney, and Pinegrove creeks all support and are managed for native Colorado River cutthroat trout (Emmerich 2009b). Middle Piney and South Piney are popular rainbow and brook trout fisheries but do not directly support nor are managed for native cutthroat trout populations (Emmerich 2009b).

Beaver Creek, which is a tributary to South Piney Creek, is managed for Colorado River cutthroat trout and native non-game fishes. A portion of Beaver Creek is classified by the BLM as an ACEC and is managed to ensure quality aquatic habitat for Colorado River cutthroat trout and to protect elk calving habitat (BLM 2008b). Beaver Creek is estimated by the WGFD to have 0 to 50 pounds of trout per mile (stream class "green") (Annear et al. 2006; WGFD 2009b). Fish species found in Beaver Creek include Colorado River cutthroat trout, brown trout (*Salmo trutta*), mottled sculpin (*Cottus bairdii*), mountain sucker

(*Catostomus platyrhynchus*), speckled dace (*Rhinichthys osculus*), and white sucker (*Catostomus commersonii*).

North Fork, South Fork, and Middle Fork Beaver Creek, and Trail Ridge Creek are all tributaries to Beaver Creek. These tributary streams are all managed for Colorado River cutthroat trout and native non-game fishes. These creeks all contain Colorado River Cutthroat trout, mottled sculpin, and mountain sucker. Trail Ridge Creek also contains populations of rainbow trout (*Oncorhynchus mykiss*). These creeks are estimated by the WGFD to have 0 to 50 pounds of trout per mile (stream class "green") (WGFD 2009b).

Fish Creek, which is a tributary to South Piney Creek, is managed for Colorado River cutthroat trout and native non-game fishes. Fish Creek is estimated to have 41 to 187 pounds of trout per mile (stream class "yellow") (WGFD 2009b). Fish species present in Fish Creek include brook trout (*Salvelinus fontinalis*), Colorado River cutthroat trout, mottled sculpin, mountain sucker, and fine-spotted Snake River cutthroat trout. In 2003, state water rights were granted in Fish Creek in a 4.2-mile reach upstream of the USFS boundary in Section 36. Instream flow water rights are 6 cubic feet per second (cfs) from October 1 to May 14, 10 cfs from May 15 to June 30, and 10 cfs from July 30 to September 30.

Middle Piney Creek, which is a tributary to the Green River, is managed for rainbow trout, brook trout, and native non-game fishes. Middle Piney is estimated by the WGFD to have 0 to 50 pounds of trout per mile (stream class "green") (WGFD 2009b). Fish species present in Middle Piney Creek include brook trout, brown trout, fathead minnow (*Pimephales promhales*), mottled sculpin, mountain sucker, rainbow trout, and speckled dace.

North Piney Creek, which is a tributary to the Green River, is managed for Colorado River cutthroat trout and native non-game fishes. North Piney Creek is estimated by the WGFD to have 12 to 121 pounds of trout per mile (stream class "yellow") (WGFD 2009b). Fish species present in North Piney Creek include brook trout, Colorado River cutthroat trout, mottled sculpin, mountain sucker, and Snake River cutthroat trout. In 2004, state water rights were granted in North Piney Creek in a 7.6-mile reach downstream of the west boundary of Section 16. Instream flow water rights are 25 cfs from October 1 to May 14, 35 cfs from May 15 to June 30, and 40 cfs from July 30 to September 30.

South Piney Creek, which is a tributary to the Green River, is managed for rainbow trout, brook trout, and native non-game fishes. South Piney Creek is estimated by the WGFD to have 19 to 169 pounds of trout per mile (stream class "yellow") (WGFD 2009b). Fish species found in South Piney Creek include brook trout, rainbow trout, rainbow trout/cutthroat trout hybrids, mottled sculpin, mountain whitefish (*Prosopium williamsoni*), mountain sucker, and Snake River cutthroat trout. In 2003, instream flow water rights were granted in South Piney Creek from the west side of the state section downstream to the USFS boundary. Instream flow water rights are 9 cfs from October 1 to March 31 and 15 cfs from April 1 to September 30.

Spring Creek, which is a tributary to Beaver Creek, is managed for Colorado River cutthroat trout and native non-game fishes. Spring Creek is estimated by the WGFD to have 0 to 50 pounds of trout per mile (stream class "green") (WGFD 2009b). Fish species found in Spring Creek include Colorado River cutthroat, rainbow trout, mottled sculpin, and mountain sucker.

Black Canyon Creek, which is a tributary to Dry Piney Creek, is managed for Colorado River cutthroat trout and native non-game fishes. Fish species found in Black Canyon Creek include brook trout, Colorado River cutthroat trout, mottled sculpin, and mountain sucker (WGFD 2009b).

Dry Piney Creek, which is a tributary to the Green River, is managed for Colorado River cutthroat trout. Fish species found in Dry Piney Creek include brook trout, Colorado River cutthroat trout, mottled sculpin, and mountain sucker. Dry Piney Creek has been intermittent in recent years due to drought (WGFD 2009b).

Pinegrove Creek, which is a tributary to Hogarty Creek, is managed for Colorado River Cutthroat trout and native non-game fishes. Fish species found in Pinegrove Creek include Colorado River cutthroat trout, mottled sculpin, and mountain sucker (WGFD 2009b).

The creeks within the RBPA drain into the Green River downstream of the confluence with the New Fork River. The Green River is classified as a Class 2 trout fishery, which is a fishery of statewide importance, and is managed for brown trout, Snake River cutthroat trout, and native non-game fishes. This section of the Green River is estimated by the WGFD to have 37 to 514 pounds of trout per mile (stream class "red") (WGFD 2009b). Fish found in the Green River, between its confluence with the New Fork River and Fontenelle Reservoir, include Snake River cutthroat trout, brown trout, rainbow trout, burbot (*Lota lota*), bluehead sucker, carp (*Cyprinus carpio*), fathead minnow, flannelmouth sucker, mottled sculpin, mountain sucker, mountain whitefish, roundtail chub, speckled dace, and Utah chub (*Gila atraria*).

3.10 LAND USE

This section describes the existing land uses in the RBPA and briefly explains other, lesser uses. Table 3-21 presents the combined federal, state, and private land uses.

Table 3-21. Comparison of Land Use in the RBPA.

Land Use	Acres	% of RBPA
Agriculture – dominant	35,119	47.6
Agriculture/Oil and gas	38,576	52.3
Other	18	0.1
Total	**73,713**	**100**

There are no Prime and Unique Farmlands identified in the RBPA (NRCS 2009). Although the RBPA was historically part of an extensive ranching and agriculture industry, lands have now been developed for oil and gas extraction, making it the dominant use for land within the RBPA. It is difficult, however, to separate agricultural uses from oil and gas development since both industries coexist on 52.3% of the private, state, and federal lands in the RBPA, through the respective provisions of well leases, grazing leases, and grazing allotments.

3.10.1 Relationship to Plans, Policies, and Programs

BLM land use decisions for the 36,045 acres (48.9%) of public land in the RBPA are made in conformance with the management goal and objectives outlined in the Pinedale RMP and ROD (BLM 2008b). The BLM management goal for the RBPA is "to provide opportunities for mineral extraction and energy exploration and development to provide resources to meet national and local needs while avoiding or otherwise mitigating significant impacts on other resource objectives" (BLM 2008b).

The Office of State Lands and Investments manages land use within 3,676 acres (5%) of the RBPA. The Bridger-Teton National Forest Land and RMP and ROD (USFS 1990) directs the management of the remaining 1,909 acres (2.6%) of the RBPA lands that occur within the Bridger-Teton National Forest boundary.

The Sublette County Federal and State Land Use Policy (LUP) contains recommendations and policies for land management and use on federal and state lands within the county. The LUP principles state that "federal and state lands are to be managed in a way that protects and improves the health, safety, environment, and well being of our citizens, and improve the performance of the economy without imposing unacceptable or unreasonable costs or impacts to local social structure. Sublette County recognizes that the private sector and private markets are the best engine for economic growth; that regulatory policies should respect the role of state and local governments; and federal and state lands policies and regulations should be effective, consistent, sensible, and understandable (Board of Commissioners, Sublette County, Wyoming 2008)."

The RBPA would comply with all other relevant federal, state, and local laws and with the Sublette and Lincoln county land use plans.

3.10.2 Oil and Gas Development

All of the oil and gas development in the RBPA is part of the Greater Big Piney-La Barge (GBPLB) area, which includes the Big Piney-LaBarge Gas Field and the Riley Ridge Unit within the RBPA and others that are outside the RBPA, including the Lake Ridge, Fogarty, Big Piney, LaBarge, North LaBarge Deep, and Tip Top Units. The GBPLB started as a number of smaller fields that have grown together to form one large field. As of April 2006, 1,500 wells had been completed in the GBPLB, making this area the largest producer in the Pinedale RMP and ROD planning area (BLM 2008b).

The RBPA currently contains 560 oil and gas wells that have been drilled. These are largely oil and conventional gas, except for the Madison sour gas wells of the Riley Ridge Unit. Part of the RBPA was previously analyzed for oil and gas development as proposed in the Riley Ridge Natural Gas Project Final EIS (BLM 1984). The ROD (BLM 1984) approved drilling of up to 238 wells and construction of associated infrastructure. The RMP and ROD state that public lands within the RBPA are open to mineral leasing and development, with appropriate mitigation of disturbance, to promote mineral recovery on behalf of the United States.

Facilities associated with oil and gas production, including pipelines, compressor stations, and the high-voltage Chimney Butte substation on Calpet Road, are also part of the existing development and land use.

3.10.3 Other Industry

CO_2 production for secondary oil recovery occurs in the GBPLB, and the only salable mineral in the GBPLB is gravel. There are no known locatable mineral deposits, coal, sodium (trona), phosphate, or potassium (aside from thin deposits of oil shale) in the RBPA.

3.10.4 Ranching/Agriculture

Ranching is the other key industry in the RBPA although increased oil and gas activity has transformed the nearby town of Big Piney into a town less tied to ranching and more concerned with supporting the nearby gas fields. There are 16 BLM grazing allotments either partially or totally within the RBPA.

3.10.5 Residences

Although residences are widely scattered throughout the RBPA, they are primarily located within, or adjacent to, the towns of Big Piney and Marbleton. Big Piney is in the extreme northeast corner of the RBPA and Marbleton is just outside the designated RBPA.

There are several homes, both permanent and part-time, within the RBPA; the largest concentration of homes is in the northeast corner of the RBPA, near Big Piney. The residence closest to the proposed M&HRF site is 2.5 miles northeast in Section 2, T29N, R114W.

Since the proposed Project would not alter the pattern of existing land uses in the RBPA, the topic will not be included in detailed impact analysis in Chapter 4.

3.11 LIVESTOCK AND RANGE RESOURCES

BLM-administered rangelands are managed following the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management that specify minimum acceptable health, productivity, and sustainability conditions. The development and application of these standards and guidelines are outlined in the grazing regulations (43 CFR 4180.1). The regulations were designed to achieve the four fundamentals of rangeland health: 1) properly functioning watersheds; 2) proper cycling of water, nutrients, and energy; 3) water quality meeting state standards; and 4) the protection of habitat for special status species. USFS rangelands in the RBPA are managed according to the Final Environmental Impact Statement Bridger-Teton National Forest Land and Resource Management Plan (USFS 1990) direction, unless an individual Allotment Management Plan is available (Beard 2009).

Based on the level of improvement effort, from low to high, grazing allotments are placed in three management categories: Custodial, Maintain, or Improve. Domestic livestock grazing administered by the BLM and the USFS in the RBPA is dominated by cattle, but there are a few sheep and horse permits.

Sixteen allotments overlap 43,951 acres (59%) of the RBPA (Map 3-14 and Map 3-15). An AUM is defined as the amount of forage necessary to sustain one cow or its equivalent for a period of 1 month (BLM 2008b). Currently data are limited for the private and state AUMs (Farr 2009). Data that are available are listed in Table 3-22.The stocking rate of the allotments ranges from <1 acre per AUM on the Beaver Tract Individual allotment to 98 acres per AUM on the Beaver Creek Meadow Individual allotment. Grazing allotments within the RBPA would maintain the current levels of AUM unless monitoring indicates a need for adjustment (BLM 2008b).

The BLM PFO assesses riparian areas for PFC and has assessed all known stream reaches with riparian habitat on BLM-administered lands between 1994 and 1999 (BLM 2008a). Table 3-23 outlines allotments within the RBPA that have riparian habitats and their PFC as determined by the BLM PFO. See Wetlands (Section 3.7) for a more detailed description of riparian and wetland areas, and PFC in the RBPA.

An MOA for Wildlife Mitigation between WGFD and Cimarex is in existence that provides financial resources to address elk damage prevention, elk monitoring/research, and elk habitat enhancement (Appendix C). This agreement only applies to the construction, operation, and maintenance of the proposed M&HRF, and does not include any other project components. Under the MOA, livestock ranchers are able to submit claims for compensatory damages to crops from displaced elk resulting from the construction, operation, and maintenance of the M&HRF.

Table 3-22. Permitted Use for Grazing Allotments in the RBPA.

Allotment Name	Private	State	BLM/USFS	Total Acres	Grazing Dates	Management Strategy
	Permitted AUMs	Permitted AUMs	Permitted AUMs			
Adjacent to Ranch Individual	118	0	26	447	5/16–6/30	Maintain
Beaver Creek Individual	0	0	129	934	7/1–7/14	Maintain
Beaver Creek Meadow Individual	0	0	20	1,974	6/15–6/28	Maintain
Beaver Tract Individual	0	0	48	27	5/16–9/15	Custodial
Deer Hills Common	15	68	731	7,670	5/20–7/1	Maintain
Fish Creek Individual (FW)	90	0	1597	1,862	6/20–7/7	Improve
Jory Individual	11	0	50	929	7/1–7/6	Maintain
LaBarge Unit Individual	10	124	140	2,102	5/16–9/15	Improve
North LaBarge Common	3,276	1621	14,501	134,576	5/16–10/15	Improve
O'Neil Individual	10	0	80	776	5/16–6/15	Maintain
South Piney Place Meadows	0	0	39	641	9/16–10/15	Custodial

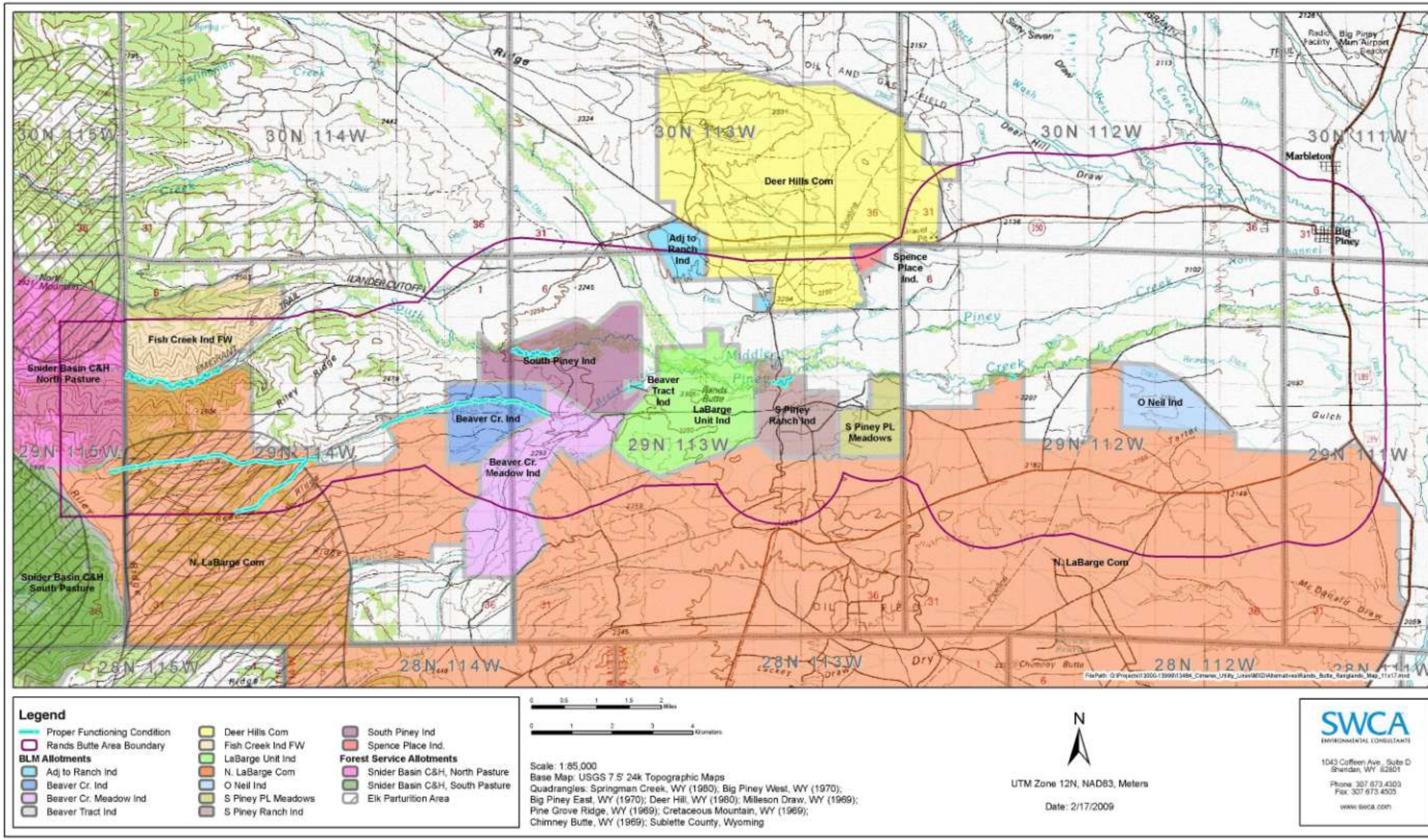
Allotment Name	Private Permitted AUMs	State Permitted AUMs	BLM/USFS Permitted AUMs	Total Acres	Grazing Dates	Management Strategy
South Piney Ranch Individual	0	0	92	977	9/1–10/15	Maintain
South Piney Individual	0	0	82	1,697	6/1–7/15	Maintain
Spence Place Individual	0	0	8	120	5/1–5/31	Custodial
Snider Basin North Pasture	0	0	1,838	7,629	7/1–10/5	N/A
Snider Basin South Pasture	0	0	1,838	9,105	7/1–10/5	N/A

Source: BLM 2008b (Pinedale FEIS RMP and ROD); BLM 2009e; USFS 1990 (Bridger-Teton FEIS RMP).
AUM = animal unit month
BLM = Bureau of Land Management
N/A = not applicable
USFS = U.S. Forest Service

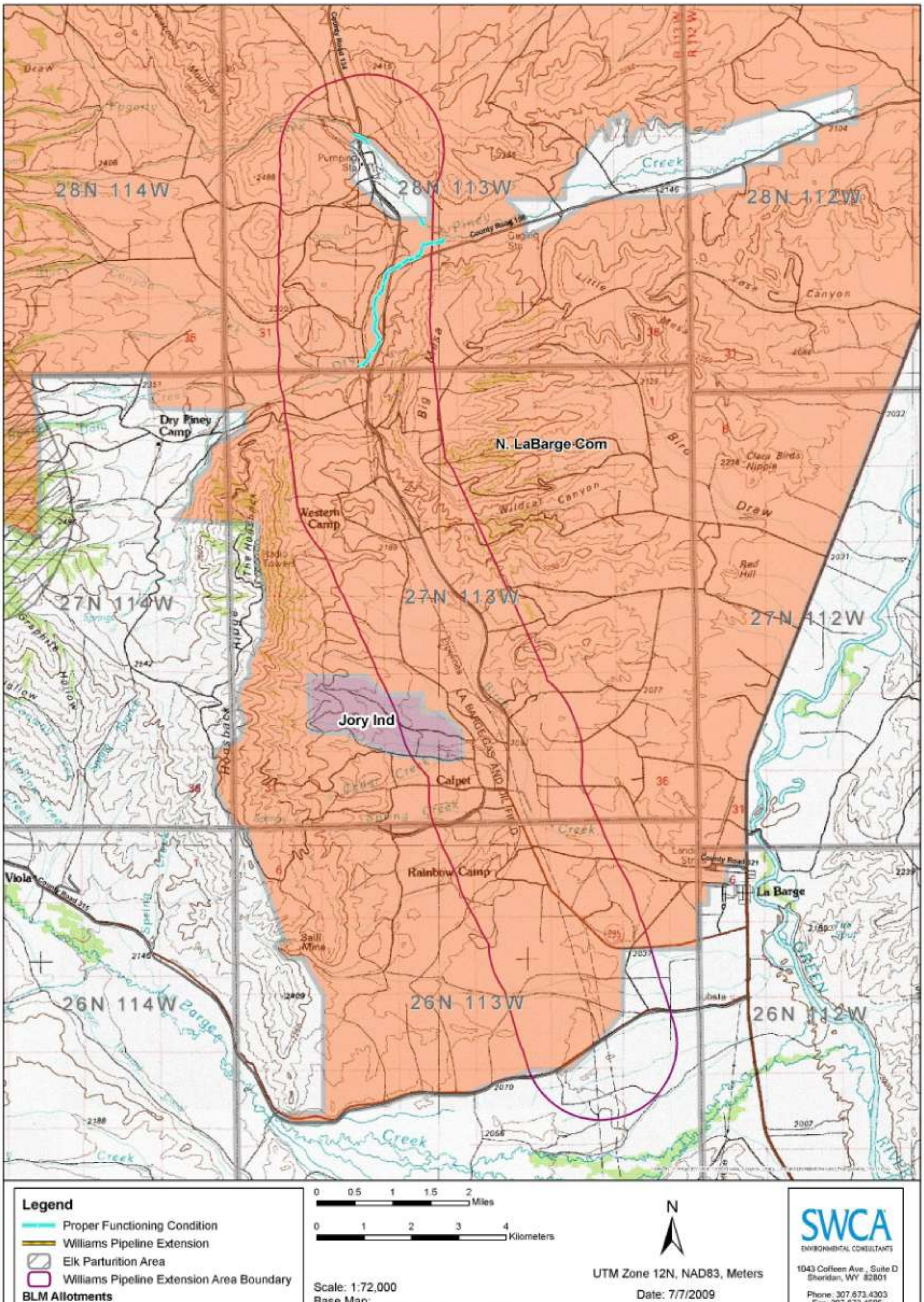
Table 3-23. PFC for Grazing Allotments in the RBPA.

