3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the study area. The resources that are addressed here were identified during the scoping process or interdisciplinary team review as having the potential to be affected. Figure 3.1 shows the general analysis area for most environmental resources.

Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, cultural resources, floodplains, Native American religious concerns, threatened or endangered (T&E) species, hazardous or solid wastes, water quality, and wetlands/riparian zones. USFS Region 2 Sensitive Species could also be affected by the proposed project. Four critical elements (areas of critical environmental concern, prime and unique farmland, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. Hazardous and solid wastes (a critical element) are addressed in Section 2.1.3. In addition to the critical elements that are potentially present in the project area, this EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water availability or quantity, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

3.1 GENERAL SETTING

The project area is located in the PRB, a part of the Northern Great Plains, which includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie. The climate is semi-arid, with an average annual precipitation at Wright (see Figure 1.1) of just over 11 inches (Martner 1986). June (2.35 inches) and May (2.04 inches) are the wettest months, and February (0.29 inches) is the driest. Snowfall averages 25.1 inches, with most occurring in March (5.0 inches) and December (4.5 inches). Potential evapo-transpiration, at approximately 23 inches (National Oceanic and Atmospheric Administration 1969), exceeds annual precipitation. The average daily mean temperature is 44.2°F. The highest recorded temperature was 103°F and the lowest -34°F. July is the warmest month, with a mean daily temperature of 70°F, and January is the coldest (20.5°F). The frost-free period is 100-125 days.

The average annual wind speed at the adjacent Black Thunder Mine (see Figure 1.2) is 11.6 mi per hour (mph), with winter gusts often reaching 30-40 mph. Wind speeds are highest in the winter and spring and are predominantly from the southwest and northwest (Figure 3.2). The absence of locally elevated terrain limits the formation and duration of temperature inversions, resulting in an average of 15 air-stagnation events annually in the PRB with an average duration of 2 days each (BLM 1974). General information describing the area's resources were gathered from draft BLM Buffalo Resource Area planning documents (BLM 1996a, 1996b, 1996c, 1996d, 1996g) and a BLM coal leasing study (BLM 1996e).

3.2 TOPOGRAPHY AND PHYSIOGRAPHY

The PRB is an elongated, asymmetrical structural downfold. The landscape consists of broad plains, low hills, and tablelands. The strata of the steep western limb and the gentle eastern limb of the PRB dip approximately 550 ft/mi and 150 ft/mi, respectively, towards the PRB axis that lies near the western margin. The area is characterized by broad plateaus dissected by incised stream valleys, which create most of the topographic relief. Generally, the topography changes from open hills with 500-1,000 ft of relief in the northern part of the PRB to plains and tablelands with 300-500 ft of relief in the southern part. Playas--shallow,

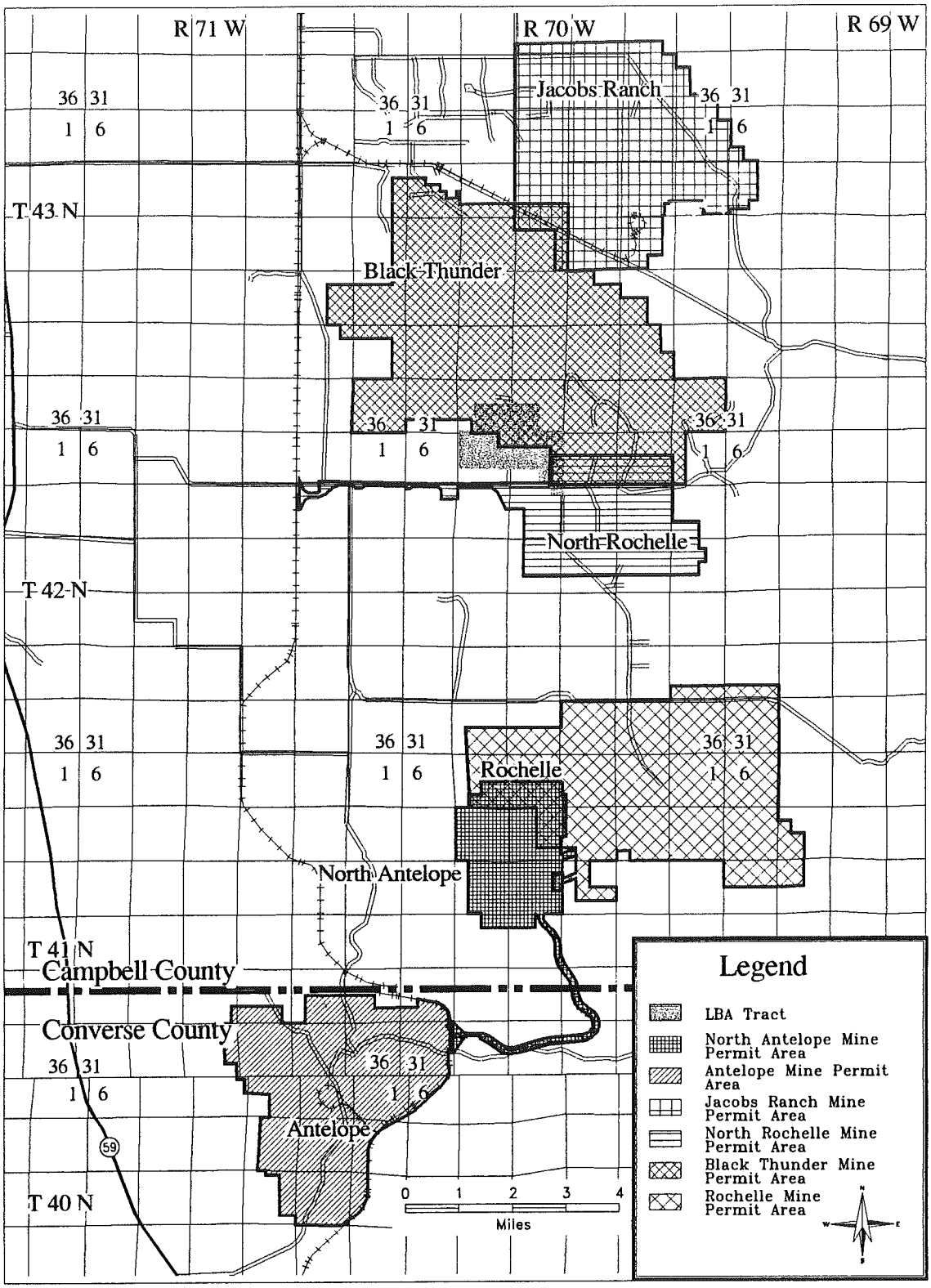


Figure 3.1 General Analysis Area.

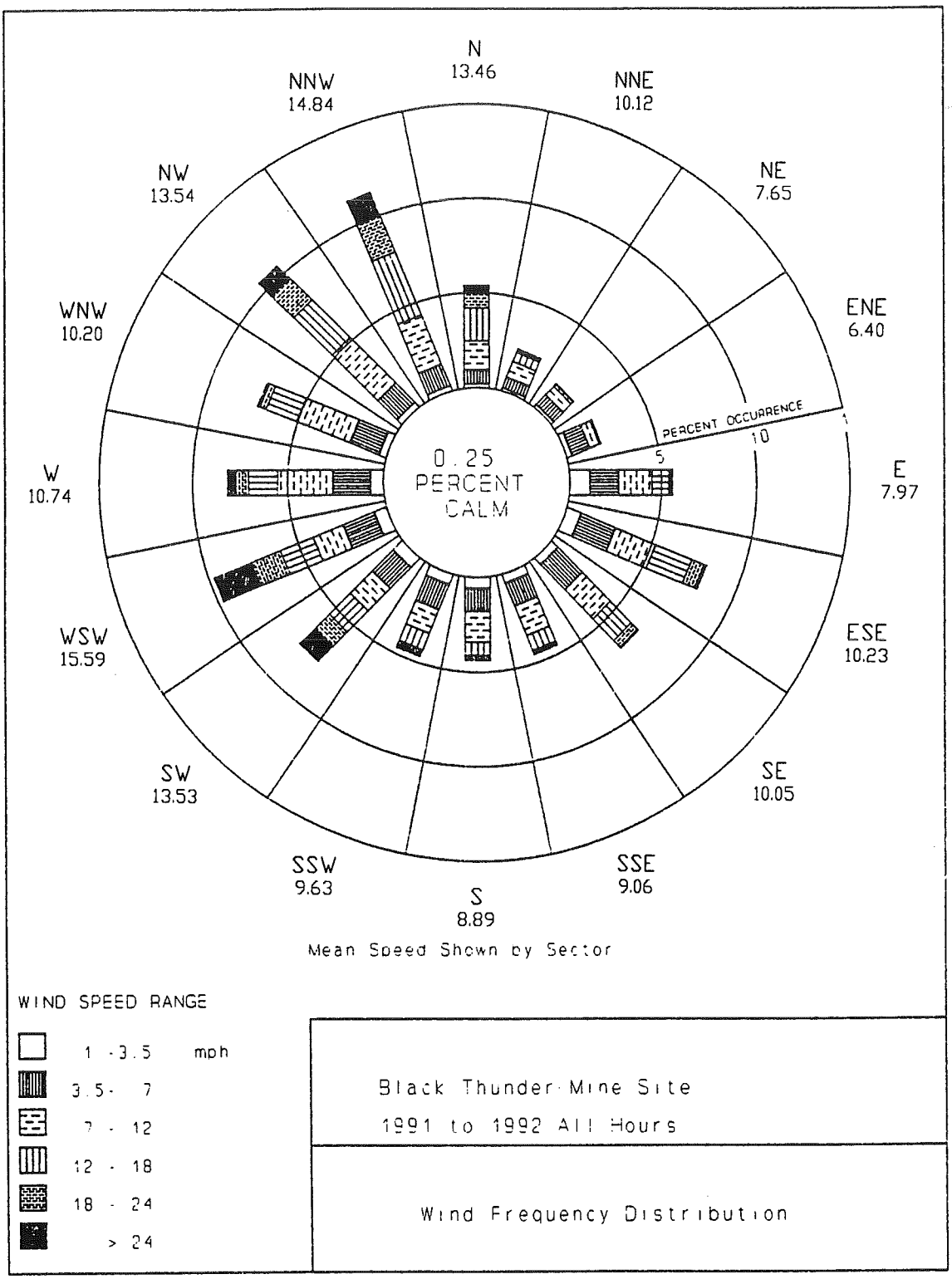


Figure 3.2 Wind Rose for Black Thunder Mine (1991-1992 Combined).

closed (internally drained) ponds that receive water during wet seasons--are common. Buttes and plateaus are also fairly common.