Allotment Name	PFC (miles)	Rating Miles FAR Up[1]	N/A[1]	Down[1]	NF (miles)
Adjacent to Ranch Individual	–	–	–	–	–
Beaver Creek Individual	–	–	–	–	–
Beaver Creek Meadow Individual	–	–	–	–	–
Beaver Tract Individual	–	–	–	–	–
Deer Hills Common	–	–	–	–	–
Fish Creek Individual (FW)	2.9	–	–	–	–
Jory Individual	0.7	–	–	–	–
LaBarge Unit Individual	–	–	–	–	–
North LaBarge Common	20.4	4.1	11.9	1.6	–
O'Neil Individual	–	–	–	–	–
South Piney Place Meadows	–	–	–	–	–
South Piney Ranch Individual	0.7	–	–	–	–
South Piney Individual	0.3	–	1.5	–	–
Spence Place Individual	–	–	–	–	–
Snider Basin North Pasture	–	–	–	–	–
Snider Basin South Pasture	–	–	–	–	–

Source: BLM 2009b (PFO PFC Survey Data).
[1] Up, N/A, and Down refer to apparent trend
FAR = Functioning at Risk
NF = Nonfunctioning
PFC = Proper Functioning Condition



Map 3-14. Rands Butte Area allotments and parturition areas.



Map 3-15. Williams Pipeline Area allotments and parturition areas.

3.11.1 Brucellosis

Brucellosis is a highly infectious wildlife disease of great concern in the cattle industry in the state of Wyoming. Since September 15, 2006, Wyoming has held a brucellosis class-free status, which confers significant economic advantages to cattle ranchers in the state. As of 1957, 124,000 infected herds have existed in the United States (Wyoming Brucellosis Coordination Team 2005). In 2008, there were three infected herds in three states: Louisiana, Montana, and Wyoming. The Wyoming case of brucellosis was discovered on June 30, 2008, in a cattle herd near Daniel, Wyoming, approximately 25 miles north of the RBPA (Donch and Gertonson 2008). This has heightened concerns among citizens in the area because of the proximity of the area to known infected wildlife populations. According to the Animal and Plant Health Inspection Service (APHIS), all herds within Wyoming must not present a single additional case of brucellosis for 24 consecutive months, that is, until June 30, 2010, in order to maintain its brucellosis class-free classification. If another affected herd is found in Wyoming within 24 months, Wyoming would be subject to reclassification to class-A status. This downgrade in status would have a dramatic effect on local ranchers and their herds.

Brucellosis in cattle is caused by an infection with various *Brucella* bacteria, but is almost exclusively caused by *Brucella abortus*, found in elk and bison. Brucellosis in cattle can also result in an infection caused by *Brucella suis* found in swine, and *Brucella melitensis*, found in sheep and goats (Cutler et al. 2005). Transmittal of the disease occurs when bacteria are ingested from aborted fetuses, fetal membranes and fluid, or uterine discharges. Following infection with brucellosis, the first pregnancy often fails (aborted) or results in stillborn or weak calves (Siello and Mays 1998).

Livestock can contract the disease by using the parturition areas used by infected animals. Elk parturition areas overlap three of the RBPA allotments: North LaBarge Common, Snider Basin North Pasture, and Snider Basin South Pasture (see Map 3-14 and Map 3-15). Unpublished data from the WGFD has shown that documented commingling of elk and cattle has occurred on 1 of 12 public grazing allotments that have turn-on dates before June 15 and overlap WGFD-delineated elk parturition areas within the brucellosis endemic area of western Wyoming (WGFD 2007a).

Brucellosis is present in free-ranging bison and elk in the Greater Yellowstone Area. Infected elk and bison in this area present a potential threat to domestic livestock herds in or near the RBPA. The Big Piney Elk Herd Unit 106 range consists of Hunt Areas 92 and 94 that encompass the RBPA. Three feedgrounds occur in Hunt Area 94 which overlaps the RBPA. Feedgrounds provide the greatest risk for direct and indirect transmission of the disease between elk due to the higher than average concentrations in the feedgrounds (WGFD 2007a). There are no elk feedgrounds on any affected grazing allotments or within the RBPA, however recent testings in winter 2008/2009 resulted in 1 of 42 elk testing positive (2%) for brucella antibodies (Smith 2009). For more information on Big Piney Elk Herd Unit 106, see Section 3.9.1.

3.12 HEALTH AND SAFETY

3.12.1 Regulatory Setting

OSHA regulates worker safety under the Occupational Safety and Health Acto of 1970. This act requires employers and operators to provide a safe and healthy workplace for employees, and the agency must track and monitor reportable incidents of accidents and injury.

The DOT oversees and implements the Federal Pipeline Safety Law under the authority of the Pipeline and Hazardous Materials Safety Administration in carrying out duties regarding pipeline safety under the Pipeline Safety Law (49 USC 60101 et. Seq.) and hazardous material transportation laws (49 USC 5101 et seq.). Part 192 Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards regulates the in-pipeline transportation of natural gas and other gases. The regulations are targeted to protect both workers and the general public.

The EPA regulates the planning, response, and reporting procedures necessary when handling, storing, or disposing of hazardous substances. The regulations are included within the Code of Federal Protection of the Environment Regulations (EPA 40 CFR, Parts 302 and 355). The 1990 Clean Air Act Amendments require that facilities using extremely hazardous substances in excess of specified threshold quantities prepare a Risk Management Plan.

The BLM PFO has developed an instruction memorandum, which requires that all NEPA documents list and describe any hazardous and/or extremely hazardous materials that would be generated, used, stored, transported, or disposed of as a result of a proposed project. Under the RMP and ROD for the PFO, a Hazard Management and Resource Restoration (HMRR) program has been developed and implemented to manage hazards on public lands for the reduction of risks to the public and employees, while protecting public lands and responding to emergency situations (BLM 2008b). A spill plan maintained by the PFO outlines guidelines for the potential spill and release of oil, gas, and hazardous substances. The plan outlines actions such as hazard identification, hazardous substance inventory, facility design oversight that protects nearby areas and is consistent with applicable laws, spill response and cleanup, and management and intra-office cooperation of hazardous substances within the PFO jurisdiction.

The HMRR is implemented under the following federal laws regarding hazardous and extremely hazardous substances:

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (42 USC 9601 et seq.);
- Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq.);
- Emergency Planning and Community Right-to-Know Act of 1986;
- Federal Facilities Compliance Act of 1992;
- Oil Pollution Act of 1990;
- Occupational Safety and Health Act of 1970 (29 USC 651 et seq.);

- Clean Water Act of 1972, as amended (33 USC 1251 et seq.);
- Federal Land Policy and Management Act of 1976 (43 USC 1711–1712);
- National Environmental Policy Act of 1972 (42 USC 4321); and
- Safe Drinking Water Act of 1974, as amended (42 USC 300 et seq.).

Other guidance for the implementation of the program is obtained through documents such as:

- BLM Manual Section 1703—Hazardous Materials Management;
- BLM Handbook H-1703-1—CERCLA Response Actions Handbook; and
- BLM Handbook H-2101-4—Pre-acquisition Environmental Site Assessments.

Other federal regulations that Cimarex would apply toward the management of hazardous and extremely hazardous substances under the direction of the BLM PFO include the:

- National Contingency Plan Regulations (40 CFR §300); and
- Natural Resource Damage Assessment Regulations (43 CFR).

Federal and state law and policies regulate the generation, use, storage, and disposal of hazardous and extremely hazardous substances. Substances considered hazardous are listed in 40 CFR 302, Designation, Reportable Quantities, and Notification, and are administered under Title III of the Superfund Amendments and Reauthorization Act (1986) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Hazardous substances may also be listed within Section 112 (r) of the Clean Air Act (1990). Extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (40 CFR 355) titled as the Emergency Planning and Notification, which establishes a list of extremely hazardous substances and states the threshold planning quantities and the facilities notification responsibilities necessary for the development and implementation of state and local emergency response plans required under the Emergency Planning and Community Right-to-Know Act. An abbreviated hazardous and extremely hazardous substance list has been produced and is available from the EPA (2001). Actual hazardous substances planned for use within the RBPA are included with Appendix E.

3.12.2 Health and Safety Guidance Pertaining to the RBPA

The RBPA, although historically used for agriculture, has, in recent decades, seen increasing oil and gas development. Development, and an increased human presence, increases the likelihood of health and safety issues including traffic accidents, wildlife collisions, hazardous substances, and work-related accidents.

Per regulations, all chemicals stored within the project area during construction and operations must be handled according to label directions for each chemical. All chemicals present within the project area must also have a Material Safety Data Sheet (MSDS) located in a specified central location where it could be accessed to during an emergency situation would be possible. These MSDSs must be kept up to date and any new chemical added to the project area must have an MSDS added to the existing catalogue. All lists of hazardous substances stored within the project area must be updated at a minimum of once per month or more frequently if unless chemicals are added more often. If that is occurring then the chemical list must be updated more frequently.

All hazardous chemicals, as defined by the EPA Hazardous Substances Reportable Quantities and the Emergency Planning and Community Right to Know Act (EPCRA) list within 40 CFR Part 302-312 (EPA 2001), stored at quantities greater than the reportable quantities must be reported as required by the EPCRA regulations. Any release of a hazardous substance above a specified reportable quantity for the hazardous substance must be reported to the EPA. Any spill must be cleaned up immediately based upon information that is available in the MSDS. If any spill is of a sufficient quantity to require notification and possible emergency response, the emergency response agency within Sublette County must be notified immediately upon discovery of the release. All hazardous substances that are recovered during the cleanup must be handled and disposed of in accordance with available information. Any emergency response necessary will be based upon information available regarding the specific hazardous substance and after consultation of Cimarex Operations Manager and the Sublette County Emergency Response official.

Natural gas pipelines are the only practical means of transporting natural gas to the place of use. Alternative 1 would include the installation of a natural gas pipeline that would connect the processing plant with a regional natural gas transmission line. The pipeline safety regulations, listed in CFR 49 Parts 190 to 199 (USDOT 2008b), administer the design, operation, and maintenance of pipelines. Because of the explosive potential of the methane product being transported within the product pipeline, constant monitoring of the pipeline and all associated equipment will occur throughout the length of the pipeline. Natural gas pipelines are required to be The pipeline will be instrumented and monitored continuously for potential leaks. If a leak is determined or reported during operation, the pipe transmission line will be shutdown and the source of the leak shall be determined. These regulations do not only apply to the operation of the helium pipeline, since as helium is not considered a hazardous substance.

Operators must also cooperate and coordinate with other federal, state, and local emergency and environmental agencies as appropriate to permit and manage hazardous and extremely hazardous substances. Other actions outlined by the BLM in regards to management of substances is the management of illegal dumping and releases; emergency response toward accidental releases of hazardous substances; and risk and liability related to human health and safety and substance releases.

Oil and gas development is occurring within the RBPA, and it is likely that hazardous substances are stored or in use in these areas. Oil and gas operations may have hazardous or extremely hazardous substances associated with the development, operation, and maintenance of the activities. A table of hazardous and extremely hazardous substances is provided pursuant to BLM HMRR requirements that all NEPA documents list and describe hazardous and/or extremely hazardous materials present as a result of activities. All known hazardous and extremely hazardous materials potentially generated, used, stored, transported, and/or disposed of as a result of the drilling and oil and gas activities within the RBPA are presented in Table 3-24.

Table 3-24. List of Hazardous and Extremely Hazardous Substances Likely to Occur at Oil and Gas Development Sites in the RBPA.

Fuels	Hazardous Substances	Extremely Hazardous Substances
Liquid hydrocarbons (diesel, gasoline)	Benzene, cumene, ethyl benzene, methyl tert-butyl ether, naphthalene, n-Hexane, PAHs, POM*, toluene, m-Xylene, o-Xylene, p-Xylene	–
Natural gas	n-Hexane, PAHs, POM	–
Propane	Propylene	–
Pipeline		
Coating	Aluminum oxide	–
Cupric sulfate solution	Cupric sulfate, sulfuric acid	–
Diethanolamine	Diethanolamine	–
Liquid petroleum gas	Benzene, n-Hexane, Propylene	–
Molecular sieves	Aluminum oxide	–
Pipeline primer	Naphthalene, toluene	–
Potassium hydroxide solution	Potassium hydroxide	–
Rubber resin coatings	Acetone, coal tar pitch, ethyl acetate, methyl ethyl ketone, toluene, xylene	–
Emissions		
Gases	Formaldehyde	Nitrogen dioxide, ozone, sulfur dioxide, sulfur trioxide
Hydrocarbons	Benzene, ethylbenzene, n-Hexane, PAHs, toluene, m-Xylene, o-Xylene, p-Xylene	–
Particulate matter	Barium, cadmium, copper, fine mineral fibers, lead, manganese, nickel, POM, zinc	–
Coolants	Ethylene glycol, freon, triethylene glycol, polyethylene glycol	–
Crude oil	Benzene, PAHs, POM	–
Grease, lubricants	1,2,4-trimethylbenzene, barium, cadmium, copper, n-Hexane, lead, manganese, nickel, PAHs, POM, zinc compounds	–
Batteries	Cadmium, cadmium oxide, lead, nickel hydroxide, potassium hydroxide, sulfuric acid	–
Drilling Fluids		
Anionic polyacrylamide		Acrylamide
Barite	Barium compounds fine mineral fibers	–
Bentonite	Fine mineral fibers	–
Caustic soda	Sodium hydroxide	–
Glutaraldehyde	Isopropyl alcohol	–
Lime	Calcium hydroxide	–
Mica	Fine mineral fibers	–

Fuels	Hazardous Substances	Extremely Hazardous Substances
Modified tannin	Ferrous sulfate fine mineral fibers	–
Phosphate esters	Methanol	–
Polyacrylamides	Petroleum distillates	Acrylamide
Polyanionic cellulose	Fine mineral fibers	–
Retarder	Fine mineral fibers	–

*Polycyclicaromatic hydrocarbons and Polycyclic organic matter

Safety issues and the protection of the health of those who work, live, and play in or near oil and gas development projects are the purview of existing federal and state regulations. These regulations include the concern of hazards associated with oil and gas exploration, drilling operations, sour gas and CO_2 separation operations, and gas transport. Workers generally are exposed to the occupational hazards of oil and gas operations in the fields and at ancillary facilities. There are also risks associated with hazardous materials that are used and stored at oil and gas facilities. The U.S. Department of Transportation (DOT), OSHA, BLM, and WOGCC all regulate safety aspects of oil and gas operations.

Due to their proximity to development areas, oil and gas workers and rural residents would be the most vulnerable to health and safety issues. The closest communities or population centers are Big Piney and Marbleton, which are located outside the eastern boundary of the RBPA and are approximately 4.5 and 3.5 miles north of the proposed helium plant and pipeline terminus, respectively. Building sites and farmsteads are listed in Table 3-25 with location information and distance to the proposed natural gas processing plant.

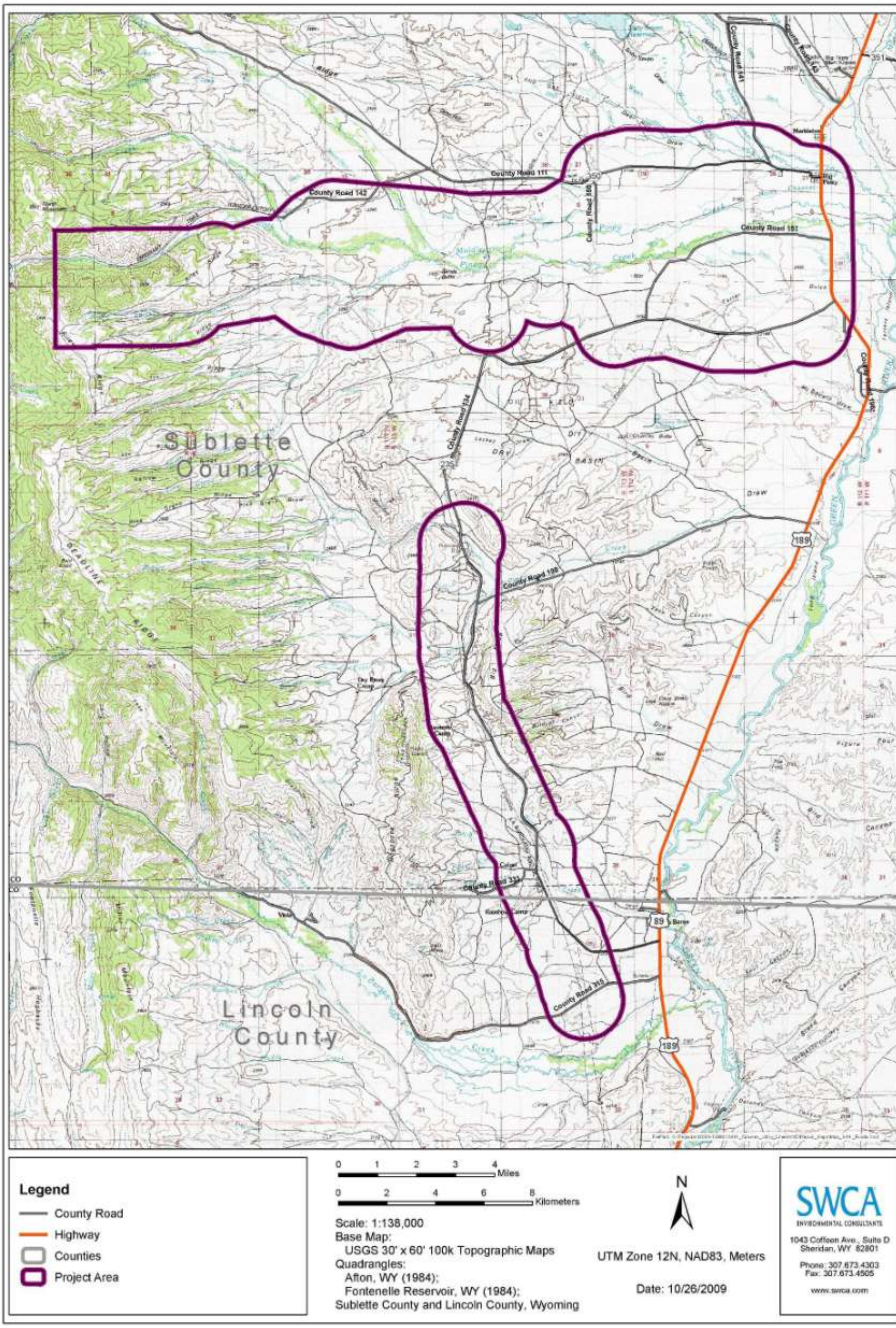
Table 3-25. Structures within 5 Miles of Project Components.