The PRB is bounded by the Casper Arch, Laramie Mountains, and Hartville Uplift to the south, the Miles City Arch in Montana to the north, the Big Horn Mountains on the west, and the Black Hills to the east. The LBA tract is located in the south-central part of the PRB at an elevation of about 4,500 ft in an area of low rolling topography.

3.3 GEOLOGY

The applicant's main mining objective is the lower Wyodak coal seam. An upper split of the Wyodak is present locally and will also be mined where it can be economically recovered. The rocks above the recoverable coal (overburden) are interbedded sandstones, siltstones, and shales of the Tertiary Fort Union and Wasatch formations. The lower Wyodak coal seam on the LBA tract is approximately 60 ft thick and the overburden ranges from about 150 ft thick on the eastern boundary of the tract to 250 ft on the western boundary. Figure 3.3 shows a vertically exaggerated cross section of the geology of the North Rochelle permit area. This cross section is a general representation of the geology of the LBA tract, the primary variables being the amount of sandstone in the overburden, the local presence and variable thickness of the upper split of the Wyodak coal seam, and the surface topography.

Surficial deposits in the analysis area generally include Quaternary alluvial deposits, scoria or clinker, and weathered Wasatch and Fort Union formations (Figure 3.4). Scoria forms when near-surface coal beds spontaneously burn and bake the overlying rocks. Scoria is characteristically red in color and is similar to angular porous gravel; it is resistant to erosion and forms buttes and plateaus east of the LBA tract in an area regionally known as the Rochelle Hills. No scoria is present on the LBA tract. Surface deposits on the LBA tract consist of alluvial deposits along Trussler Creek and Wasatch formation. The alluvial deposits along Trussler Creek consist primarily of poorly to well-sorted, irregularly bedded to laminated, and unconsolidated sand, silt, and clay with minor interbeds of fine gravel.

Drilling and sampling programs have been conducted throughout the PRB coal fields to identify overburden which may be unsuitable for reclamation (i.e., unsuitable for use in growing vegetation). All of the mines have identified some unsuitable overburden, which must be specifically handled in the reclamation process. A small portion of the overburden in the analysis area may be unsuitable due to high sodium adsorption ratios, potentially acid-forming materials, or unsuitable texture. All of the PRB mines have some overburden containing excessive total carbon content associated with nonminable carbonaceous zones, and several mines also have excessive selenium concentrations in near-surface material.

Mineral Resources

The PRB contains large reserves of fossil fuels including oil, natural gas or methane (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and scoria are mined in the PRB (BLM 1996g).

Coal. There are 17 active coal mines lying along the north/south line that parallels Highway 59 starting just north of Gillette, Wyoming, and extending south for about 75 mi, where the coal is at its shallowest depths (see Figure 1.2). An 18th active mine (Dave Johnston) is located near Glenrock, Wyoming, about 25 mi southwest of the Antelope Mine. The Wyodak coal seam--the main seam mined in the PRB--is sub-bituminous and is generally a low sulfur, low ash coal. On the LBA tract, a 60 foot thick lower seam or split of the Wyodak coal bed would be mined. Average delivered quality of coal from the existing North Rochelle lease in 1994 was 8,631 Btu/pound, 4.71% ash, and 0.24% sulfur (Wyoming State

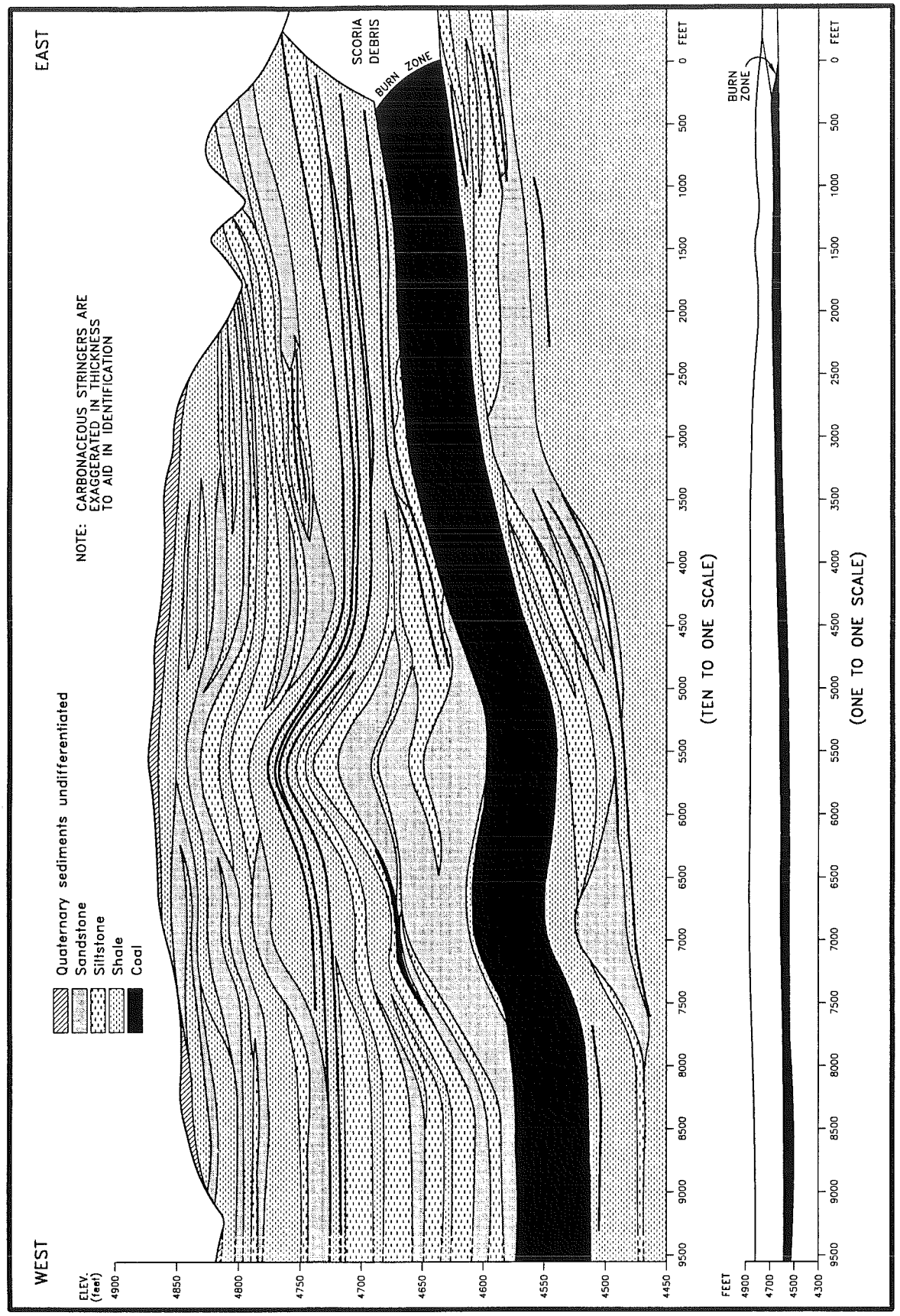


Figure 3.3 Generalized Geologic Cross Section of the North Rochelle Mine Area.