Structure	Within 5 Miles of the M&HRF	Within 5 Miles of the Pipeline	Within 5 Miles of the Helium Plant
Buildings and/or Homes	3	42	26

M&HRF = methane and helium recovery facility

3.13 TRANSPORTATION

The study area for transportation includes all highways and roads that provide access to and traverse the RBPA. Principal travel corridors such as major highways do not cross through the RBPA; however, the RBPA contains an extensive network of secondary, local, collector, and resource roads. Several paved all-weather roads provide access to the RBPA, as well as numerous non-paved, improved roads that serve as access to energy exploration and development and other activities surrounding the RBPA. The study area includes U.S. 189, State Highway (SH) 350 (Middle Piney Road), and SH 235. Access to the RBPA would also occur along numerous secondary and local/collector roads, including CR 111, CR 134 (Big Piney-Calpet Road), CR 142 (South Piney-Fish Creek Road), CR 151 (South Piney Road), CR 198 (Dry Piney Road), CR 315, and CR 321 (Map 3-16).



Map 3-16. Roads in the Rands Butte Project Area.

The entire RBPA is located west of U.S. 189, which is the primary north-south travel artery between Kemmerer and Pinedale. All traffic accessing the RBPA would travel along U.S. 189 and access the RBPA from multiple state, county, and BLM roads that depart west from U.S. 189. State roads include SH 350, an east-west roadway that parallels the northern portion of the RBPA, and SH 235, which is a secondary north-south travel artery paralleling U.S. 189, serving as an access route to areas west of U.S. 189 between Big Piney and La Barge. SH 235 begins at U.S. 189 south of LaBarge and becomes CR 134 north of the Sublette–Lincoln County line, eventually terminating once again at U.S. 189 south of Big Piney.

Several county roads also bisect or border the RBPA. Approximately 5 miles west of Big Piney, SH 350 becomes CR 111. This road, also referred to as Middle Piney Road, connects to CR 142 and CR 180, both of which would serve as access routes to the northern portion of the RBPA. CR 142 extends southwest from CR 111 along South Piney Creek. Farther south along U.S. 189 (approximately 1.5 miles south of Big Piney), CR 151 heads west to its junction with Middle South Piney Road, which heads west and would serve as access along the proposed transmission line and facilities located within the Riley Ridge Area. From its junction with Middle South Piney Road, CR 151 travels southwest to intersect with CR 134, which travels east to meet U.S. 189 approximately 3 miles south of Big Piney. To the west, CR 134 continues 9 miles before turning south to rejoin U.S. 189 just south of the town of La Barge.

SH 235/CR 134 is the primary access route along the proposed Williams Pipeline Area. CR 198 travels along Dry Piney Creek and heads east from CR 134 connecting with U.S. 189 approximately 8.5 miles south of Big Piney and 9.5 miles north of La Barge. Just north of the Sublette–Lincoln county line, CR 321 provides another access route between CR 134 and U.S. 189. This road leaves U.S. 189 at the northern limits of La Barge and continues northwest to meet CR 134 approximately 5.5 miles northwest of La Barge.

Traffic volumes vary greatly along the various roads that surround or pass through the RBPA. All of the primary highways have experienced a consistent increase in average daily traffic (ADT) since 2000 (Wyoming Department of Transportation [WYDOT] 2008); Table 3-26 provides ADT recorded at traffic counter stations along the three primary highways surrounding the RBPA. No data are available to describe the volume of traffic along the local, resource, and collector roads at the present time.

Existing vehicular traffic along secondary and local/collector roads includes energy exploration and development activities, residential, livestock operations, and recreational activities.

Table 3-26. 2007 ADT along Primary Highways Surrounding the RBPA.

Station	Milepost	ADT
SH 235		
Jct. Route 11 (U.S. 30, 189)	0	900
Lincoln–Sublette County Line	3.89	780
SH 350		
Big Piney West Corp. Limits	1.39	1,400
U.S. 189		
Jct. SH 351	109.38	1,640
Jct. Airport Road	107.97	4,020
Marbleton North Corp. Limits	107.47	4,510
Marbleton South Corp. Limits	106.93	5,000
Big Piney North Corp. Limits	106.32	6,200
Jct. SH 350	105.94	5,940
Big Piney South Corp. Limits	105.81	4,200
Jct. County Road 315 West	83.96	1,610
Lincoln–Sublette County Line	85.92	1,450

Source: WYDOT 2008
ADT = average daily traffic

3.14 SOCIOECONOMIC RESOURCES

The scope of the analysis for social and economic resources includes a discussion of current social and economic data relevant to the RBPA and surrounding communities within Sublette and Lincoln counties, Wyoming. These counties were chosen as the socioeconomic study area because the RBPA is located within or adjacent to these counties, and this is the geographic area where potential impacts would most likely be realized. This section discusses community characteristics including population, housing, demographics, employment, and economic trends taking place in the RBPA. Also included are data relating to the State of Wyoming and the United States, which provides for a comparative discussion when analyzed against the RBPA. Information in this section was obtained from various sources including, but not limited to, the U.S. Census Bureau, the U.S. Bureau of Economics, and the State of Wyoming Economic Analysis Division.

3.14.1 Population and Housing

The local and regional population and housing stock are key considerations in conducting Project development and operations. The population may offer a potential workforce to construct, operate, and manage the various Project elements. The housing stock has an impact on availability and, subsequently, affordability of housing for all citizens in the community, including Project-related employees.

3.14.1.1 Population

Historic, current, and projected population counts in the RBPA, compared to the state, are provided in Table 3-27. Between 1980 and 2007, the combined population of Lincoln and

Sublette counties grew by approximately 44.0%, bringing the total population of these two counties to approximately 24,096 (State of Wyoming 2008a). During this time, Sublette County's population grew by 74.2% (4.4% annually) and Lincoln County grew by approximately 32.8% (1.9% annually), compared with 11.3% growth for the state of Wyoming (State of Wyoming 2008a). Between 2006 and 2007, Sublette County was the fifth fastest growing county among more than 3,000 counties in the nation, the second fastest growing county west of the Mississippi River, and the fastest growing county out of the state's 23 counties (Jacquet 2008). This growth can be primarily attributed to economic opportunities from energy development and service industries. Between 2007 and 2020, Lincoln County is projected to grow by approximately 24.2% and Sublette County by approximately 68.7% for a combined projected growth of approximately 39% for the region.

Table 3-27. Historic, Current, and Projected Population Forecasts for the RBPA, Wyoming, and United States, 1980–2020.

Location	1980[1]	1990	2000	2007	2010	2015	2020
Lincoln County	12,177	12,625	14,573	16,171	17,240	18,710	20,100
Sublette County	4,548	4,843	5,920	7,925	9,170	11,200	13,370
County Totals	*16,725*	*17,468*	*20,493*	*24,096*	*26,410*	*29,910*	*33,470*
State of Wyoming	469,557	453,588	493,782	522,830	539,740	560,000	578,730
U.S. (thousands)	226,545	248,709	281,421	301,139	308,935	322,365	335,804

Source: State of Wyoming 2008a, 2008b.
[1] State of Wyoming 2002.

3.14.1.1.1 Lincoln County

In 2007, Lincoln County's population was approximately 16,171, an increase of 10.9% from 2000. The towns of Kemmerer and Afton have the highest population with approximately 2,427 and 1,988 residents, respectively, comprising approximately 27.3% of the county in 2007. The remaining 72.7% of the county's 2007 population live in smaller communities such as Alpine, Cokeville, LaBarge, Opal, and Thayne. Projections per the U.S. Census Bureau estimate by 2020, Lincoln County's population is expected to grow by approximately 37.9% over the 2000 Census population to approximately 20,100 (U.S. Census Bureau 2008a).

Between 2007 and 2020, Lincoln County is projected to grow by approximately 24.3%. This compares to the state of Wyoming, which is expected to realize a 10.6% population growth rate, averaging 0.73% per year (State of Wyoming 2008b).

Ethnic diversity is limited in Lincoln County with the White, Non-Hispanic residents comprising approximately 97.7% of the 2007 population. Other ethnicities include American Indian and Native American (0.64%), African American (0.18%), Asian (0.25%), and Native Hawaiian or Pacific Islander and two or more races combined (1.16%) (U.S. Census Bureau 2008a).

3.14.1.1.2 Sublette County

In 2007, Sublette County's population was approximately 7,925, an increase of 33.8% from 2000. The towns of Pinedale, Marbleton, and Big Piney have the highest population with approximately 2,043, 919, and 476 residents, respectively, comprising approximately 43.3% of the county in 2007. The remaining 56.7% of the county's 2007 population live in smaller communities such as Bondurant, Boulder, Cora, and Daniel. Projections per the U.S. Census Bureau estimate by 2020, Sublette County's population is expected to grow by approximately 125.8% over the 2000 Census population to approximately 13,370 (U.S. Census Bureau 2008a).

Between 2007 and 2020, Sublette County is projected to grow by approximately 68.7%. This compares to the state of Wyoming, which is expected to realize a 10.6% population growth rate, averaging 0.73% per year (State of Wyoming 2008b).

Ethnic diversity is limited in Sublette County with White, Non-Hispanic residents comprising approximately 97.6% of the 2007 population. Other ethnicities include African American (0.4%), American Indian and Native American (0.6%), Asian (0.3%), and Native Hawaiian or Pacific Islander and two or more races combined (1.1%) (U.S. Census Bureau 2008a).

3.14.1.2 <u>Housing</u>

Housing unit supply estimates in the two-county study area are shown in Table 3-28. Growth in the energy exploration and development industry has impacted the availability and cost for housing in the RBPA. As of 2007, a grand total of 12,598 housing units were in Lincoln and Sublette counties.

Housing costs for all unit types (single-family homes, apartments, mobile homes, and mobile home lots) in the RBPA have steadily increased between 2000 and 2007. Average increases are discussed below. To understand and address the increase in the local population and housing needs, the Wyoming Community Development Authority, a coalition of Wyoming State departments, released the annual Wyoming Housing Needs Forecast Report (Wyoming Housing Database Partnership 2008). The 2008 report offers three alternative housing forecasts: a moderate growth scenario, a strong growth scenario, and a very strong growth scenario. For the purposes of this analysis, the strong growth scenario is discussed. To view the full report, the reader is referred to Wyoming Housing Database Partnership (2007).

Table 3-28. Housing Unit Estimates by County, 2000–2007.

Year	Lincoln County		Sublette County		Wyoming	
	Housing Units	% Change from 2000	Housing Units	% Change	Housing Units	% Change
2000	6,831	–	3,552	–	223,854	–
2007	8,253	20.8	4,345	22.3	242,332	8.2

Source: Wyoming Community Development Authority 2008.

3.14.1.2.1 Lincoln County

Housing unit supply between 2000 and 2007 showed an increase of about 20.8% in Lincoln County, compared to 8.2% for the state of Wyoming (Wyoming Housing Database Partnership 2008). Based on fourth quarter data for 2000 and 2007, the cost of renting an apartment in Lincoln County increased 94.5% from $277 to $539 a month. The cost of renting a house increased 40.5% from $417 to $586. Mobile home rentals also experienced an increase in price, rising 79.8% from $317 to $570, and a mobile home lot increased 17.9% from $195 to $230. Similar to rent rates, the real value of single-family homes also increased. In 2000, the average value of a single-family home was approximately $160,760 in Lincoln County, in 2007 dollars. In 2007, this value increased to approximately $187,630, reflecting a 16.7% increase (Wyoming Housing Database Partnership 2008). Projected future growth indicates the need for construction of additional housing units in Lincoln County.

3.14.1.2.2 Sublette County

Housing unit supply between 2000 and 2007 showed an increase of about 22.3% in Sublette County, compared to 8.2% for the state of Wyoming (Wyoming Housing Database Partnership 2008). Based on fourth quarter data for 2000 and 2007, the cost of renting an apartment in Sublette County increased 85.3% from $464 to $860. The cost of renting a house increased 145.1% from $566 to $1,387. Mobile home rentals also experienced an increase in price, rising 107.4% from $325 to $674, and a mobile home lot increased 66.6% from $165 to $275. Similar to rent rates, the real value of single-family homes also increased. In 2000, the average value of a single-family home was approximately $156,260 in Sublette County, in 2007 dollars. In 2007, this value increased to approximately $192,690, reflecting a 23.3% increase (Wyoming Housing Database Partnership 2008). Projected future growth indicates the need for construction of additional housing units in Sublette County.

3.14.2 Employment and Income

Employment in the RBPA is typical of western rural communities relying on agriculture, mineral extraction, construction, and retail services to employ a large part of the workforce. This section describes earnings per job, per capita income, and new income per industry.

3.14.2.1 <u>Lincoln County</u>

3.14.2.1.1 Employment by Industry

Between 1970 and 2005, the total full- and part-time workforce increased approximately 109% from 4,444 to 9,302. In 1970, the wage and salary workforce accounted for 3,349 people, which increased by 91% to 6,408 people by 2005.

Broken down by industry, according to the North American Industrial Classification System, approximately 9,302 people comprised Lincoln County's total 2005 full- and part-time workforce. Of this, government and government enterprises employed the largest number of people, comprising approximately 18.3% (1,703 people) of the workforce. Other dominant industries include construction at 13.1% (1,219 people), and retail trade at 10.9% (1,014 people) (Headwaters Economics 2007a).

3.14.2.1.2 Average Earnings per Job

Average earnings per job in Lincoln County in 1980 were approximately $16,045. In 2006, the average earnings per job were approximately $33,951. This 2006 average is lower than the state average at $40,455 and the national average of $47,286 (U.S. Department of Commerce 2008). Table 3-29 summarizes historic and recent average earnings per job.

Table 3-29. Average Earnings per Job for Lincoln and Sublette Counties, 1980–2006.

Location	1980	1990	2000	2001	2002	2003	2004	2005	2006
Lincoln County	$16,045	$20,510	$24,548	$26,279	$27,325	$30,880	$31,554	$32,113	$33,951
Sublette County	$14,606	$18,675	$23,097	$25,628	$27,203	$30,821	$32,991	$37,734	$42,911
State of Wyoming	$17,026	$28,737	$29,545	$31,587	$32,305	$33,755	$35,665	$37,724	$40,455
U.S.	$15,894	$26,561	$39,007	$40,164	$41,116	$42,428	$44,381	$45,805	$47,286

Source: U.S. Department of Commerce 2008.

3.14.2.1.3 Unemployment

In June 2008, the unemployment rate in Lincoln County was 2.9% (Wyoming State Department of Economic Analysis 2008). As of July 2008, the unemployment rate in Lincoln County was approximately 3.1%, which is slightly above the state rate of 3.0% and below the national average of 6.0% for the same time.

3.14.2.2 Sublette County

3.14.2.2.1 Employment by Industry

Between 1970 and 2005, the total full- and part-time workforce increased approximately 181% from 2,027 to 5,703. In 1970, the wage and salary workforce accounted for 1,504 people, which increased by 160% to 3,919 people by 2005.

Broken down by industry, according to the North American Industrial Classification System, approximately 5,703 people comprised Sublette County's total 2005 full- and part-time workforce. Of this, mining employed the largest number of people, comprising approximately 14.8% (844 people). Other dominant industries include government and government enterprises at 14.7% (838 people), construction at 14.2% (810 people), and accommodation and food services at 9% (513 people) (Headwaters Economics 2007b). (Data to be updated per new report's 2009 release.)

3.14.2.2.2 Average Earnings per Job

Average earnings per job in Sublette County in 1980 were approximately $14,606. In 2006, the average earnings per job were approximately $42,911. This 2006 average is higher than the state average at $40,455 and lower than the national average of $47,286 (U.S. Department of Commerce 2008). See Table 3-29 for a summary of historic and recent average earnings per job.

3.14.2.2.3 Unemployment

In June 2008, the unemployment rate in Sublette County was 1.4% (Wyoming State Department of Economic Analysis 2008). As of July 2008, the unemployment rate in Sublette

County was approximately 1.5%, which is well below the state rate of 3.0% and below the national average of 6.0% for the same time.

3.14.3 Median Family Income

The U.S. Department of Housing and Urban Development estimates 2008 Median Family Income (MFI) at $59,100 for Lincoln County and $63,000 for Sublette County. This compares to Wyoming's 2008 MFI of $57,505 (U.S. Department of Urban Housing and Development 2008). MFI is based on the distribution of the total number of families within a certain geographical area, including those with no income. Between 2000 and 2008, MFI grew in both Lincoln and Sublette counties. Sublette County realized the largest gain at 55.9%, and Lincoln County realized a 42% gain in MFI. This compares to a state gain of 28.6%.

As indicated, since 2003, the MFI of the two-county study area in southwest Wyoming has steadily increased, surpassing the state's MFI. This can be attributed to typical inflation rates and the increase in employment from natural resource exploration and development in the region.

3.14.4 Cost of Living

An area's cost of living is represented in the Cost of Living Index, a theoretical pricing index that measures relative cost of living over time and shows the differences in living costs between cities. The Cost of Living Index uses a numerical range between 1 and 100 to rate a geographical area's cost of living compared to the state average. A cost of living rate of 100 represents the state's average. Anything below 100 means that it is less expensive than the state average and anything above 100 indicates that it is more expensive than the state average.

The cost of living for Lincoln and Sublette counties is based the Wyoming Economic Analysis Division's Wyoming Cost of Living Index report for the fourth quarter of 2007. The Wyoming Cost of Living Index summarizes price data collected from 28 cities and towns throughout Wyoming over a three-day period in January 2008. The price data is aggregated into six categories, which were then weighted according to their overall importance in the average consumer's budget. These categories and their approximate respective weight components include housing (48.1%), transportation (17.7%), food (13.8%), recreation and personal care (9.3%), medical (6.2%), and apparel (4.8%) (State of Wyoming 2008b).

As illustrated in Table 3-30, the overall cost of living in Sublette County is more expensive than the statewide average. The only item less expensive than the rest of the state is the cost of medical services with a comparative cost of living index of 98. It should be noted that the cost of living in Sublette County is the second highest in the state, second to Teton County, one of the most expensive counties in the United States (State of Wyoming 2008c). The cost of housing in Sublette County is the primary factor in the region's high cost of living. This is due to the relatively recent economic expansion from increased oil and gas activities, which consequently increased the cost of living in this region and other mineral-rich areas when compared to the rest of the state.

Table 3-30. Lincoln and Sublette Counties Comparative Cost of Living Index, Fourth Quarter 2007.

County	All Items	Housing	Transportation	Food	Recreation and Personal Care	Medical	Apparel
Lincoln	104	110	101	98	100	104	88
Sublette	119	132	102	106	111	98	122

Source: State of Wyoming 2008c.

The overall cost of living in Lincoln County is slightly more expensive than the rest of the state, including items such as housing, transportation, recreation and personal care, and medical services. The costs of items such as food and apparel are slightly less expensive in Lincoln County than the rest of the state.

3.14.5 Public Services and Infrastructure

County profile information was primarily obtained from the State of Wyoming; local, county, and community websites; and the Wyoming Department of Education.

3.14.5.1 Lincoln County

Telecommunications: Eight telecommunication companies service Lincoln County: All West Communications, Net Wright LLC, OneWest.net, Qwest Communications, Silverstar, Union Telephone Company, Visionary, and Wyoming.com. These communication services providers offer a variety of ways to access the internet, such as broadband and wireless; local and long distance telephone service; and web management services.

Energy/Power Providers: Three power companies provide power services to Lincoln County: Bridger Valley Rural Electric Association, based in Lyman, Wyoming; Lower Valley Energy, based in Afton, Wyoming; and Rocky Mountain Power, based in Portland, Oregon.