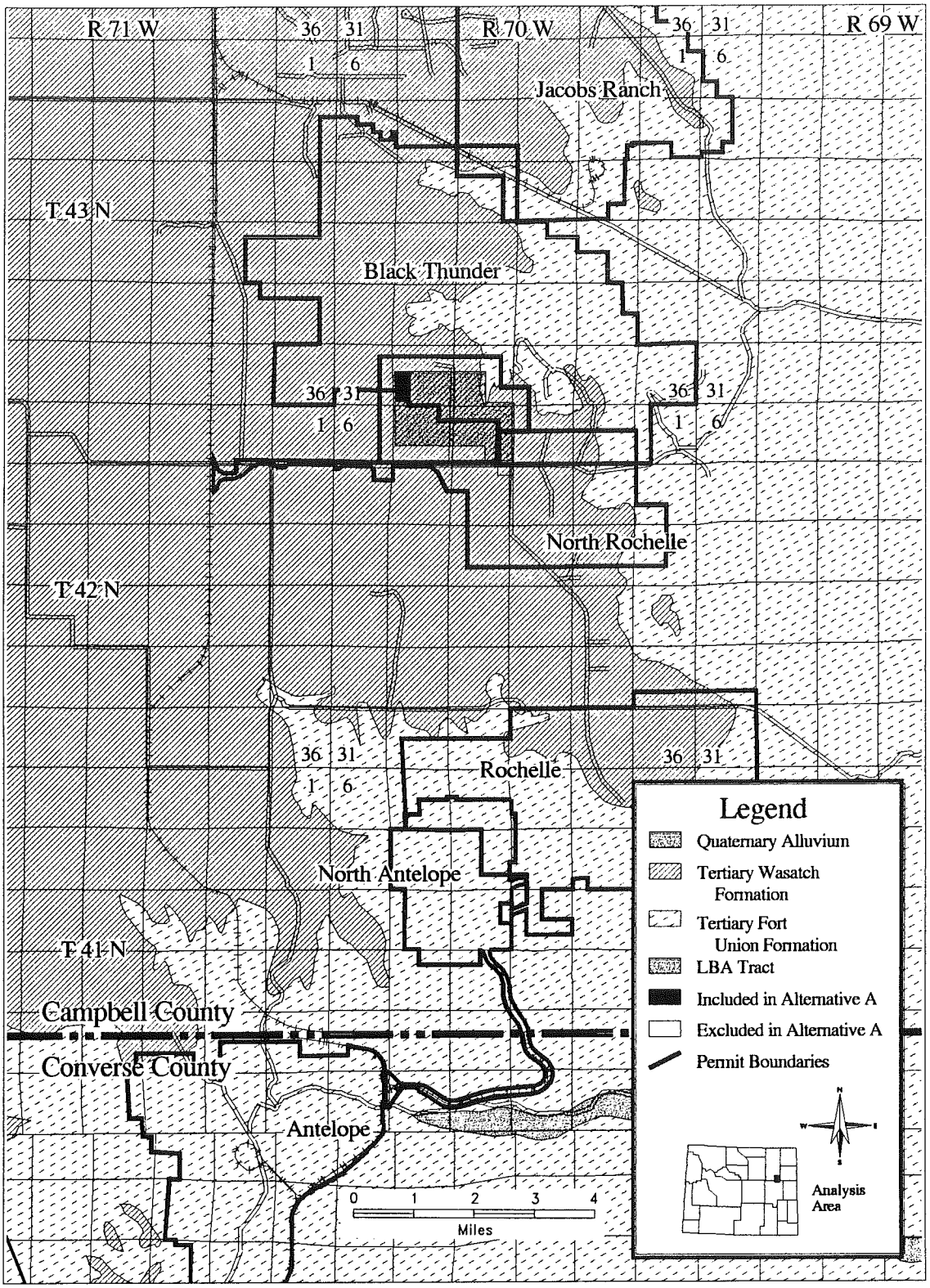


Figure 3.4 Surficial Geologic Map of the Analysis Area (Love and Christiansen 1985).

Geological Survey, 1995). An upper split of the Wyodak, varying from less than 1 ft to over 8 ft thick and discontinuous over the area, contains some recoverable coal. Other coal seams in the LBA tract are either too thin and discontinuous or too deep to be of economic value.

Oil and Gas. There are approximately 500 fields that produce oil and/or natural gas from a number of formations of varying geologic ages in the PRB. Depth to oil-bearing strata is generally between 4,000 ft and 13,500 ft, but some of the older wells are as shallow as 400 ft. The LBA tract overlies parts of two geologic structures that may contain producible quantities of oil and gas. There are currently no producing or abandoned oil or gas wells on the LBA tract (personal communication, January 1996, with Molly DeVore, Wyoming Oil and Gas Commission); however, the potential for future exploration exists. Although the coal rights on the LBA tract are all federal, only about 48% of the oil and gas rights are federal. The remaining 52% of the oil and gas rights on the LBA tract are privately owned. There are currently no applications for permit to drill on file within the LBA tract.

Coal Bed Methane. The generation of methane gas from coal beds occurs as a natural process. Methane produced by coal may be trapped in the coal by overburden pressure, by the pressure of water in the coal, or by impermeable layers immediately above the coal. The methane may also migrate upward and be trapped in shallower rocks (like sandstone), or it may disperse to the atmosphere. Deeper coal beds have higher pressures and generally trap more gas. Under certain geologic conditions, methane can be trapped at shallow depths in and above coal beds. Historically, methane has been reported flowing from shallow water wells and coal exploration wells in parts of the PRB. In the PRB, commercial production of coal bed methane began in 1989, north of Gillette. Since that time, exploration and development of coal bed methane trapped in the Wyodak coal bed west of the operating coal mines has continued. Coal bed methane development south of Gillette is currently being evaluated in the area shown on Figure 3.5. There are currently no proposals or applications to develop coal bed methane resources on or near the LBA tract; however, if coal bed methane resources can be economically developed in the Lighthouse Project Area (Figure 3.5), then exploration is likely to continue to the south. In the PRB, methane is recovered by the drilling and completion of wells, similar to, but generally shallower than, conventional natural gas development.

Bentonite. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, and because of this characteristic, it is used in the processing of or directly in a number of products, including kitty litter, concrete, and drilling mud. No minable bentonite reserves have been identified on the LBA tract.

Uranium. Uranium exploration and mining was very active in the 1950s, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply significantly decreased uranium mining activities in the early 1980s; however, substantial uranium reserves exist in southern Campbell, southern Johnson, and northern Converse Counties. There are currently two in situ leach operations in the PRB, and the recent price increase in uranium has raised interest in developing additional sites in the PRB and elsewhere in Wyoming (Wyoming State Geological Survey 1996). No known uranium reserves exist on the LBA tract.

Scoria. Scoria has been and continues to be a major source of gravel for road construction in the area. Scoria is present along the exposed outcrop of the Wyodak coal seam located just east of the mines.