Airports/Railroads: Four airports service Lincoln County. Jackson Hole is 7 miles north of Jackson with commercial service provided by Sky West, American, United, Air Wisconsin, and Great Lakes. Afton Municipal Airport is located on the south edge of the town of Afton with Mountain Air as the fixed-base operator. Cokeville Municipal Airport is 3 miles south of the town of Cokeville and does not have fixed-base operators. Kemmerer Municipal Airport is 2 miles northwest of the town of Kemmerer and services local commuter aircrafts with fixed-based operations.

Railroad service to Lincoln County is provided by Union Pacific.

Education: The Lincoln County educational system consists of two school districts: #1 and #2. As of October 2007, total enrollment at both school districts was 3,235 students. This represents a 2.3% increase (75 students) from October 2006 (Wyoming Department of Education 2008).

Crime: The Wyoming Attorney General, Division of Criminal Investigation (DCI) produces annual reports on crime statistics for the state of Wyoming. Crime data are compiled from the

Uniform Crime Reporting (UCR) records, submitted to the DCI by law enforcement agencies across the state.

According to UCR data, the number of total annual arrests in Wyoming increased by 5,719, or 16.8%, between 2000 and 2007 (State of Wyoming 2007). The total number of arrests for murder, robbery, burglary, and motor vehicle theft increased, while rape, aggravated assault, and larceny decreased between 2000 and 2007 for the entire state. Overall arrests in Lincoln County increased by 91 (23.6%) between the same time period (State of Wyoming 2007). Notable increases in arrests occurred for the sale/manufacture of drugs, disorderly conduct, and other assaults (except aggravated). A notable decrease in arrests occurred for aggravated assault.

3.14.5.2 Sublette County

Telecommunications: Four telecommunication companies service Sublette County: All West Communications, Century Telephone, Contact Communications, and Visionary.

Energy/Power Providers: Two companies provide power services to Sublette County: Lower Valley Energy, Inc., based in Afton, Wyoming, and Rocky Mountain Power, based in Portland, Oregon.

Airports/Railroads: Three airports service Sublette County. Big Piney-Marbleton Airport is 1 mile north of the town of Marbleton, and Big Piney Aviation is the fixed-base operator. Ralph Wenz Field is 5 miles southeast of Pinedale, and New Breed Aviation is the fixed-base operator. Jackson Hole is 7 miles north of Jackson with commercial service provided by Sky West, American, United, Air Wisconsin, and Great Lakes.

Sublette County does not have any railroad service.

Education: The Sublette County educational system consists of two school districts: #1 and #9. As of October 2007, total enrollment at both school districts was 1,620. This represents an 8.9% increase (133 students) in total student enrollment from October 2006 (Wyoming Department of Education 2008).

Crime: As stated, the DCI produces annual reports on crime statistics for the state of Wyoming. According to UCR data, the number of annual total arrests in Wyoming increased by 5,719, or 16.8%, between 2000 and 2007 (State of Wyoming 2007). Overall arrests in Sublette County increased by 260 (107%) between the same time period (State of Wyoming 2007). Notable increases in arrests occurred for aggravated assault, drug possession, and driving under the influence. Notable decreases in arrests occurred for fraud and vandalism.

3.14.6 Government Revenue Sources

Unlike other states, the State of Wyoming does not assess certain taxes, including taxes on intangible assets such as bank accounts, stocks, or bonds. The state also does not assess any tax on retirement funds, corporate state income tax, personal state income tax, and inventory tax. Therefore, the state relies on other forms of revenue and taxation to generate important income.

The mineral exploration and development industries have long been an important part of Wyoming's history, beginning in the mid to late 1800s, and are vital to the economic well-being of the state. As such, the minerals industry accounts for a substantial share of revenues, through taxation and other methods of payment, to the state and regional economies.

3.14.6.1 Production Taxes

Produced minerals are classified as personal property, and mineral producers pay two types of taxes on mineral production: the mineral property (ad valorem) tax imposed by the county and the severance tax imposed by the state.

3.14.6.1.1 Mineral Property Taxes

In Wyoming, all property tax is based on the assessed value of property. Assessed value is a percent of the fair market value of property in particular classes, such as minerals and mine products, property used for industrial purposes, and real and personal property.

The County Assessors establish assessed values for most properties within their counties. Agricultural land valuation is based on its productivity. The Wyoming Department of Revenue establishes taxable values for properties such as utility and transportation companies, which include airlines, electric and gas distribution, pipelines, railroads and rail car, and telecommunication companies. Minerals are valued by the state, with these values allocated back to the counties for property tax purposes.

Mineral producers pay county property tax on production plants, refineries, mining and well head equipment, pipelines, and other facilities used in the production and transportation of produced minerals. In addition to property taxes, mill levies are also applied against mineral facilities and structures and are treated the same as all other property in the taxing jurisdiction. Property associated with mineral production is classified as industrial property and therefore has a higher assessment ratio than commercial, agricultural, or residential property. Because Wyoming does not impose an income tax, local governments largely rely on property tax collections, which is a large source of revenue.

3.14.6.1.2 Mineral Severance Taxes

In addition to property taxes on production imposed by each county, a state severance tax is also imposed on mineral producers in Wyoming. A severance tax is an excise tax imposed on the present and continuing privilege of removing, extracting, severing, or producing any mineral in Wyoming. Severance taxes are distributed to all Wyoming counties and cities according to Wyoming Statute 39-14-801. The statute stipulates that revenues are distributed to government entities, including the state general fund, water development account, state highway fund, counties, cities, and towns. Therefore, the government entities of Lincoln and Sublette counties receive only a percentage of total severance taxes collected on production. Approximately 25% of all severance taxes collected by the state are held in the Permanent Wyoming Mineral Trust Fund. This fund functions like a savings account for the state. As of June 2007, the fund balance was $3.7 billion. The interest of the Permanent Wyoming Mineral Trust Fund goes to the state's general fund for the legislature to allocate to current programs. In 2008, severance taxes contributed $275,859,263 to the state's General Fund (Consensus Revenue Estimating Group [CREG] 2009). Total severance tax distributions by the state in 2008 were $1,093,952,011 (CREG 2009). Of the $6,371,939 severance taxes distributed to all counties in the state, Lincoln County received $174,685 and Sublette County received 69,314 (Meyer et al. 2008).

In addition to state taxes, mineral producers also pay royalties, bonuses, rentals, and fees to the owner of the mineral for the right to obtain a lease and produce the mineral. For minerals owned by the federal government, the government receives a share of the revenues from the mineral production, or annual rentals are paid on unproductive mineral leases. Although the same protocol is applied for minerals owned by the state, the state also receives a share of federal revenue generated by mineral production through a federal revenue-sharing provision.

3.14.6.2 Mineral Royalties

The owner of the minerals also collects payment from the mineral extractor in the form of royalties. For state and federally owned lands, the state receives a base royalty of 16.7% of the value of production, and the federal government collects 12.5% of the value of mineral production. Half of the federal royalties are returned to the state and a portion of that is then distributed to the state's cities and counties. Unlike severance taxes, royalties are based on the value of the mineral production and byproducts. Total mineral royalty distributions by the state in 2008 was more than $1,185,971,530 (CREG 2009), of which $18,562,500 was distributed to all cities and towns in the state (Meyer et al. 2008). The towns of Alpine, Cokeville, and La Barge in Lincoln County received $56,567, $53,242, and $47,573, respectively. The towns of Pinedale, Marbleton, and Big Piney in Sublette County received $170,428, $94,255, and $59,911, respectively (Meyer et al. 2008).

3.14.6.3 Payments in Lieu of Taxes

Of Wyoming's approximately 60 million acres, the federal government owns and manages approximately 29,890,000 acres or roughly 49%. Federally owned land is not subject to federal property taxes, which are important to support local government operations and education. To help offset this loss, in 1976 Congress authorized federal land agencies to share income with state and counties and provided a Payment in Lieu of Taxes (PILT) program to help compensate lost tax revenue otherwise incurred by local governments for lands within their boundaries. PILT is based on three factors:

1. amount of eligible federally owned land in the county;
2. federal revenue sharing received by the county the prior year; and
3. county population up to the predetermined ceiling.

Lincoln and Sublette counties received approximately $1.3 million in PILT revenue in 2007, almost double the amount from the year 2000 (University of Wyoming 2008).

3.14.6.4 Sales, Use, and Lodging Tax

Sales taxes apply to the retail sale of personal property or services within the state. A use tax is levied on any sale of any property outside the state of Wyoming for use, storage, or consumption inside the state of Wyoming.

Cities, towns, and counties may impose a lodging excise tax of up to 4% on all sleeping accommodations for guests staying less than 30 days. This tax extends to mobile accommodations, such as tents, trailers, and campers.

3.14.7 County Government Expenditures

Because the Project would be constructed and operated outside of city limits, generally the counties would be the primary affected jurisdictions. The information below summarizes the major categories of expenditures incurred by the potentially affected counties.

3.14.7.1 Lincoln County

Total expenditures for Lincoln County increased from approximately $13.2 million by the end of fiscal year (FY) 2002 to approximately $18.3 million by the end of FY 2007. This is an increase in county costs of more than 38.5%. Average net expenditure per person also increased from $909 in FY 2002 to $1,260 in FY 2007. This compares to the statewide average per capita cost for county government, excluding hospitals, which was $1,046 in FY 2002. In FY 2007, the statewide average, excluding hospitals, increased to $1,863 per capita, a 78% increase (Geesey 2001–2007).

Between FY 2001 and FY 2007, Lincoln County consistently spent the most money on the county sheriff and road and bridge expenses at an average cost of $2.3 million and $1.0 million, respectively. Other major county expenditures over this time period include construction, solid waste and landfill, and library boards (Geesey 2001–2007).

3.14.7.2 Sublette County

Total expenditures for Sublette County increased from approximately $12.5 million by the end of FY 2002 to approximately $66.5 million by the end of FY 2007. This is an increase in county costs of more than 429%. Average net cost per person also increased from $2,124 in FY 2002 to $11,245 in FY 2007. This compares to the statewide average per capita cost for county government, excluding hospitals, which was $1,046 in FY 2002. In FY 2007, the statewide average, excluding hospitals, increased to $1,863 per capita, a 78% increase (Geesey 2001–2007).

Between FY 2001 and FY 2007, Sublette County consistently spent the most money on construction, and equipment, land, and buildings at an average cost of $5.9 million and $3.8 million, respectively. Other major county expenditures over this time period include county sheriff, county administration, and road and bridge expansion (Geesey 2001–2007).

3.15 RECREATION RESOURCES

The scope of analysis for recreation resources discusses current recreation activities and direction based on the Revised Pinedale RMP and ROD (BLM 2008b) for BLM-administered lands within Sublette County, Wyoming. Sublette County was chosen for the focus of the analysis because the majority of RBPA is contained by Sublette County, and potential impacts would most likely be realized there.

Due to the diversity of attractive natural features and topography such as the Upper Green River and several major mountain ranges, portions of the RBPA are valued for their recreational opportunities. Within the approximately 912,000 acres administered by the BLM PFO, the agency focuses on providing undeveloped recreation opportunities such as OHV use, boating, hunting, fishing, wildlife viewing, camping, and hiking. According to the BLM, recreational activity and intensity is steadily increasing, particularly in remote and unpopulated areas that offer a primitive recreation experience. As such, public lands in Sublette County support a substantial amount of outdoor recreation use by both local residents and visitors to the area. Due to the diversity of attractive natural features and topography such as the Wyoming Mountain Range at the west end of the RBPA, recreators often pass through the RBPA on their way to the mountains. Information in this section was obtained from various sources, including the BLM PFO and the WGFD.

3.15.1 Recreation Management Direction

The management goal for recreation resources under the Pinedale RMP and ROD is to "provide substantial personal, community, economic, and environmental benefits to local residents and visitors through recreational uses of the public lands" (BLM 2008b). As such, the Pinedale RMP and ROD identifies two basic units of recreational management that provide specific recreational activities and opportunities: Special Recreation Management Areas (SRMAs) and Extensive Recreation Management Areas (ERMAs). SRMAs are designated to protect unique recreational settings and experiences, which would provide substantial long-term personal, environmental, and economic recreational benefits. ERMAs are areas not specifically designated as an SRMA and include all BLM-administered lands outside SRMAs where dispersed recreation activity generally occurs (BLM 2008b).

The RBPA and proposed Williams Pipeline Area do not contain any SRMAs or any developed recreation sites. As such, the RBPA is managed under ERMA direction, where hunting and OHV use are the primary recreational activities. The RMP and ROD state that the objective of ERMAs is to "provide an array of resource-dependent dispersed recreation opportunities, such as hunting, fishing, motorized use, and open space. Management will be extensive rather than intensive. Management actions are custodial in nature and will focus on:

a. the development of new recreation facilities only when necessary to protect human health, safety, and natural resource values;
b. the maintenance and enhancement of important public access; and
c. the resolution of resource and social conflicts" (BLM 2008b:2–34).

In addition to the SRMAs and ERMAs, the BLM uses the Recreation Opportunity Spectrum (ROS) to manage recreation activities on public lands. The ROS method is widely used by the BLM and other land agencies and classifies recreational opportunities on federal land based on elements of the setting, such as access and remoteness. The goals of the ROS system are to 1) establish outdoor recreation management goals and objectives for specific areas; 2) allow for modification of recreational opportunities when other resource management actions are needed; and 3) establish standards for an area that would allow monitoring of the recreational experience and opportunity setting (BLM 2008b). The Pinedale RMP and ROD depict the

ROS classifications as Natural Resource Recreation settings and provides a classification range from undeveloped (Primitive – characterized) to substantially modified (Urban).

The Natural Resource Recreation Settings for the RBPA are Back Country, Middle Country, Front Country, Rural, and Urban. However, the dominant recreation setting is Front Country where big game and upland bird hunting may be the major recreational activity. Factors used to determine these setting classifications include remoteness, naturalness, facilities, social encounters, access, visitor impacts, and visitor management. The Pinedale RMP and ROD provide the following definition for these Natural Resource Recreation Settings in the RBPA:

- **Back Country**. Characterized by a roadless, predominantly unmodified natural environment. Activities might include camping, hiking, enjoying scenery or natural features, photography, hunting, swimming, fishing, canoeing, sailing, and river running (nonmotorized craft).
- **Middle Country**. Area is characterized by a predominantly natural or natural-appearing environment. Interaction between users is low, but there is evidence of other users. Motorized use is permitted.
- **Front Country**. Characterized by a generally natural environment, with evidence of resource modification and utilization harmonizing with the natural environment. Motorized travel is permitted.
- **Rural**. Characterized by a substantially modified natural environment. Activities might include camping, hiking, enjoying scenery or natural features, photography, swimming, fishing, canoeing, sailing, river running (motorized craft), power boating, picnicking, rock collecting, wood gathering, auto touring, water skiing and other water sports, interpretive services use, rustic resorts and organized camps, competitive games, spectator sports, bicycling, jogging, outdoor concerts, and modern resorts.
- **Urban**. Characterized by a substantially modified natural environment that can no longer be classified as “rural.” This includes not only towns and housing subdivisions but also industrialized landscapes such as intensively developed natural gas fields.

3.15.1.1 Big Game Hunting

Data related to big game hunting and harvest was obtained from the Annual Report of Big and Trophy Game Harvest 2007 published by the WGFD (2007b). Hunting is an important part of the regional infrastructure, as it is one of the most popular recreational activities in the region. As such, the WGFD administers hunting permits and monitors use within the hunt areas that are fully and partially located on BLM lands. The presence and variety of wildlife, especially big game, is the primary draw for hunters to the area. Big game hunting permits are issued for antelope/pronghorn, mule deer, moose, elk, black bear (*Ursus americanus*), big horn sheep (*Ovis Canadensis*), Rocky Mountain goat (*Oreamnus americanus*), bison (*Bos bison*), and mountain lion (*Felis concolor*).

To monitor hunting on public lands, the WGFD segregates public hunting grounds into numerical Hunt Areas. These Hunt Areas vary for big game hunting licenses issued throughout the state. This enables the WGFD to assess yearly population estimates and compile data to create objectives that help wildlife managers regulate animal numbers, primarily through numbers of hunting licenses sold. It should be noted that no bison inhabit the RBPA and no Hunt Areas are assigned for big horn sheep and Rocky Mountain goat in the RBPA.

3.15.1.2 Antelope/Pronghorn

According to the WGFD, Hunt Area 89, also known as Piney, is located within the RBPA. The general hunting season for pronghorn in this Hunt Area begins on September 10 and runs through October. In 2007, the WGFD had a total of 414 active licenses/hunters (resident and nonresident), which harvested a pooled total of 403 pronghorn, providing a 97.3% hunter success rate.

3.15.1.3 Mule Deer

According to the WGFD, Hunt Area 143, also known as South Piney, is located within the RBPA. The general hunting season for mule deer in this Hunt Area begins on September 15 and runs until November 5. In 2007, the WGFD had a total of 888 active licenses/hunters (resident and nonresident), which harvested a pooled total of 259 mule deer, providing a 29.2% hunter success rate. Although there were 25 active hunting licenses for white-tailed deer (*Odocoileus virginianus*), no white-tailed deer were harvested in this Hunt Area for the 2007 hunting season.

3.15.1.4 Elk

According to the WGFD, Hunt Area 94, also known as South Piney, is located within the RBPA. The general hunting season for elk in this Hunt Area begins on October 1 and, for some license types, can run through the end of January. In 2007, the WGFD had a total of 1,625 active licenses/hunters (resident and nonresident), which harvested a pooled total of 504 elk, providing a 31.0% hunter success rate.

3.15.1.5 Moose

According to the WGFD, Hunt Area 25, also known as Big Piney – off National Forest, is located within the RBPA. Hunting season for moose in this Hunt Area runs through the month of October only. In 2007, the WGFD issued 43 Limited 1 permits (resident and nonresident), which harvested a pooled total of 40 moose, providing a 93.0% hunter success rate.

3.15.1.6 Black Bear

According to the WGFD, Hunt Area 14, also known as South Piney, is located within the RBPA. Hunting season for black bear in this Hunt Area begins on May 1 and runs to June 15, then resumes on September 1 and runs through the end of October. In 2007, the WGFD had 110 active licenses/hunters (resident and nonresident), which harvested a pooled total of 10 black bears, providing a 9.0% hunter success rate.

3.15.1.7 Mountain Lion

According to the WGFD, Hunt Area 17, also known as Piney, is located within the RBPA. The general hunting season for mountain lion in this unit begins on September 1 and runs through the end of March. In 2007, the WGFD had 48 active licenses/hunters (resident and nonresident), which harvested a pooled total of two mountain lions, providing a 4.1% hunter success rate.

In addition to big game, there are several small animal and upland game birds that are permitted for hunting in the RBPA. Hunt Unit 3 and Hunt Unit 7, also known as Bridger and Eden, respectively, are located in the RBPA. Small animal and upland game birds hunted in these units include mourning dove (*Zenaida macroura*), blue grouse (*Dendragapus obscurus*), ruffed grouse, snowshoe hare, and cottontail rabbits (*Sylvilagus* spp.). In 2007, hunting licenses were also required for the greater sage-grouse within these Hunt Areas.

3.15.2 Fishing

Because part of the RBPA is on private land, there is no developed public access to fishing opportunities within the RBPA. Access to perennial streams and tributaries for fishing purposes requires permission from the private landowner where the access point and stream is located. As such, data do not exist for fishing in the RBPA. However, it is expected that some limited fishing does occur in the RBPA. Therefore, for the purposes of this recreation analysis, a brief description of fish species in the RBPA is warranted. The RBPA is located within the Upper Green River Basin and is part of the Colorado River drainage system that contains many streams and tributaries. The Middle Big Piney and the South Big Piney creeks, both perennial tributaries to the Green River, are the main streams flowing through the RBPA. These sites are primarily coldwater trout fisheries. Based on recent WGFD surveys, many creeks and tributaries in the RBPA contain fish. These include Beaver Creek, Fish Creek, Middle Piney Creek, Piney Creek North, South Piney Creek, Spring Creek, and Black Canyon Creek. Fish species found in these streams include, but are not limited to, brook trout, Colorado River cutthroat trout, mottled sculpin, mountain sucker, Snake River cutthroat trout, speckled dace, white sucker, and rainbow trout.