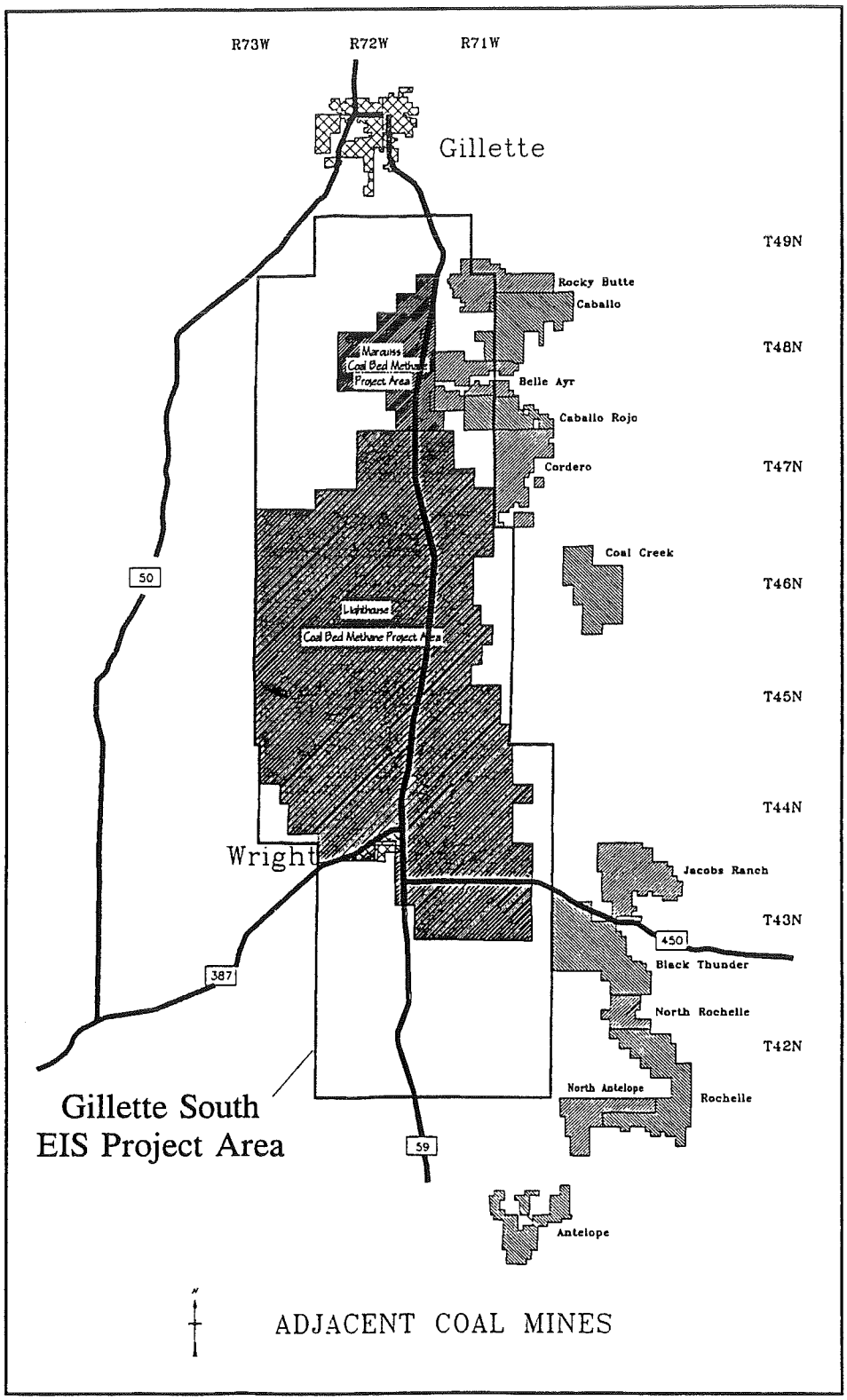


Figure 3.5 Coal Bed Methane Areas and Adjacent Coal Mines (Taken from BLM 1996).

3.4 SOILS

Soils in the region are mostly residual (developed in place) and have formed from weathered sandstones and shales. Due to the prevailing climate and vegetative conditions, organic matter accumulates slowly and the fertility of the soils is relatively low. Soils in the PRB can generally be classified into four taxonomic orders: 1) aridisols; 2) entisols; 3) vertisols; and 4) mollisols.

The aridisols cover the majority of the broad, rolling uplands and are usually dry for significant portions of the growing season. They have moderate accumulations of organic matter in the surface layers, and leaching over a long period of time has resulted in modest to strong accumulations of clay in subsoil horizons. Textures range from sand to clay and can be highly variable within a short distance.

Entisols occur in small scattered areas on upper hillsides and ridge crests, where erosion has prohibited soil horizon development, and on areas of recent alluvial (unconsolidated material deposited by streams) deposition. Textures of entisols vary from sand to clay and are strongly influenced by the parent rock, which ranges from sandstone to shale.

Vertisols occur in playas. They are clayey and typically have wide surface cracks when dry. Because these soils are associated with playas, moisture is much greater than in surrounding soils and vegetative productivity is normally higher.

Small areas of mollisols occur in the larger river bottoms. These soils exhibit a dark color and are highly productive.

The soils on the LBA tract are typical of the soils that occur on the adjoining North Rochelle and Black Thunder Mines. The Natural Resource Conservation Service (NRCS) (formerly Soil Conservation Service) has mapped (Order 3) the LBA tract soils as part of their Soil Survey of Campbell County, Southern Part, which is not yet published. A complete list of soils occurring on the LBA and their associated hydric classification is provided in Table 3.1 (NRCS 1996). Adjoining mines have also completed detailed (Order 1) soil surveys on small portions of the LBA tract that extend into their permit boundaries (Shell Oil Company Mining 1982; ARCO Coal Company 1995). These surveys are required by the WDEQ prior to issuance of a permit to mine, and if the LBA tract is leased, it would be inventoried for site-specific soil information prior to mining. Maps of Order 1 surveyed areas are available from mine permit files at WDEQ and are incorporated, by reference, into this EIS. Based on a review of the above surveys, soils on the LBA tract are similar to soils on the existing North Rochelle and Black Thunder Mines, and the tract is expected to have an adequate quantity and quality of soil for reclamation.