Based on these surveys, no fish were found in North Fork South Piney Creek, but data suggest that spotted cutthroat were caught below the confluence with South Piney. No fish were found to be in Birch Creek, as this creek was dry when the survey was completed by the WGFD in January 2009.

The WGFD does not have any fishing data for Cedar Creek, Chappell Creek, Dry Piney Creek, Fogarty Creek, North Fork Dry Piney Creek, South Fork Birch Creek, Pine Hollow Conway Creek, and Haysback Spring No. 1 Creek.

3.15.3 Back-Country Activities (Motorized and Non-Motorized)

Snowmobiling season typically runs from mid-December until April, depending on snow conditions and cover. Much of the snowmobiling activity relative to the RBPA originates out of Pinedale and occurs in the Wyoming Range to the west. The Wyoming Range has more than 330 miles of groomed snowmobile trails and thousands of acres of off-trail riding areas. Snowmobile terrain in the Wyoming Range is variable, ranging from flat to gently rolling sagebrush prairie to rugged forested mountains. Popular snowmobile loops are the Middle Piney Creek to South Cottonwood Creek and Middle Piney Creek to South Piney Creek, both of which are groomed by the Wyoming State Trails Program when conditions permit. In addition to active snowmobiling, recreators accessing the trails in the Bridger-Teton National Forest may be required to drive through the RBPA.

Snowmobile trails are managed cooperatively by the Wyoming State Trails Program and the landowner or land manager responsible for the lands on which the trails are located. Typically, the BLM, under the terms and conditions of a Memorandum of Understanding, authorizes the State of Wyoming to establish and maintain the snowmobile trails. In 2007, 1,318 Off-road Vehicle Permits were purchased in Sublette County (Wyoming State Trails Program 2007). Generally, snowmobile use is allowed on BLM lands, except within areas closed to motorized winter use due to wildlife winter range restrictions. Certain BLM-administered lands within the PFO are subject to closure to motorized travel and/or human presence during certain time periods in order to protect crucial winter range habitat and wintering animal species. This closure period typically starts on January 1 and goes through April 30 and includes much of the RBPA, including Deer Hills in the north-central part of the RBPA and public lands surrounding the Williams Pipeline Area. After April 30, motorized vehicle use is limited to existing roads and two-track trails.

An OHV is defined as a motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain (43 CFR 8340.0-5). In the RBPA, motorized vehicle use, except for over-the-snow equipment, is limited to existing roads and trails unless otherwise specified (BLM 2008b). There are also certain areas within the PFO that are closed to OHV use, and there are no designated open OHV use areas within the PFO. To further manage motorized vehicle use, the ROD states that transportation planning would be completed within 5 years of implementation of the RMP. However, two management goals for the PFO related to transportation, access, and travel management are identified in the ROD and state 1) provide access for approved public land uses consistent with public health and safety and other resource value concerns; and 2) provide opportunities for OHV use and activities, including motorized, nonmotorized mechanized, and foot travel where compatible with other resource values (BLM 2008b). The ROD also states that OHV designations for restrictions to existing roads and trails would remain in effect until travel management planning is completed and designated roads and trails are identified. In the RBPA, motorized vehicle use, except for over-the-snow equipment, is limited to existing roads and trails in the Green River and New Fork River SRMAs and the Ross Butte Management Area (BLM 2008b).

Cross-country skiing, snowshoeing, and other similar back-country activities are possible in most areas surrounding and within the RBPA when conditions permit. Although no formal groomed trails are offered, tracks/trails become apparent over time offering plenty of opportunities for solitude and wildlife viewing.

An additional form of motorized recreational use in the RBPA is motorized travel for pleasure. Locals and non-residents may drive the paved and unpaved roads in the RBPA to experience the open vistas and views in the eastern and central portions of the RBPA as well as the mountainous terrain in the western portion of the RBPA. Driving for pleasures affords recreators an easy and convenient way to have a recreational experience, such as wildlife viewing, without leaving the convenience of their vehicle.

As stated, recreators also use the existing roads to access the dispersed recreation opportunities in the RBPA, such as hunting and camping as well to the trails in the Bridger-Teton National Forest. Many people on the east side of the Wyoming Range use the existing roads in the RBPA to access these dispersed recreation opportunities and the Bridger-Teton National Forest.

3.15.4 Lander Road Historic Trail

The congressionally designated Lander Road (of the Oregon Trail) Historic Trail lies within the RBPA. Emigrants traveled across the continent along the Oregon Trail beginning in 1843. Due to increased traffic during the 1850s, the U.S. Government decided to initiate the first road construction project in the west. The result was a 256-mile section of road leading from South Pass, Wyoming, to Fort Hall, Idaho. This segment of road would be known as the Lander Cutoff. This new segment of road afforded water, wood, and forage for emigrants and their stock. Between 1858 and 1912, it provided travelers with a new, shorter route to Oregon and California, saving travel time. After this time however, the Lander Road Historic Trail, as it is referred to in this document, was eventually abandoned due to the invention of the automobile.

Today, the segment of the Lander Road Historic Trail within the RBPA remains as faint ruts in the land that were once created by wagon wheels. As such, some public land users travel portions of the Lander Road to have a cultural experience and try to better relate to the historic days of local emigrant travel on this route. Although the BLM issues commercial permits to outfitter and guide operators for recreational activities such as big game hunting, fishing, and competitive and group activities, there is a growing interest in other types of commercial recreation use PFO planning area including touring historic features such as the Lander Road Historic Trail.

3.16 VISUAL RESOURCES

Visual resources represent the aesthetic quality of the environment as perceived through the visual sense only. As such, many people have differing definitions of what constitutes an aesthetically pleasing environment. Although the BLM is responsible for managing public lands for multiple uses, the agency is also responsible for ensuring that the scenic values of these public lands are considered before allowing uses that may have negative visual impacts. The analysis area for visual resources is limited to lands within and immediately surrounding the RBPA in Sublette County. Special consideration is given to the Lander Road Historic Trail, part of which extends through the RBPA.

3.16.1 Scenic Landscape of the RBPA

The scenic landscape of the RBPA varies greatly from flat open space in the east, rolling hills in the center, to mountainous terrain in the west near the Wyoming Range.

3.16.1.1 East

The landscape in the eastern portion of the RBPA, along U.S. 189, SH 350 near the town of Big Piney, and CR 151, generally consists of open range vegetation with sagebrush and native grasses. The topography consists of flat open spaces with low rolling hills to the south. Linear visual elements consist of structures in the landscape and in certain locations create a high level of visual disturbance. These structures consist of residential neighborhoods, including several farms and small suburban communities, as well as horizontal power and transmission lines and towers and two white water towers that may be approximately 90 feet in height or higher. The predominant line in the landscape to the east and north is the horizon and long flat plane of the sages and grasslands. To the south and west the predominant lines become horizontal and diagonal as rolling hills become the dominant topography. Colors in the landscape vary by season. During the growing season, vegetation is a light grayish-green, which matures and fades to brown for fall and winter seasons. Soils are colors of buff, umber, and light browns. Textures from vegetation and landform are mostly smooth at middle distances, but may be coarse in the foreground due to patchy sagebrush and other human-made disruptions in the landscape. The elevation within this portion of the RBPA is approximately 2,000 meters above mean sea level.

3.16.1.2 Central

The landscape in the central portion of the RBPA consists of a narrow, flat valley floor with floodplains along Middle Piney Creek surrounded by rolling terrain with bluffs. The topography can be characterized as smooth, rolling hills surrounding a flat valley floor. The predominant lines are horizontal and diagonal as rolling hills are the dominant topography. Colors in the landscape vary by season. During the growing season, vegetation is a light grayish-green, which matures and fades to brown for fall and winter seasons. Soils are colors of buff, umber, and light browns. Textures from vegetation and landform are mostly smooth at middle distances, but may be coarse in the foreground due to patchy sagebrush and other human-made disruptions in the landscape. Disruptions to the natural physical characteristics are few, limited only to several unpaved roads and sporadic residential dwelling. Some linear visual disturbances exist within this portion of the RBPA due to the presence of gas wells, well pads, roads, and few sporadic residential dwellings. Otherwise, this area is in a relatively undeveloped setting with an open landscape typical of southwestern Wyoming. Dominant vegetation includes native grasses, sagebrush, and riparian vegetation along Middle Piney Creek. The elevation of this area is approximately 2,250 meters above mean sea level.

3.16.1.3 West

The landscape in the western portion of the RBPA consists of flat open space that quickly gives way to mountainous terrain that can be considered the foothills to the Wyoming Range. The topography can be characterized as rugged with steep canyons, deep drainages, and high elevation plateaus on the mountain tops. Disruptions to the natural physical characteristics are few, limited only to several unpaved roads, sporadic residential dwellings, and one oil rig located west of the location of the proposed M&HRF. The predominant line in the landscape is horizontal and diagonal as rolling hills give way to steep, vertical mountain walls, some of which are topped by horizontal plateaus. Colors in the landscape vary by season. During the winter, there is a high contrast in color between the dominant dark green of the conifer vegetation against the white color of snow. During the spring, summer, and fall, colors of the area consist of a dark green from the conifer vegetation. Textures from vegetation and landform are mostly rough at all distance zones due to the uneven, mountainous terrain. The elevation within this portion of the RBPA is approximately 2,500 meters above mean sea level. As the elevation rises, distant views to the east include the Wind River Mountain Range. Distant views to the west include the Wyoming Range and Bridger-Teton National Forest. With the exception of the noted infrastructure, this portion of the RBPA is in an undeveloped setting with a mountainous landscape.

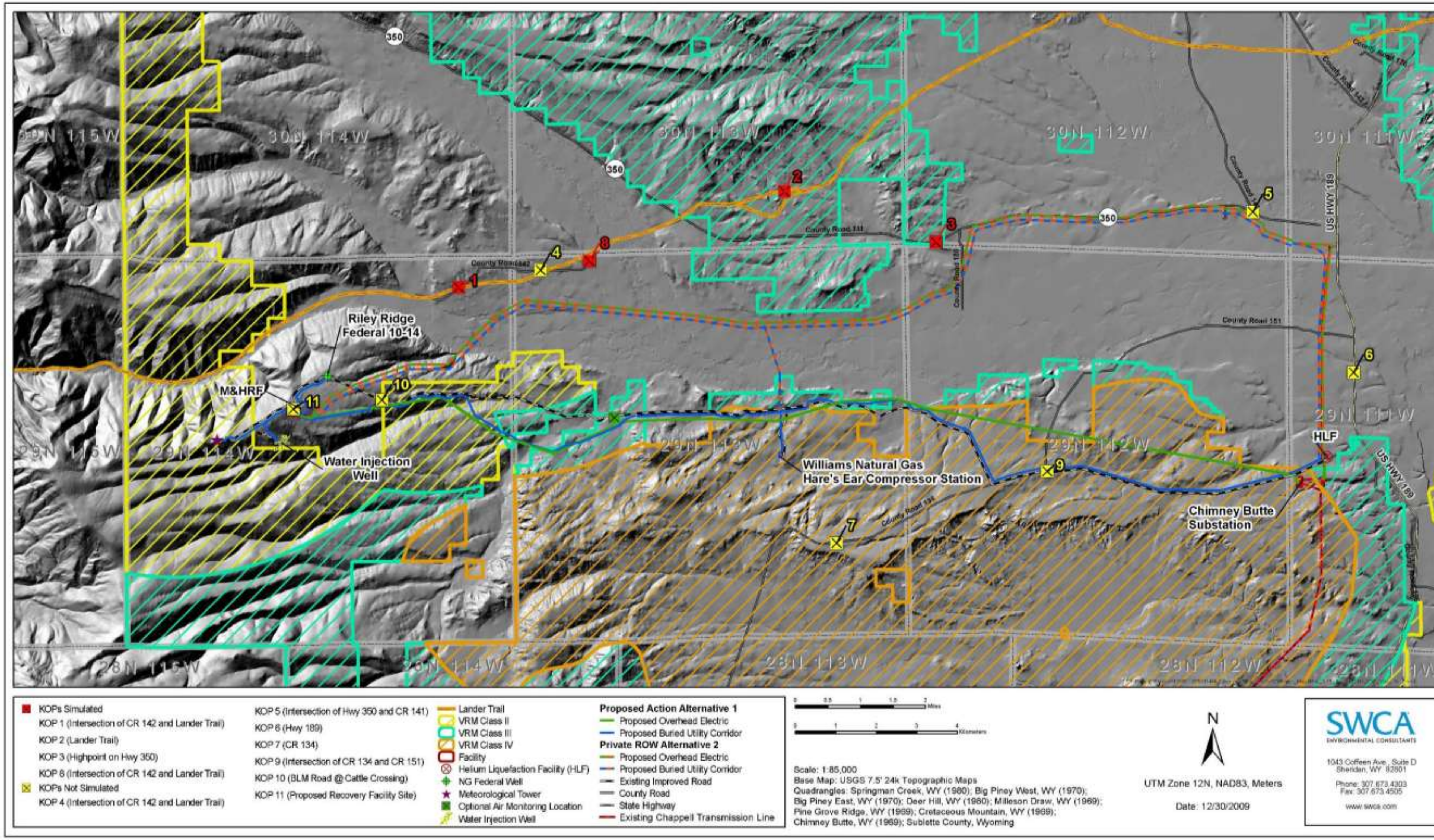
3.16.1.4 Williams Natural Gas Pipeline Expansion Loop

The scenic landscape of the proposed Williams Natural Gas Pipeline Expansion Loop can be characterized as a flat valley floor with smooth, rolling hills to the west and a cliff band to the east of the north/south linear RBPA. Colors in the landscape vary by season. During the growing season, vegetation is a light grayish-green, which matures and fades to brown for fall and winter seasons. Soils are colors of buff, umber, and light browns. Textures from vegetation and landform are mostly smooth at middle distances, but may be coarse in the foreground due to patchy sagebrush and other human-made disruptions in the landscape. There are many disruptions to the natural physical landscape due to the current oil and gas activity in the RBPA. In addition, the natural landscape has been greatly altered by road construction and other infrastructure associated with oil and gas development such as well pads and buildings. As such, the predominant lines in the landscape are vertical in the foreground due to existing infrastructure and horizontal and diagonal in the middleground as the oil and gas infrastructure blends into the hills, cliffs, and horizontal plateaus in the background.

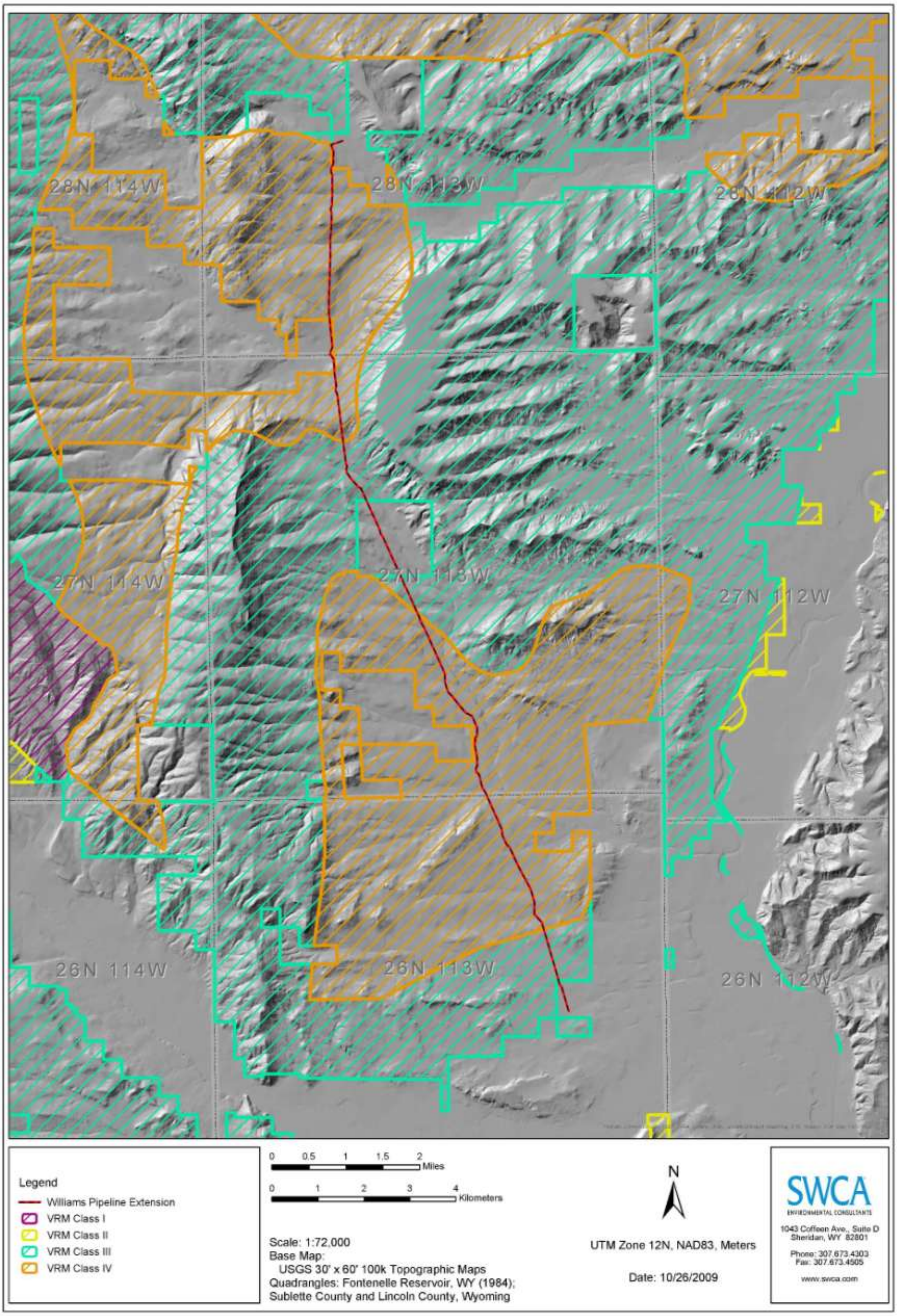
3.16.2 BLM Direction for Visual Resources

The BLM is responsible for managing public lands for multiple uses while ensuring that the scenic values and open space character of the public lands are considered before authorizing actions on public lands. The BLM accomplishes this through the Visual Resource Management (VRM) System. The VRM System classifies land based on visual appeal, public concern for scenic quality, and visibility from travel routes or observation points. The system is based on the premise that public lands have a variety of visual values, where these values mandate different levels of management. Visual values are identified through the VRM inventory (BLM Manual Section 8410) process, which consists of scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. The VRM classes are used to identify the degree of acceptable visual change within a landscape based on the physical and sociological characteristics: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value.

VRM Classes II, III, and IV are located within the RBPA comprising a total of 22,312 acres (Table 3-31; Map 3-17 and Map 3-18). Of this, approximately 6,764 acres of VRM Class II areas are found in the RBPA. This class is located in the western portion of the RBPA near the foothills of the Wyoming Range. There are approximately 4,212 acres of Class III areas found in the RBPA, which can be found is several locations including the north-central area over the Deer Hills area, the southern portion of the RBPA adjacent to the Bridger-Teton National Forest boundary, and small pockets along SH 151 (South Piney Road), South Piney West Road, and adjacent to U.S. 189 at the intersection of SH 182A. Class IV areas comprise approximately 11,336 acres of total VRM class designations in the RBPA and are located in the southern portion along SH 235. In addition, there are 13,739 acres of VRM Class designations in the Williams Natural Gas Pipeline Expansion Loop area. Of this total, approximately 5,122 acres are designated as VRM Class III and 8,617 acres are designated as VRM Class IV.



Map 3-17. Rands Butte Area VRM Classes.



Map 3-18. Williams Pipeline Area VRM Classes.

Table 3-31. VRM Classification in the RBPA.

Name	VRM Class	Total Acreage
Cimarex RBPA	II	6,764
	III	4,212
	IV	11,336
Cimarex RBPA Total		**22,312**
William Pipeline	III	5,122
	IV	8,617
Natural Gas Pipeline Expansion Loop Total		**13,739**

RBPA = Rands Butte Project Area
VRM = Visual Resource Management

The BLM Manual 8431, Visual Resource Contrast Rating, provides the following VRM Class Objectives that are located in the RBPA (BLM 1986):

> Class II Objective: The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
>
> Class III Objective: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objective: The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impacts of these activities through careful location, minimal disturbance, and repeating the basic elements.

VRM class areas are generally required to conform to objectives and characteristics of the classification, or the project will be modified to meet the class objective. Short-term modifications in portions of VRM class areas may be approved if site-specific analysis determines that impacts would be within an acceptable threshold.

3.16.2.1 <u>BLM Distance Zones</u>

In addition to the VRM classes, the BLM uses distance zones to describe the part of a characteristic landscape that is being inventoried or evaluated. The four distance zones are described in Table 3-32.

Table 3-32. BLM Distance Zones, Average Distances, and Descriptions.

Distance Zone	Average Distance	Description
Foreground	1 foot – ¼ mile	Individual plants and landscape features are visible and detailed.
Middleground	¼ mile – 3 to 5 miles	Texture and forms of individual plants are no longer apparent.
Background	3 to 5 miles – 15 miles	Vegetation and landscape features appear as patterns and massing.
Seldom Seen	Obstructed view or 15+ miles	Portions of the landscape generally are not visible or over 15 miles away.

Source: BLM Manual H-8410-1, Visual Resource Inventory

The BLM also protects the visual integrity of historic trails. Surface disturbance is prohibited within either 0.25 mile or the visual horizon (whichever is closer) of historic trails (BLM 2008b). The Lander Road Historic Trail, once a wagon route to Oregon and California, traverses the center of the RBPA. Today the trail has largely returned to its original condition and has revegetated to sagebrush, but remnants of wagon wheels in the form of ruts are apparent.

3.16.3 Viewer/User Groups

The viewsheds within the RBPA were analyzed to identify the viewers that travel through or live within these areas and which level of sensitivity each type of viewer may have for landscape change. Key observation points (KOPs) were then selected to represent the average experience of traveling through the landscape and the scenery associated with each location or view corridor. Several factors were analyzed to guide the selection of KOPs to evaluate the impacts of Project activities in terms of landscape change and contrast with the surroundings, including type of users, amount of use, public interest, and sensitivity of each viewer type.

The RBPA can be viewed from U.S. 189, which runs north-south along the east end of the RBPA; SH 350 (Middle Piney Road), which runs east–west within the eastern portion of the RBPA; CR 142, which starts where the paved SH 350 ends in the central and western portions of the RBPA; CR 151 (South Piney Road), which runs east-west in the eastern part of the RBPA; and CR 134 (Big Piney-Calpet Road), which runs east-west in the eastern portion of the RBPA, then turns sharply south in the central portion of the RBPA. A BLM road extends off of CR 235, which runs east-west into the RBPA and ultimately serves as the main access road to the location of the proposed M&HRF. Some people may also view the area if using the unimproved roads and two-track roads that provide access to ranches, well pads, and industrial sites within the RBPA. Recreational users include hunters, OHV users, and people visiting the Lander Road.

Travelers driving through the RBPA would have temporary views of the RBPA. Passengers in moving vehicles would have greater opportunities for off-road views of the Project than would drivers. Some people using these roads are industrial employees accessing local oil and gas fields in the RBPA. Viewers also include local residents traveling to and from their homes, including homeowners in neighborhood developments and on ranches, hunters, recreators accessing the Bridger-Teton National Forest at the west end of the RBPA, and visitors to the Lander Road Historic Trail. Average daily traffic for the highways and major roads in the area are reported in Section 3.14.

Generally, most residents are expected to be highly sensitive to changes in the landscape that can be viewed from their homes and neighborhoods. Industrial users are expected to have a low sensitivity to changes in the landscape. Recreational, including cultural users, would be sensitive to changes in the landscape. In the RBPA, recreation includes primitive activities such as hunting and fishing, as well as visitors to the Lander Road Historic Trail. Recreational users may also be traveling through the area to reach the Bridger-Teton National Forest.

3.16.3.1 Key Observation Points

KOPs represent the most critical viewpoints or typical views encountered in representative landscapes along the proposed route. Eleven potential KOPs were identified within the RBPA. Based on sensitivity analysis per BLM Handbook H-8410-1, four KOPs were identified and visually simulated, which are discussed below. All KOPs are discussed in the Visual Impact Assessment Report.

KOP 1 is located on South Piney Road (CR 142) at the intersection with the Lander Road Historic Trail (Photograph 3-1). Although this KOP is located on private land, it represents the current view drivers have when traveling west on CR 142 accessing the Bridger-Teton National Forest. A trail marker for the Lander Road Historic Trail is approximately 50 yards up the trail denoting its historical significance. KOP 2 looks west and south from near a contributing section of the Lander Road Historic Trail (Photograph 3-2). This KOP is located on BLM-administered lands within a VRM Class III area on the north-central part of the RBPA (see Photograph 3-2 representing the existing conditions view). KOP 3 is located on a high point on SH 350 in a VRM Class III area (Photograph 3-3). This KOP represents an elevated view drivers have when traveling west on the highway. KOP 8 is located on South Piney Road (CR 142) on private land (Photograph 3-4). This KOP was chosen because it is located on an undetermined section of the Lander Road Historic Trail and represents the view of visitors to the trail as well as views from nearby residential neighborhoods.

All KOPs existing and simulated views are discussed in the Visual Impact Assessment Report.

The existing landscape viewed from KOPs 1 and 8 is generally rolling hills and open space in the foreground to the south with mountainous terrain in the background view to the west. The view is dominated by a plateau/mountain-sky horizon, with several contrasting elements in the landscape, such as rocks and outcrops, variable trees, and other contrasting vegetation. Existing features include open land vegetated with low-growing sagebrush on rolling hills giving way to rugged mountainous terrain with dark, conifer vegetation. Although there is one vertical structure in the foreground to the west, no other vertical structures exist in the viewshed. The existing landscape viewed from KOPs 2 and 3 includes rolling hills of sagebrush in the foreground, a horizontal mountain plateau line with sporadic trees along the plateau in the middle ground, and rolling hills in the background.

Photograph 3-1. KOP 1, existing view from intersection of CR 142 and the Lander Road Historic Trail, looking southwest.

Photograph 3-2. KOP 2, existing view from near the Lander Road Historic Trail, looking southwest.

Photograph 3-3. KOP 3, existing view from SH 350, looking due south.

Photograph 3-4. KOP 8, existing view from CR 142, looking southwest.

3.17 AIR QUALITY

This section discusses the setting for the Proposed Action in relation to regulated air pollutants and greenhouse gases. Characteristics of visibility and acid deposition in nearby Class I areas are also discussed. Additional general information on air quality is contained in Chapter 3 of the Pinedale RMP (BLM 2008b). The BLM ROD contains air quality management objectives and actions as well.

This Project is primarily a gas extraction and separation project. For natural gas systems, the EPA categorizes emissions from distinct stages of development and production. These stages include exploration, well development, product production, processing, transmission and storage, and distribution. The BLM has regulatory jurisdiction only over well development and field production. For new energy development, the BLM, through the RMP, has the authority to require actions to control dust, use alternative power sources, and implement BMPs. Appendix G contains the BLM Pinedale Field Office's Best Management Practices that detail mitigation measures that would be considered.

3.17.1 Other Agency Laws and Regulations

The EPA has the primary responsibility for regulating air quality, including 7 regulated ambient air pollutants and about 180 hazardous air pollutants. The primary responsibility for implementing and enforcing the provisions of the Clean Air Act rests with the individual states. Ambient air quality in a specific geographic area is designated by the federal government as Class I or Class II. Class I areas are usually pristine wilderness areas or have important natural characteristics that require good visibility for enjoyment and use by the public (e.g., National Parks). Visibility resources in designated Class I areas are discussed further in later parts of this section. Any area that is not designated Class I is by default considered Class II.

3.17.1.1 Clean Air Act

The Clean Air Act was passed in 1963 by Congress and has been amended several times. The 1970 Clean Air Act Amendments strengthened previous legislation and laid the foundation for the overall regulatory scheme. In 1977, Congress again added several provisions, including requirements for areas not meeting National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration program.

The NAAQS consist of three parts: a regulated compound, an allowable maximum ambient concentration, and time period over which the concentration is averaged. The NAAQS maximum allowable concentrations are derived from studies on human health, crops, vegetation, and materials (e.g., damage to rubber). The averaging times are based on whether the damage caused by the pollutant is more likely to occur during short exposures to a high concentration (e.g., one hour) or to a relatively lower average concentration over a longer period (e.g., 24 hours). For many criteria pollutants, there is more than one air quality standard, reflecting both short- and long-term effects (Table 3-33).

Table 3-33. National Ambient Air Quality Standards.

Pollutant	Averaging Time	Primary Standard	Secondary Standard
Ozone	8-hour	0.075 ppm	Same as primary
Respirable PM_{10}	24-hour	150 µg/m^3	Same as primary
Respirable $PM_{2.5}$	24-hour	35 µg/m^3	Same as primary
	Annual arithmetic mean	15 µg/m^3	
Carbon monoxide	8-hour	10,000 µg/m^3	None
	1-hour	40,000 µg/m^3	
Nitrogen dioxide	Annual arithmetic mean	100 µg/m^3	Same as primary
Sulfur dioxide	Annual arithmetic mean	80 µg/m^3	None
	24-hour	365 µg/m^3	
	3-hour	None	1,300 µg/m^3
Lead	Calendar quarter	1.5 µg/m^3	Same as primary

Note: Data from EPA (2008a); PM_{10} = particulate matter of 10 microns or less; $PM_{2.5}$ = particulate matter of 2.5 microns or less; µg/m^3 = micrograms per cubic meter; ppm = parts per million.

Note: The Wyoming Ambient Air Quality Standards are effectively the same as the National Ambient Air Quality Standards.

3.17.1.2 State of Wyoming

The WDEQ is responsible for meeting state and federal air standards. To accomplish this, the WDEQ Air Quality Division has people working in four main offices and a number of program areas. These program areas include air monitoring, permitting new and existing sources, and planning. The agency oversees various studies and special-purpose programs, including measuring visibility, open burning, and fossil fuel energy development. The WDEQ has primary responsibility to review the Cimarex natural gas plant and determine emission control requirements; the WDEQ issued permit #CT-8093 for the plant on June 18, 2009. Other parts of the proposed Project (e.g., construction) would not be subject to WDEQ permit. The BLM, through the management goals of the RMP and ROD, would coordinate emission mitigation programs with the WDEQ to protect public health and welfare.

3.17.2 Pollutants of Concern

The NAAQS are set for the most common and widespread pollutants including ozone. The 8-hour standard for ozone has been exceeded for a number of years in Wyoming and the state has requested the EPA to take action, which begins with formal re-designation to non-attainment. The pollutants regulated by the NAAQS are discussed in detail below.

3.17.2.1 Criteria Pollutants

3.17.2.1.1 Ozone

Ground-level ozone (O_3) smog usually is not emitted directly into the atmosphere, but is a secondary air pollutant produced through chemical reactions involving volatile organic carbons (VOCs) and oxides of nitrogen (NO_x, discussed further below). Sunlight drives this reaction, thus, ozone smog is formed primarily on sunny days, and is not formed at night. Since VOCs and NO_x are known ozone precursor compounds, ozone control efforts focus on reducing these emissions. Ozone plumes may persist for several days and travel hundreds of miles, impacting air quality far downwind. Ground-level ozone can cause significant damage to crops, material (such as rubber), and human health—especially affecting those persons with chronic conditions such as asthma.

3.17.2.1.2 Carbon Monoxide

Carbon monoxide (CO) is a non-reactive pollutant that is a product of incomplete combustion. Ambient CO concentrations generally follow the spatial and temporal distributions of stationary or mobile sources. Concentrations are also influenced by wind speed and atmospheric mixing. When inhaled, CO combines with hemoglobin in the blood, and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues.

3.17.2.1.3 Oxides of Nitrogen

Fuel combustion usually creates oxides of nitrogen (NO_x), typically NO. While NO is mildly toxic by itself, nitrogen dioxide (NO_2) is about 200 times more toxic. NO is an ozone precursor and atmospheric ozone generation also converts some NO to NO_2 (a powerful greenhouse gas). NO_2 is the whiskey-brown colored gas readily visible during periods of heavy air pollution. Ozone smog formation also creates some N_2O_5 and peracylacetylnitrates. Because of the complex chemistry of smog formation, the criteria pollutant measured and reported is $NO_{2.}$ Elevated NO_x concentrations are associated with increased acute and chronic respiratory disease. Major sources of NO_x include motor vehicles, wildfires, fuel combustion, and agricultural burning.

3.17.2.1.4 Sulfur Dioxide

Sulfur dioxide (SO_2) is formed by combustion of sulfur-containing compounds; suspended sulfates are the product of further oxidation of SO_2. In some parts of the state elevated levels can also be due to natural causes such as geologic vents and hot springs. SO_2 often combines with water vapor to form sulfuric acid mist or acid rain. Thus, breathing SO_2 is harmful to all animals, and it is also damaging to trees and other plants endemic to the RBPA.

3.17.2.1.5 Particulate Matter

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

- PM_{10}, particles with diameters less than 10 micrometers, are small enough to be inhaled and can cause adverse health effects.
- $PM_{2.5}$, particles with diameters less than 2.5 micrometers, are so small that they can be drawn deeply into the lungs and cause serious health problems. Particles in this size range are also the main cause of visibility impairment. Some research indicates $PM_{2.5}$ can directly cross cell walls in the lungs and enter the bloodstream.

Combustion, dust from industrial activities, agricultural burning, and secondary formation from vehicle exhaust are all significant sources of PM_{10} and $PM_{2.5}$. Residential wood burning can also be a significant source in some areas. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as power plants, have a more regional impact.

3.17.2.1.6 Lead

Excessive exposure to lead (Pb) concentrations can result in gastrointestinal effects, anemia, kidney disease, and severe cases of neuromuscular and neurological dysfunction. Gasoline containing tetraethyl lead used to be the major source of airborne lead in the United States. The United States eliminated use of lead additives in motor vehicle fuel and lead levels in ambient air has declined substantially as a result. The rest of the developed world is following suit phasing out lead in gasoline.

The NAAQS are concentrations of air pollution above which the EPA has determined that serious health and welfare consequences could occur, and are shown in Table 3-32.

3.17.2.1.7 Additional Pollutants of Concern Potentially Emitted by Oil and Gas Drilling and Well Operation

3.17.2.1.7.1 Sulfates

As previously mentioned, sulfates are a type of transformed pollutant. Originating as a gas, typically SO_2, sulfates are a salt of sulfuric acid containing the $–SO_4$ group. Sulfates are often found in the atmosphere as a fine particulate, tend to be acidic, and are known to contribute to premature death in individuals with pre-existing respiratory disease. They can also deposit on material surfaces and damage crops and forests, cause rust, decay marble, or mar painted surfaces. A primary local source of sulfates is industrial activities, such as a coal-fired power plants or oil refineries. A more widespread source is combustion of diesel fuel containing sulfur. Non-anthropogenic sources of sulfates are primarily active volcanoes. With the many wilderness lakes in Wyoming, sulfate deposition presents a serious concern for acidic degradation.

3.17.2.1.7.2 Nitrates

Nitrates are a type of transformed pollutant. Originating as a gas such as NO_2, nitrates are a salt of nitric acid containing the $–NO_4$ group. They are often found as a fine particulate. Nitrates mix with water and form nitric acid, and they are known to contribute to premature death in individuals with pre-existing respiratory disease. Nitrates can also deposit on material surfaces and damage crops and forests, cause rust, decay marble, or mar painted surfaces. A primary source of nitrates near the proposed Project is fuel combustion. As with sulfates, nitrates present a danger to the many wilderness lakes in Wyoming, since changes in pH can kill fish and plants. In some cases acidic particle deposition has created sterile environments where wildlife once thrived.

3.17.2.1.7.3 Hydrogen Sulfide

Hydrogen sulfide (H_2S) is found in nature around some hot springs and geothermal sources and some oil fields (where it is called sour gas). It is also produced by anaerobic decomposition and is sometimes called swamp gas. The human nose can detect H_2S at concentrations well below toxic levels. Low concentrations of this gas are considered obnoxious and unpleasant. At higher levels it de-sensitizes the nose and can be fatal because it blocks oxygen uptake by the blood. H_2S is mainly a health threat to refinery and oil field workers; it is usually regulated to avoid nuisance to nearby residents or property owners. Heavier than air, an emergency H_2S release would stay near the ground with low wind speeds.

3.17.2.1.7.4 Nitrogen and Sulfur Compounds

NO_2 is a red-brown gas formed during operation of internal combustion engines. Such engines emit a mixture of nitrogen gases, collectively called nitrogen oxides (NO_x). NO_2 can contribute to brown cloud conditions, and can react with other nitrogen compounds to form ammonium nitrate particles and nitric acid, which can cause visibility impairment and acid rain. Microbiological activity in soil can be a natural source of nitrogen compounds.

SO_2 forms during combustion from trace levels of sulfur in coal or diesel fuel. It can react with ammonium to form ammonium sulfate ($[NH_4]_2SO_4$) and with water vapor to form sulfuric acid (H_2SO_4), which can cause visibility impairment and acid rain. Emissions from volcanoes are natural sources of SO_2. Anthropogenic sources include refineries and power plants.

Sulfur and nitrogen compounds that can be deposited on terrestrial and aquatic ecosystems include nitric acid (HNO_3), nitrate (NO_3-), ammonium (NH_4+), and sulfate (SO_4--). Nitric acid (HNO_3) and nitrate (NO_3-) are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NO_x); and sulfate (SO_4--) is formed in the atmosphere from industrial emission of sulfur dioxide (SO_2). Deposition of HNO_3, NO_3- and SO_4-- can adversely affect plant growth, soil chemistry, lichens, aquatic environments, and petroglyphs (ancient carvings and/or engravings on rock surfaces). Ammonium (NH_4+) is volatilized from animal feedlots and from soils following fertilization of crops. Deposition of NH_4+ can affect terrestrial and aquatic vegetation via soil nitrogen balance and aqueous nitrogen chemistry. While this type of deposition may be beneficial as a fertilizer, it can adversely affect plant growth stages such as budding, leafing development maturation and reproduction.

3.17.3 Existing Air Quality

3.17.3.1 <u>Criteria Pollutants</u>

Local air quality is determined by atmospheric pollutants chemistry, dispersion characteristics, meteorology, and terrain. Ambient air quality is measured at three locations in Sublette County. Table 3-34 summarizes the highest monitored levels of these compounds in 2008. Values in bold are exceedences of the NAAQS.

Increased emission sources in west-central Wyoming, including increased oil and gas development, are contributing to degrading air quality. The WDEQ and EPA are concerned with potential health impacts from air pollutants, and the area is likely to be designated non-attainment for the 8-hour ozone standard. Additionally, an overall haze and the brownish discoloration of NO_x can often be seen in the skies, which impacts visibility. These factors are discussed below.

Table 3-34. Existing Air Quality 2006–2008.

Pollutant	Location	Comparison to the NAAQS
Ozone	WDEQ Daniel Monitor (5 miles south of Daniel, WY)	0.072 ppm (2006–2008 Design Value 4th highest eight hour average)
CO	WDEQ Murphy Ridge Monitor (Bear River, WY)	0.7 ppm (2008 highest 8-hour average) 0.9 ppm (2008 highest 1-hour average)
SO_2	WDEQ Murphy Ridge Monitor (Bear River, WY)	0.001 ppm (2008 annual average) 0.003 ppm (2008 2nd highest 24-hour average)
NO_2	WDEQ Daniel Monitor (5 miles south of Daniel, WY)	0.003 ppm (2008 annual arithmetic mean)
PM_{10}	WDEQ Daniel Monitor (5 miles south of Daniel, WY)	27 μg/m^3 (2008 highest 24-hour average)
$PM_{2.5}$	WDEQ Pinedale Monitor (101 East Hennick, Pinedale, WY)	6.6 μg/m^3 (2008 annual average) 16 μg/m^3 (2006–2008 Design Value 24-hour 98th percentile average)

Source: EPA 2009c
μg/m^3 = micrograms per cubic meter
ppm = parts per million
Bolded values indicate exceedance of NAAQS

3.17.3.2 Protecting Visibility in Important Natural Areas

The Clean Air Act outlines different classes of air quality protection. Generally, Class I areas are the most pristine and any emission sources located in or near them have strict emission limits set by regulatory agencies. Class I areas include wilderness areas 5,000 acres or greater in size and designated as such before August 8, 1977. Both state and federal agencies generally have a legal responsibility to protect the air quality related values within a Class I area. These responsibilities focus on protecting views and expansive vistas, and subsequently, human health is also protected through lowered concentrations of particulate and other pollutants (such as sulfur dioxide) that can be inhaled.