Inclusions of hydric soils (soils that are saturated, flooded, or ponded long enough to develop anaerobic [no oxygen] conditions) are absent to uncommon in all soils mapped within the LBA (see Table 3.1) (NRCS 1996). Site-specific soil surveys (Order 1) will be used to evaluate the presence of hydric soils and/or inclusions of hydric soils in detail, and the presence of hydric soils, as well as hydrophytic vegetation and wetland hydrology, will be determined during jurisdictional wetland determinations included in the mine permit application package (see Section 3.8).

3.5 AIR QUALITY

Ambient air quality in Wyoming, where "ambient air" is defined as air which is contiguous with publicly accessible lands, is regulated by the State of Wyoming and the EPA through the Wyoming air quality standards and regulations, which are enforced by the WDEQ, Air Quality Division (AQD) (WDEQ 1994a). Lands within an approved mine permit boundary and not accessible to the general public are not subject to state air quality standards, but are governed by the Mine Safety and Health Administration respirable dust regulations.

Table 3.1 List of Soils Occurring on the LBA Tract and Their Associated Hydric Classification.[1]

Soil Map Unit	Hydric Soils Classification[2]
Arvada, thick surface-Arvada-Slickspots complex, 0-6% slopes	2
Decolney-Hiland sandy loams, 0-6% slopes	1
Forkwood-Ulm loams, 0-6% slopes	2
Hiland-Bowbac sandy loams,0-6% slopes	1
Hiland-Vonalee sandy loams, 0-6% slopes	1
Hilight-Wags-rock outcrop complex, 3-45% slopes	4
Maysdorf fine sandy loam, 0-6% slopes	1
Maysdorf-Pugsley complex, 0-6% slopes	1
Maysdorf-Pugsley sandy loams, 6-15% slopes	1
Pits-dumps complex	1
Ulm-Renohill complex, 0-6% slopes	1

[1] Based on NRCS unpublished data (1996).

[2] 1 = No hydric soil components or inclusions occur in these units.
2 = Hydric soil inclusions consisting of intermittently ponded basins (playas) may occur in these units. Ponding may occur in these areas for more than 7 days in April, May, and June. Areas are small, typically less than 5% of the map unit, and not every delineation will have this inclusion.
4 = Hydric inclusions consisting of narrow, wet drainages have been identified in some delineations. They are not common. On-site investigation should be done to verify occurrence.

The EPA has authorized Wyoming to enforce federal ambient air quality standards as enumerated in the Clean Air Act through approval of a State Implementation Plan. The plan specifies that state air quality standards for criteria pollutants must be at least as stringent as the National Ambient Air Quality Standards (NAAQS) (Table 3.2).

The dominant air pollutants in the PRB are particulates, which are measured as total suspended particulates (TSP) and as particulate matter less than 10 microns in diameter (PM_{10}). Both are measured as $\mu g/m^3$ (micrograms per cubic meter). The largest contributor to TSP and PM_{10} in the PRB is dust resulting from surface mining, blasting, coal handling and loading, farming activities, and vehicular traffic on dirt roads (including mine haul roads). Surface winds also cause elevated levels of dust. Ambient concentrations of other air pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide, and ozone) are low and cause little regulatory concern in this area.

Air quality monitoring data demonstrate that ambient concentrations of TSP (annual

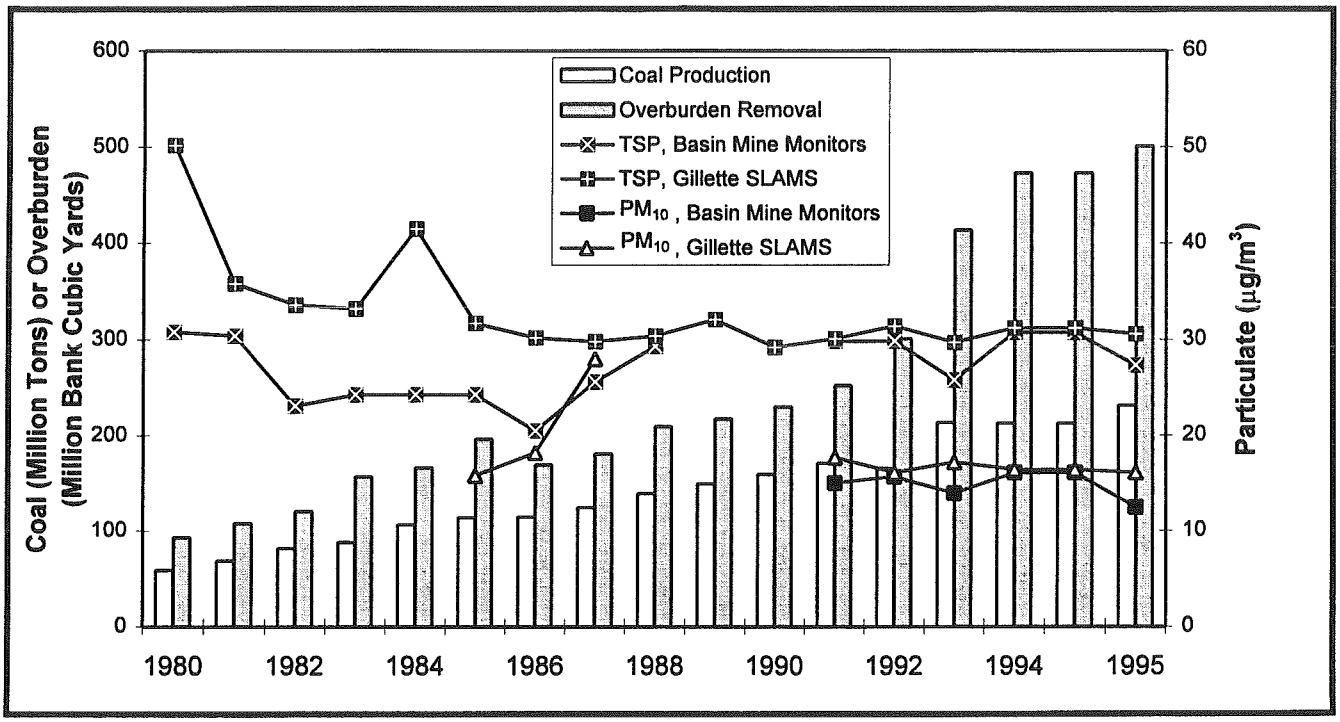
Table 3.2 National and Wyoming Air Quality Standards.