In Class II areas, regulators set emission limits to meet or maintain the criteria pollutant standards (see Table 3-32). Class II areas usually experience ambient pollution levels that limit visibility for many days of the year. Any area that is not designated Class I is by default considered Class II (Figure 3-7).

Figure 3-7. Federal and state Class I areas in Wyoming.
Source: WDEQ 2009b.

One of the primary attributes of western national parks is the ability to see extraordinary and dramatic vistas and archaeological sites in a near-natural state. The National Park Service (NPS) has conducted air monitoring for approximately 30 years at many of the western parks and uses various techniques to measure and describe how far one can see, or *visibility*. Wilderness areas are also prized for their grand vistas, an attribute that is diminished by air pollution. Visibility is usually expressed in terms of light extinction or diminishment of visible sight (e.g., one can see 100 miles on an unpolluted day but only 20 miles on a day with considerable haze from smog). The NPS has conducted extensive evaluations of the air pollutants that reduce visibility. These are summarized for two areas near the RBPA as shown in Table 3-35. Note that Badlands National Park (South Dakota) data are shown for comparison.

Table 3-36 shows that sulfates (primarily from burning coal and oil containing sulfur) are the primary source of visibility impairment. Soil disturbance and nitrates emitted from fuel combustion are significant as well.

All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

Table 3-35. Sources of Visibility Reducing Compounds in Class I Areas near Pinedale.

Compound	Sources	Class I Area		
		Yellowstone NP	Bridger Wilderness	Badlands NP (South Dakota)
Sulfates	Utility and industrial boilers	34%	40%	48%
Crustal materials (soil dust)	Roads, construction, and agriculture	14%	21%	7%
Elemental carbon (soot)	Combustion of wood, diesel, and other materials	8%	8%	3%
Organic carbon	Autos, trucks, and industrial processes	37%	23%	12%
Nitrates	Motor vehicles and industrial boilers	7%	8%	30%

Source: EPA 1997 (2008b)
NP = National Park.

Table 3-36. Summary of Current Atmospheric Deposition.

Deposition Component	Description
Precipitation pH	Precipitation pH demonstrates some acidification • Pinedale: 4.8–5.4 • Yellowstone National Park: 5.2–5.6
Total nitrogen deposition	Total nitrogen deposition is less than levels of concern • Pinedale: 1.0–1.5 kg/ha-yr
Total sulfur deposition	Total sulfur deposition is less than levels of concern • Pinedale: 1.0–2.0 kg/ha-yr

Source: EPA 2008b.
kg/ha-yr = kilogram per hectare-year
Level of Concern (LOC) for nitrogen is 1.5 kg/ha-yr. LOC for sulfur is 3.0 kg/ha-yr.

Prevention of Significant Deterioration

The goal of the Prevention of Significant Deterioration (PSD) program is to ensure that air quality in areas with clean air does not significantly deteriorate, while a margin for future industrial growth is maintained. Under the PSD program, each area in the United States is classified by the air quality in that region according to the following system:

- **PSD Class I Areas.** Areas with pristine air quality, such as wilderness areas, national parks, and some Indian reservations, are accorded the strictest protection. Only very small incrementalincreases in pollutant concentrations are allowed in order to maintain the very clean air quality inthese areas.
- **PSD Class II Areas.** Essentially, all areas that are not designated as Class I are designated as Class II. Moderate incremental increases in pollutant concentrations are allowed, although the concentrations are not allowed to reach the concentrations set by Wyoming and federal standards (WAAQS and NAAQS).

- **PSD Class III Areas.** No areas have been designated yet as Class III. A larger incremental increase in pollutant concentrations would be allowed, up to the WAAQS and NAAQS.

Table J-1. National and Wyoming Ambient Air Quality Standards

Pollutant	Average Time	NAAQS ($\mu g/m^3$)	WAAQS ($\mu g/m^3$)
Carbon Monoxide (CO)	1 hour	40,000	40,000
	8 hours	10,000	10,000
Nitrogen Dioxide (NO_2)	Annual	100	100
Ozone (O_3)	1 hour	235	235
	8 hours	157	157
Particulate Matter (PM_{10})	24 hours	150	150
	Annual	50	50
Particulate Matter ($PM_{2.5}$)	24 hours	65	65
	Annual	15	15
Sulfur Dioxide (SO_2)	3 hours	1,300[1]	1,300
	24 hours	365	260
	Annual	80	60
Hydrogen Sulfide (H_2S)	½ hour[2]	-	70
	½ hour[3]	-	40

Sources: Wyoming DEQ 2004; EPA 2005
[1]Secondary standard only, as there is no 3-hour federal primary standard for SO_2.
[2]Average not to be exceeded more than two times per year.
[3]Average not to be exceeded more than two times in any 5 consecutive days.
$\mu g/m^3$ micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
WAAQS Wyoming Ambient Air Quality Standards

Table J-2 provides the incremental increases allowed for specific pollutants in Class I and Class II areas. Comparisons of potential PM_{10}, NO_2, and SO_2 concentrations with PSD increments are intended to evaluate a threshold of concern only and do not represent a regulatory PSD increment consumption analysis. Regulatory PSD increment consumption analyses are solely the responsibility of the State of Wyoming, which has been granted primacy (with EPA oversight) under the CAA. In project-specific EAs, the BLM does not expect that a PSD analysis will be performed; rather, the PSD standards are used as a reference only to give the public a better understanding of the level of potential impact.

Table J-2. Prevention of Significant Deterioration Increments

Pollutant	Average Period	PSD Increment Class I	PSD Increment Class II
Sulfur Dioxide SO_2	3-hours 24-hours Annual	25 5 2l	512 91 20
Particulate Matter PM_{10}	24-hours Annual	8 4	30 17
Nitrogen Dioxide NO_2	Annual	2.5	2.5
Carbon Monoxide CO	1-hour 8-hours	None None	None None
Lead	3-months	None	None

Source: Wyoming DEQ 2004
PSD Prevention of Significant Deterioration

3.17.3.3 Acid Deposition in Sensitive Water Bodies

Atmospheric deposition is the processes where air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems. Scientifically it is reported as the mass of material deposited on an area per unit time, (kilograms per hectare-year [kg/ha-yr]). Total deposition of air pollutants includes rain or fog, and dry deposition. Dry deposition is gravitational settling of particles and adherence of gaseous pollutants to soil, water, and vegetation, which includes:

- acids such as sulfuric acid and nitric acid (sometimes referred to as *acid rain*);
- air toxics such as pesticides, herbicides, and VOCs; and
- nutrients such as nitrate and ammonium (a nitrogen-based compound with formula NH_4).

Current atmospheric deposition in the RBPA is included in Table 3-35. These data show a slight precipitation acidification in Pinedale from 1994 through 2004 and near-natural precipitation pH in Yellowstone National Park from 1980 through 2004. Typical pH for remote areas ranges from 5.0 to 5.6, representing the natural acidity of rainwater (Seinfeld 1986). Precipitation pH values lower than 5.0 are considered acidified and may adversely affect plants and animals. A voluntary level of concern for a decrease in pH levels in rainwater has been estimated to be 0.1 to 0.2 (BLM 2008b). Nitrogen deposition from nitrate and ammonium is less than levels of concern (1.5 kg/ha-yr). Sulfur deposition from sulfate and sulfur dioxide is also less than levels of concern (3.0 kg/ha-yr).

Atmospheric deposition of nitrogen and sulfur compounds can cause acidification of lakes and streams. Lake acidification is expressed as the lake's ability to resist pH change due to atmospheric deposition. This is usually referred to as acid neutralizing capacity (ANC), expressed in units of micro-equivalents per liter (μeq/l). Lakes with ANC values of 25 to 100 μeq/l are considered to be sensitive to atmospheric deposition; lakes with ANC values of 10 to 25 μeq/l are considered to be very sensitive; and lakes with ANC values of less than 10 μeq/l are considered to be extremely sensitive. The USFS has collected site-specific lake chemistry background data (pH, ANC, elemental concentrations, etc.) in various wilderness mountain lakes near the RBPA, summarized in Table 3-37.

The distances shown in Table 3-37 were obtained by measuring from the nearest part of the outside RBPA boundary to the nearest edge of the lake.

Table 3-37. Representative Background Acid Sensitive Lakes near the Proposed Project.

Lake	Wilderness Area	Direction from RBPA	Distance in Miles	10th Percentile Lowest ANC Value (µeq/l)	Number of Samples	Sensitivity	Period of Monitoring
Black Joe	Bridger	East	50	67.1	67	Sensitive	1984–2005
Deep	Bridger	East	49	59.7	64	Sensitive	1984–2005
Hobbs	Bridger	Northeast	41	69.9	71	Sensitive	1984–2005
Upper Frozen	Bridger	East	49	6	8	Extremely Sensitive	1997–2005
Ross	Fitzpatrick	Northeast	63	60.4	33	Sensitive	1988–2008
Lower Saddlebag	Popo Agie	East	57	54.2	32	Sensitive	1989–2005

Source: Pinedale Anticline Project Area SEIS (BLM 2008c).
µeq/l = micro-equivalents per liter
ANC = acid neutralizing capacity

3.17.3.4 Greenhouse Gases

The EPA has identified primary greenhouse gases (GHG) as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), water vapor, and several trace gasses. These gases would potentially be created by the construction and operation phases of the proposed Project. GHG have the potential to contribute to climate change which could influence indirectly the activities conducted on public land managed by the BLM, ranging from droughts and decreased grazing, to diminished timber harvests.

Greenhouse gas emissions decrease the amount of heat energy radiated by the earth back into space. Although greenhouse gas levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused greenhouse gas concentrations to increase more rapidly than at any time in the last 600,000 years. Greenhouse gases are not currently regulated by the EPA under the Clean Air Act, but the Supreme Court has affirmed the agency's authority to do so.

Between 1890 and 2006, global mean surface temperatures increased nearly 1.0 degree Celsius (°C) (1.8°F) (Goddard Institute for Space Studies 2007). Observations and predictive models used by the Intergovernmental Panel on Climate Change (IPCC) indicate that average temperature increases this century are likely to increase 1.4°C to 5.8°C (2.5°F to 10.4°F) above 1990 levels. The 2007 geophysical year, from research conducted at the earth's poles, indicates that ice melting and sea level temperature increases are occurring faster than predicted by the IPCC, which used conservative consensus numbers (IPCC 2007). Some scientists have indicated that methane trapped in Polar Regions could be released during ice melt creating an almost unstoppable recursive cycle of heating and melting.

Credible scientific forecasts are now tending toward the upper temperature estimate of an almost 10°F gain in the coming century. Additionally these changes will be relatively permanent in terms of human history. According to a recent report published by the National Academy of Sciences,

> The severity of damaging human-induced climate change depends not only on the magnitude of the change but also on the potential for irreversibility. Climate change that takes place due to increases in carbon dioxide concentration is largely irreversible for 1,000 years after emissions stop. Following cessation of emissions, removal of atmospheric carbon dioxide decreases radiative forcing, but is largely compensated by slower loss of heat to the ocean, so that atmospheric temperatures do not drop significantly for at least 1,000 years. (National Academy of Sciences 2006).

In 2007, the Supreme Court ruled that GHGs fit within the CAA's definition of a pollutant, and that the USEPA has the authority to regulate GHGs (US Supreme Court No. 05-1120, April 2, 2007). At the time of this EA there are no promulgated federal regulations limiting GHG emissions. Global climate change is a cumulative impact and projects participate in this potential impact through incremental contribution of GHGs.

3.18 LIGHT AND GLARE

This section describes the existing sources of light and glare within the RBPA. "Light" is defined as that portion of the electromagnetic spectrum that is visible to the naked eye. "Glare" is the reflective light that is strong enough to produce an annoyance, discomfort, or a reduction in the viewer's ability to see.

There are currently no regulations or statutes concerning outdoor lighting restrictions in Wyoming. However, a bill has been introduced (SF0027, State of Wyoming 2009) seeking to add wording to the Wyoming Statutes that, in effect, authorizes municipalities and counties to restrict outdoor lighting. Although several individual cities and counties (Cody, Laramie, and Albany) are currently working to pass their own regulations, there are no standards or regulations in Sublette County. The FLPMA discusses the issue only as it relates to land use planning, requiring land use plans to "provide for compliance with applicable pollution control laws, including state and federal air, water, noise, *or other* pollution standards or implementation plans." For purposes of this EA, light is considered as an aesthetics issue.

The RBPA is comprised of hills, valleys, and elevated plains and gradually gains in elevation as it nears the Bridger-Teton National Forest. The west end of the RBPA is reasonably prominent and visible from Big Piney, but other views to the area vary by location, elevation, and surrounding vegetation. Current outdoor illumination in the RBPA is very limited and is indicative of many rural Wyoming areas. Widely spaced residential homes in agricultural or ranching settings include lighted buildings of varying heights, surrounded by vegetated open space. Areas of oil and gas development are sparsely lighted, limited mostly to lights produced by traffic into and out of the area, temporary drilling rigs, and appurtenant facilities. No significant lighting or glare issues currently exist within the RBPA. The dominant sources of light offer little light or glare during daylight or nighttime.

3.19 NOISE

Noise, defined as unwanted sound, has two sources: line and point. Line source noise is produced by moving objects along a linear corridor, the most common example being roadways. Point source noise is generally associated noise that remains in one place for extended periods of time, such as construction activities and industrial operations.

Noise can be an irritant to human and animal receivers. Sensitive human and animal receivers, identified by the presence of homes, sage-grouse leks, and big game migration routes, exist in the RBPA. Specific regulations exist that establish thresholds for significant and dangerous noise levels within specific industrial work settings, such as drill rigs, well pads, compressor stations, gas plants, and other industrial work places. However, no similar standards exist to regulate noise experienced by non-industrial receptors, either human or wildlife, on federal or state lands, in Sublette County, or within the town limits of Big Piney.

Noise is measured in dBa, with noise audible to humans beginning at 10 dBa, noise levels irritating to humans beginning at 80 dBa, and noise at the level of 85 dBa (for prolonged periods of time) causing damage to the human ear. Noise is cumulative, with additional noise sources increasing the dBa experienced at a receptor.

The relationship between noise and distance is related to the dBa level at the source and the distance to the receptor. Noise levels attenuate (fall off) at a rate of approximately 6 dBa with each doubling of distance from isolated noise sources (Blickley and Patricelli 2007). If the noise source is continuous, such as that emitted by a drill rig or traffic along a roadway, sound levels decrease by about 3 dBa for every doubling of distance (SE Group 2004). Whether the noise source is located on a “hard site” (generally a flat, hard surface such as water or concrete) or a “soft site” (normal, unpacked earth with a vegetative cover and/or hilly topography) can also affect noise attenuation.

The RBPA is predominantly considered to be agricultural and industrial (oil and gas); commonly occurring background noises also occur (Table 3-38). Standard ambient background noise levels in the RBPA are generally low. Outside of development areas, noise levels can be characterized as “rural,” or “natural,” and sources include wind, thunderstorms, livestock, and wildlife.

Industrial noise sources in the RBPA include traffic, three compressor stations, drill rigs, trucks, equipment servicing the well fields, and 695 approved or producing wells. Table 3-39 summarizes the known and extrapolated noise data for the Hare’s Ear Compressor Station and drill rigs known to operate in the area.

Data is available on the dBa of familiar, commonly heard sounds that can be used as a comparison to noise levels typically found in gas field operations, as shown in Table 3-38.

Table 3-38. Comparison of Measured Noise Levels with Commonly Heard Sounds.

Source	Noise Level (dBA)	Description
Normal breathing	10	Barely audible
Rustling leaves	20	–
Soft whisper (at 16 feet)	30	Very quiet
Library	40	–
Quiet office	50	Quiet
Normal conversation (at 3 feet)	60	–
Busy traffic	70	Moderately noisy
Noisy office with machines; factory	80	–
Heavy truck (at 49 feet)	90	Loud

Source: BLM 2006.

Table 3-39. Known Oil and Gas Noise Levels within the RBPA.

Source	Distance (feet)	dBA
Hare's Ear Compressor Station	3	97
	6	91[1]
	12	85[1]
	24	79[1]
	48	73[1]
	96	67[1]
	192	61[1]
	384	55[1]
	768	49[1]
Questar Unit 106 drilling rig	231	56.2
	267	55.2
	537	45.4

Source: Blickley 2008; Taylor 2008.
[1] Extrapolated from initial reading at 3 feet.

Operation of heavy equipment is characteristic of the construction phase of development projects with noise generally ranging from 70 to 89 dBa at 50 feet. Typical noise levels for construction equipment and industrial and gas field operations are described in Table 3-40.

Table 3-40. Typical Noise Levels for Construction and Operations Equipment.

Construction Equipment	Noise Level (dBA)	Operations Equipment	Noise Level (dBA)
Loaders, excavators	80–85	Pumps	76
Graders, scrapers	85–89	Generators	81
Concrete pumps, mixers	82–85	Compressors	83
		Drill rigs	70–85

Note: Typical noise levels at 50 feet; Source: BLM 2006.

Construction noise sources include equipment such as loaders, excavators, graders, and scrapers; concrete pumps and mixers; and drill rigs. Noise generated by construction equipment is temporary. Gas processing operations noise, however, is continuous and year-round. Operation noise sources include pumps, generators, compressors, and flaring operations.

3.20 CULTURAL AND HISTORIC RESOURCES

Cultural resources are the nonrenewable remains of past human activity. They are primarily managed pursuant to the National Historic Preservation Act of 1966 (NHPA) and the Archaeological Resources Protection Act of 1979 (ARPA). Additional statutes governing the preservation, use, and disposition of cultural resources include the Native American Graves Protection and Repatriation Act (NAGPRA), the American Indian Religious Freedom Act (AIRFA), EO 13007: Indian Sacred Sites, and EO 13287: Preserve America. In particular, the NHPA requires identification of significant cultural resources prior to a federal undertaking (36 CFR 800.4) and that federal agencies take into account the effects of those undertakings on historic properties (36 CFR 800.1).

The Wyoming BLM has entered into an agreement with the Wyoming State Historic Preservation Office (SHPO) to implement a state Protocol (BLM and Wyoming SHPO 2006). The Wyoming Protocol supplements the National BLM Programmatic Agreement; these documents guide the Wyoming BLM and the Wyoming SHPO fulfillment of their requirements and responsibilities under Section 106 of the NHPA, especially for the assessment of potential impacts to and guidance for the adequate mitigation of visual and direct impacts to cultural resources (BLM and Wyoming SHPO 2006:Appendix C).

Management actions for cultural resources concerning the Lander Road, in Section 2.3.2 of the Pinedale RMP ROD, include the specification that "the Lander Trail and its visual historic setting would be protected through the establishment of a VRM Class II designation for about 71,510 acres of public land within 3 miles of contributing segments of the trail (Map 2-30)" (BLM 2008b:[2]11).

Appendix 3 of the RMP ROD applies "Mitigation Guidelines and Operating Standards Applied to Surface Disturbing and Disruptive Activities" to all significant historic trails and roads, including the Opal Wagon Road, as well as the Lander Road Historic Trail. The Cultural/Paleontological Resources section of that appendix states specifically, "Historic trails would be avoided. Surface disturbing activities would avoid areas within one-quarter mile of a trail unless such disturbance would not be visible from the trail or would occur in an existing visual intrusion area. Historic trails would not be used as haul roads. Placement of facilities outside one-quarter mile that are within view of the Lander Road Historic Trail would be located to blend the site and facilities in with the background" (BLM 2008b:[A3]6).

3.20.1 Area of Potential Effect

The direct APE is a 300-foot-wide area that encompasses the construction corridor for the length of the proposed utility lines, as well as the 40-acre block areas centered upon proposed facilities. The viewshed APE for cultural resources is extended beyond the 300-foot-wide direct APE to areas within a 2-mile radius of the RBPA (Table 3-41) from which any of the proposed components may constitute a visual impact.

Table 3-41. Areas in the Viewshed APE.

Township (North)	Range (West)	Section(s)
29	111	4–9, 16–21, 28–31
29	112	5–30, 33–36
29	113	1–36
29	114	1–5, 7–30, 36
29	115	12, 13, 24, 25
30	111	19, 20, 28–33
30	112	19–36
30	113	25, 28–36
30	114	25, 33–36

3.20.2 Cultural Resources Identification

Cultural resource inventories are being conducted to identify cultural resources in the APE of the Proposed Action and alternatives. Sites within the viewshed APE that are discussed in this EA are those for which the visual setting is considered integral to the cultural/historical significance or those that could be considered culturally sensitive to Native American tribes as defined in Section 3.21.2.3. Cultural resource inventories include a file search for known cultural resource locations in agency databases, followed by field inventories. The files reviewed included the Wyoming Cultural Resources Information System (WYCRIS) database of the Wyoming Cultural Records Office (WYCRO) administered by the SHPO on October 31, 2008 (File Search No. 23162), and the files of the BLM PFO on November 20, 2008, which contain the most up-to-date data sources for the RBPA.

The file searches were conducted for a 2-mile-wide corridor centered on the 230-kV transmission line proposed in Alternatives 1 and 3. Cultural resource field inventories followed database reviews, with qualified archaeologists inspecting the direct APE using three standard pedestrian transects at 30-meter intervals in parallel to the Project centerline along the utility line alternatives, in 40-acre survey blocks centered on the proposed HLF, and the M&HRF. A complete Class III (intensive) cultural resource inventory report by a BLM permitted third-party contractor is in progress and will be submitted to inform final BLM decisions regarding the mitigation measures (specified in Section 4.20 of this EA) that are appropriate to each significant cultural resource site threatened by project impacts. Mitigation for compliance with Section 106 of the NHPA will proceed per the Wyoming Protocol (BLM and SHPO 2006). As such, the Class III report must be to the standards of BLM and SHPO and be acceptable to by BLM, with SHPO concurrence, for the BLM to be able approve project actions in relation to cultural resources.

Cultural resource field inventories were conducted in 2008 for the proposed alternatives excluding those portions of private land crossings (Table 3-42) and areas pending final design (e.g., AAM&WS). The remaining private land portions and those in the viewshed APE were investigated through a file search. Additional cultural resource field inventories would be conducted on these lands with finalization of alternative selections in the EA process. Access to all private lands and all significant cultural resource sites would necessarily be established, and appropriate protective measures would be identified prior to Project construction in order for the permanent ROW to be established. Identification of culturally sensitive sites was carried out through consultation with BLM PFO archaeologists prior to completing cultural resource inventories and will continue before additional work is performed.

Table 3-42. Private Lands in the APE Reviewed in File Search.

Alternative	RBPA Component	Township (North)	Range (West)	Section(s)
1	Transmission; Helium and Fiber Optic	29	112	18, 24
1	Transmission; Helium and Fiber Optic	29	113	13, 18
1	Transmission; Helium, Gas, and Fiber Optic; Electric, Gas, and Fiber Optic	29	114	10, 15
2 and No Action	Helium, Gas, Electric, and Fiber Optic	29	111	6, 7, 18, 19
		29	112	15, 16, 17, 18, 20, 21, 22, 23, 24
		29	113	4, 5, 6, 8, 9, 10, 11, 12, 14
		29	114	1, 10, 11, 12, 15
		30	111	31
		30	112	32, 33, 34, 35, 36

3.20.2.1 Cultural History Context

The history and prehistory of the area, including culture area contexts, historic period themes, and notable local historic and prehistoric sites are described at length in the Pinedale RMP ROD (BLM 2008b) and summarized in a Cultural Resource Overview drafted for the Pinedale RMP by McNees et al. (2006). The three volumes of McNees et al. (2006) are a technical document providing specific cultural trends and contexts for the PFO, including the range of known resource types and composition, chronology and radiocarbon metrics, and quantification of past actions and known resources. These trends are summarized with respect to defined subregions. With the exception of the Williams pipeline, the proposed Project components are located at the confluence of the La Barge, Deer Hills, and Wyoming Range Front cultural subregions. Cultural resources identified in the RBPA fit the distribution patterns described in culture history contexts for the La Barge, Deer Hills, and Wyoming Range Front cultural subregions, which suggests that cultural resource sites of all time periods have the potential to occur within the RBPA.

The majority of the RBPA is located within the northern bounds of the La Barge Uplift subregion. The La Barge Uplift subregion is distinguished by its diverse physical setting represented in the transition between the Middle Rockies and Wyoming basin ecoregions (Chapman et al. 2004). The diversity in the natural environment is reflected in the variety of prehistoric site types that include those with stone circles, rock alignments and cairns, rock art and petroglyphs, primary and secondary lithic raw material sources, ceramics, rockshelters, housepits, human interment, faunal processing, and more common assemblages of hearths, fire-altered rocks, and flaked stone. Several of these sites are considered to be prominent and have made significant contributions to our understanding of both local and regional prehistory. In particular, the subregion has produced a high frequency of sites dated to the Late Prehistoric time period—particularly Unita phase (McNees et al. 2006). Historic site types are also well represented in the La Barge Uplift subregion, stemming primarily from ranching, oil extraction, and activity centered on the Opal Wagon Road.

The Deer Hills subregion is located north of the La Barge subregion, bounded by the North, Middle, and South Piney creeks and excluding the Wyoming Range foothills to the west. The majority of assemblages from prehistoric sites contain remnants of hearth features in the form of fire-altered rocks and/or charcoal stains. Abundant eolian sand deposits in the southern portion of the subregion on the terrace above Middle Piney Creek have resulted in an increased number of prehistoric sites containing intact buried cultural remains that have a higher potential to yield information relevant to our understanding of the past. In contrast with the La Barge subregion, the Deer Hills subregion has a lower frequency of sites, and proportionally less sites with stone circles, cairns, alignments, or other types of rock features. The majority of historic sites in the subregion are related to cattle ranching (e.g., Circle Ranch), the establishment of Big Piney and Marbleton, and the Lander Road, which is located in the southern portion of the subregion.

The Wyoming Range Front subregion, conversely to the Deer Hills subregion, is characterized by higher elevations and more rugged terrain. Overall site density is very low, but represented by a higher proportion of stone alignment complexes (stone circles, cairns, or rock alignments) relative to more typical open camps and lithic scatters. Sites of prominence in the southern portion of the subregion include a protohistoric site and the Aspen Spring Sites. Segments of the Lander Road Historic Trail are located in the southern portion of the subregion. The only other historic sites are ranch settlements and Depression-era Civilian Conservation Corps (CCC) sites.

3.20.2.2 Cultural Resource Site Occurrence

Based on the results of the cultural resources file search and field inventories, 38 cultural resource sites were identified in the RBPA (Table 3-43); no newly documented sites resulted from field inventories. These sites include 27 of prehistoric age, 1 protohistoric, and 10 historic. Within the range of prehistoric sites, 5 are represented by lithic scatters (flaked stone artifacts only); 12 are represented by open camps; 9 are represented by those containing cairns, stone circles, and/or rock alignments; and 1 is represented by an open camp with cairns. The single protohistoric site is represented by the South Piney Rock Art site. The historic sites are represented by three urban buildings, one ranch, one oil exploration site, one cairn, one dump, the Lander Road Historic Trail, and two segments of the Opal Wagon Road. Twelve of the 14 sites identified in the viewshed APE were investigated only through a file search of the WYCRIS database, the exceptions of which are the Lander Road Historic Trail and two prehistoric sites considered for cultural sensitivity.

Table 3-43. Cultural Resource Count by Era and Alternative/Component.

	Prehistoric	Protohistoric	Historic*	Total
Direct APE				
Alternatives 1 and 3: 230-kV Transmission Line	2	0	0	2
Alternatives 1, 3, and 4: Helium and Fiber Optic Line	2	0	0	2
Alternatives 1, 3, and 4: Helium , Gas, and Fiber Optic Line	1	0	0	1
Alternatives 1–4: Electric, Gas, Water, and Fiber Optic Line	0	0	1	1
Alternatives 1–4: Williams Trunk Line	11	0	3	14
Alternative 2: Gas and Fiber Optic Line	1	0	0	1
Alternatives 1–4: Williams Trunk Line (Sensitivity**)	1	0	0	1
Viewshed APE				
Alternatives 1–4 (Setting***)	0	0	2	2
Alternatives 1–4 (Sensitivity**)	9	1	0	10
Alternative 2 (Setting***)	0	0	4	4
Total	**27**	**1**	**10**	**38**

* This includes two tallies for segments of the Opal Wagon Road (48SU852 and 48LN949) and one for the Lander Road (48SU387).
** Sites considered for cultural sensitivity.
*** Sites considered for impacts to the visual setting.

3.20.2.3 Cultural Resource Constraints and Site Significance

Cultural resource sites within the APE for the Project that are determined to be significant or are considered sensitive to Native American concerns are of the greatest concern. Site significance is considered based on evaluation of each cultural resource for its eligibility to be nominated to the National Register of Historic Places (NRHP). Significant cultural resources are those evaluated as eligible for nomination to the NRHP. NRHP site significance is assessed with regard to the criteria in Title 36 CFR 60.4 (cf. RMP ROD Appendix 1, page 2 [BLM 2008b]).

Sites that contain human burials, stone circles, rock alignments, rock cairns, rock art, and modern-day Native American use, extraction, or religious sites are often considered sensitive or sacred to modern Native Americans. Although Native American sites may not be eligible for the NRHP as is the case for two sites located in the viewshed APE, they are still protected under other statues, including ARPA, NAGPRA, AIRFA, and EOs 13007 and 13287. Eleven sites were identified in the RBPA that could be considered sensitive by Native American groups and may require additional consultation by the BLM with the appropriate tribal government(s).

Of the 38 previously recorded cultural resource sites identified in the RBPA, 12 sites have been determined by government oversight agencies (agency-determined) as eligible for

NRHP nomination and 5 have been recommended by field archaeologists (field-recommended) as eligible for NRHP nomination (Table 3-44). Among the eligible sites, 4 are within the direct APE and 13 are located within the viewshed APE as listed in Table 3-45. None of the eligible sites within the ROW of the Williams pipeline have components in the direct APE that are considered to contribute to the site's significance. However, 48SU807, in the direct APE, contains cairns which may be considered culturally sensitive.

Table 3-44. NRHP Eligibility for Sites Identified in the RBPA.

NRHP Eligibility	Prehistoric	Protohistoric	Historic	Total
Determined Eligible	8	0	4	12
Recommended Eligible	3	0	2	5
Determined Not Eligible	2	0	2	4
Recommended Not Eligible	12	1	1	14
Recommended Unevaluated	2	0	0	2
Unknown	0	0	1	1
Total	**27**	**1**	**10**	**38**

Table 3-45. Sites Determined or Recommended Eligible for Nomination to the NRHP Listed by Project Alternative.

Alternative: Component	Prehistoric	Historic	Total
Alternatives 1–4: Williams Trunk Line	1	1	2
Alternatives 1–4: Williams Trunk Line (Sensitivity)	1	0	1
Alternatives 1–4: Viewshed (Sensitivity)	8	0	8
Alternatives 1–4: Viewshed (Setting)	0	2	2
Alternative 2: Viewshed (Setting)	0	3	3
Alternative 2: Natural Gas and Fiber Optic Line	1	0	1
Total	**11**	**6**	**17**

Eighteen sites identified in the RBPA have been field-recommended or agency-determined as not eligible for NRHP nomination. Three sites in the RBPA are unevaluted or of unknown status with respect to NRHP eligibility including two prehistoric sites and one historic site for which the site form was not available on WYCRO.

There are six sites identified in the RBPA for which the visual setting is considered integral to the site's significance. Historic properties or cultural resources significant for preservation, representation, and interpretation of important aspects of history, prehistory, or other qualities of cultural heritage may require different treatment approaches. Those sites in the RBPA include the Lander Road Historic Trail (also known as Lander Trail or Lander Road), the Opal Wagon Road (two separate segments), three urban buildings in the town of Big Piney, and the Eugene Noble ranch. In addition to avoidance of direct Project impacts, the quality of the physical setting for these resources is considered, both in and outside of the direct path of Project construction. Visual intrusion on the integral setting of these sites by features out of character with the original historic landscapes may be considered to diminish or destroy their historical or sensitive qualities.

Routes of the Lander Road and Opal Wagon Road eligible for nomination to the NRHP were identified in the viewshed APE. Even though an historic linear feature may be eligible for the NRHP, various routes may or may not contribute to that significance depending on the integrity of the specific segment (cf. RMP ROD Appendix 1, page 2 [BLM 2008b]). Only segments that are sufficiently intact to contribute to the overall eligibility of the historic linear site for nomination to the NRHP are considered to retain significance. Impacts to significant routes of historic linear sites can occur from direct disturbance of the route itself or from disturbance of the setting if that setting is of import to the overall eligibility of the linear site. Impacts to the setting, if they cannot be avoided through Project redesign, are frequently mitigated through off-site efforts, such as establishment of interpretive signage for the public.

Finally, due to the potential of some sediments in the area to contain buried cultural deposits not manifested on the surface, unexpected subsurface discoveries could occur during ground disturbance from Project construction activities. Eolian sand deposits and some outwash alluvial and colluvial deposits have the potential to produce buried cultural materials. An approved discovery plan would need to be in place for unexpected discoveries in areas where blading and similarly extensive ground disturbance is proposed in these soil situations.

3.21 SPECIAL DESIGNATIONS AND MANAGEMENT AREAS

The Pinedale RMP and ROD has identified and designated special management areas, including Areas of Critical Environmental Concern (ACECs) and Wilderness Study Areas (WSAs) (BLM 2008b). The FLPMA mandates that priority be given to specific areas, identified as ACECs, for designation and protection to prevent irreparable damage to important historic, cultural, or scenic values and fish and wildlife resources or other natural systems or processes, or to protect life and provide safety from natural hazards. ACECs and WSAs in the area are summarized in the sections that follow.

3.21.1 Beaver Creek ACEC

The Beaver Creek ACEC is approximately 3,500 feet south of the Rands Butte Area southern boundary and about 5 miles northwest of the Williams Pipeline Area. The BLM's management goals for the 3,590-acre area are to:

- ensure wildlife habitat;
- ensure the quality of the aquatic habitat for the sensitive Colorado River cutthroat trout, the only native trout species in the Pinedale planning area and a state-listed sensitive species; and
- protect elk calving habitat.

Per the current Pinedale RMP and ROD (BLM 2008b), no surface disturbance or clearcutting is allowed within 1,000 feet of Beaver Creek or on slopes of 25% or greater, and all vehicle use is limited to existing roads and trails. Roads and ROWs would not be permitted unless adverse impacts to trout and elk calving habitat can be prevented.

The Beaver Creek ACEC encompasses VRM Classes III and IV areas. Mineral leasing and related activities would be permitted on the ACEC and the use of aboveground explosive charges for geophysical exploration would be analyzed on a case-by-case basis.

3.21.2 Rock Creek ACEC

The Rock Creek ACEC is approximately 8 miles south of the Rands Butte Area southern boundary and about 5 miles west of the Williams Pipeline Area. The BLM's management goals for the 4,960-acre area are to:

- ensure wildlife habitat;
- ensure the quality of the aquatic habitat for the sensitive Colorado River cutthroat trout;
- provide crucial winter range for a portion of the Piney elk herd; and
- protect visual resources to maintain VRM class characteristics.

Per the current Pinedale RMP and ROD (BLM 2008b), geophysical and forest management activities would comply with non-impairment criteria for lands under wilderness review. However, livestock grazing and related improvements are allowed provided they meet the Wyoming Standards for Rangeland Health and with non-impairment criteria for lands under wilderness review.

The Rock Creek ACEC encompasses VRM Class I areas. Mineral leasing and related activities would not be permitted on the ACEC and would remain closed to OHV use, including over-the-snow vehicles. The ACEC would also be managed as a ROW-exclusion area unless the proposed ROW(s) would benefit Colorado River cutthroat trout or elk habitat.

3.21.3 Lake Mountain WSA

The Lake Mountain WSA encompasses 13,490 acres under special management status according the PFO RMP and ROD (BLM 2008b). The area lies approximately 3 to 5 miles southwest of the proposed Williams pipeline.

Because the nearest ACECs and the WSA identified in the vicinity of the RBPA are a minimum distance of 0.5 mile from the RBPA and more than 1.0 mile from any Project components and unlikely to be affected, this resource topic will not be considered in detailed analysis in Chapter 4.

3.22 ENVIRONMENTAL JUSTICE

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, was signed by President Clinton in 1994. The EO requires agencies to advance environmental justice by pursuing fair treatment and meaningful involvement of minority and low-income populations. Fair treatment means such groups should not bear a disproportionately high share of adverse environmental consequences from federal programs, policies, decisions, or operations. Meaningful involvement means federal officials actively promote opportunities for public participation, and federal decisions can be materially affected by participating groups and individuals.

Table 3-46 and Table 3-47 summarize relevant data regarding minority and low-income populations for the RBPA.

Table 3-46. Minority Populations for the RBPA.

Ethnic Origin	Lincoln County		Sublette County	
	2000	2007	2000	2007
White	14,292	15,806	5,811	7,736
African American	16	30	12	34
American Indian and Native Alaskan	86	105	31	48
Asian	34	42	15	27
Native Hawaiian or Pacific Islander	8	8	5	7
Two or more races	137	180	46	73
Total Population	**14,573**	**16,171**	**5,920**	**7,925**

Source: U.S. Census Bureau 2008a.

Table 3-47. Poverty Rates for the RBPA.

Location	2000	2007
Sublette County Poverty Rate	9.7%	5.3%
Lincoln County Poverty Rate	9.0%	7.9%
State of Wyoming Poverty Rate	11.4%	9.5%

Source: U.S. Census Bureau 2008b.

3.22.1 Minority Populations

As of July 2007, Wyoming's total minority population comprised approximately 66,263, or 12.7% of the state's total population. This is an increase of approximately 23.7% since the 2000 minority population, compared with the 5.9% overall increase for the state's total population. The minority population contributed to more than 40% of the state's population growth from 2000 to 2007. According to the State of Wyoming, Hispanic was the largest minority group with 38,409 residents in July 2007, which increased 21.3% since 2000. All other races, including African American, Native American, Asian, and mixed races recorded double-digit growth, while the majority, White, Non-Hispanic, increased at 3.7%. With 12.7% of the state's total population, the proportion of minorities in Wyoming was ranked the ninth lowest in the nation, while about one in three U.S. residents are in a minority (State of Wyoming 2008c).

As previously stated, ethnic diversity is limited in Lincoln County with the White, Non-Hispanic population comprising approximately 97.7% of the local 2007 populace (see Table 3-46). Other dominant ethnicities include American Indian and Native American (0.64%), African American (0.18%), Asian (0.25%), and Native Hawaiian or Pacific Islander and Two or more races combined (1.16%) (U.S. Census Bureau 2008a).

Ethnic diversity is also limited in Sublette County with White, Non-Hispanic residents comprising approximately 97.6% of the population (see Table 3-46). Other ethnicities include African American (0.42%), American Indian and Native American (0.60%), Asian (0.34%), Native Hawaiian or Pacific Islander and two or more races combined (1.0%) (U.S. Census Bureau 2008a).

3.22.2 Poverty Rates

Poverty rate data for Sublette and Lincoln counties are shown in Table 3-47. The data show that poverty rates for both counties have decreased over the 2000 to 2007 period, and that the 2007 rates are lower than the statewide rate.

3.22.3 Environmental Justice Conclusions

Based on available data, no environmental justice populations have been identified in the study area. Minority or low-income persons would have equal access to Project employment opportunities. As a result, the topic of environmental justice will not be included in detailed analysis of Environmental Consequences.