Air Pollutant	Averaging Period	Wyoming Standard ($\mu g/m^3$)[2]	NAAQS[1] ($\mu g/m^3$)[2]
Total suspended particulate (TSP)[3]	24-hr[4]	150	--
Respirable particulate matter (PM_{10})[3]	24-hr[4]	150	150
	Annual[5]	50	50
Nitrogen oxide	Annual[5]	100	100
Photochemical oxidant (ozone)	1-hr[4]	160	235
Sulfur dioxide	3-hr[4]	1,300	--
	24-hr[4]	260	365
	Annual[5]	60	80
Carbon monoxide	1-hr[4]	40,000	40,000
	8-hr[4]	10,000	10,000

1 National Ambient Air Quality Standard.
2 $\mu g/m^3$ = micrograms per cubic meter.
3 Particulates are very small-diameter solids or liquids. Materials handling processes such as crushing or grinding rock or loading dry materials in bulk can result in the creation of fine dusts. Vehicle traffic on dirt and gravel roads also generates large quantities of dust. Combustion processes can also emit small particles of noncombustible ash or incompletely burned soot. Total suspended particulates (TSP) includes all particulates suspended in the atmosphere. Respirable particulate matter is the very fine fraction (less than 10 microns in diameter) which can penetrate deep into the lungs and cause health problems.
4 May not be exceeded more than once per year.
5 Arithmetic mean may not be exceeded.

geometric-averaged 24-hour concentrations) and PM_{10} (annual arithmetic-averaged) have remained relatively constant, although mining activity has increased. Figure 3.6 compares average TSP and PM_{10} concentrations in the PRB relative to coal and overburden removal. Although the tonnages of overburden being removed and coal being mined have both been increasing, average annual TSP concentrations measured at the mines and in Gillette have remained relatively constant in the 25 to 30 $\mu g/m^3$ range. PM_{10} concentrations of 15-18 $\mu g/m^3$ are assumed to be background concentrations by the WDEQ. WDEQ estimates that PM_{10} amounts to about 30% of TSP (WDEQ 1979).

The data confirm the findings of the WDEQ/AQD that although annual tonnage of mined coal has increased, air quality has not been significantly affected. TSP and PM_{10} concentrations have remained well within NAAQS. The maintenance of air quality in the PRB is due, in large part, to the state and federal requirements for mines to actively reduce the potential for generation of particulate pollution through the use of specific control equipment and mining practices.



Data Source: WDEQ (1993) and EPA (1994).

Figure 3.6 Coal Production vs. Annual Average Particulate Concentrations, Powder River Basin.

Table 3.3 shows the allowable increment of particulate as PM_{10} which is permitted by the Clean Air Act Prevention of Significant Deterioration regulations (WDEQ 1995). PSD is designed to preserve existing air quality which meets NAAQS by limiting the increase in air pollution over current levels. Class I areas, which are allowed the smallest increment, include national parks and wilderness areas. All of Wyoming outside of national parks and wilderness areas is in the Class II area, reflecting the state's low overall pollution level. The nearest Class I area is approximately 80 mi east of the analysis area at Wind Cave National Park in southwestern South Dakota.

In order to obtain a state air quality operating permit, each mine must demonstrate, through modeling, that its activities will not increase TSP above what is allowable (WDEQ 1994a). This demonstration is required to include the estimated air pollutant emissions from other existing pollution-generating activities, including adjacent mines, so that control of overall air quality is a part of the permitting process. The historical record shows that increased mining in the PRB has not resulted in exceedances of air quality standards for TSP and PM_{10}.

3.6 WATER RESOURCES

3.6.1 Groundwater

Groundwater occurs in several geologic units of interest within and adjacent to the LBA tract. Figure 3.7 displays the relationship of stratigraphic units to hydrogeologic units. Three principle aquifers would be affected by mining the LBA tract. In descending order, these are the Wasatch Aquifer, the Wyodak Coal Aquifer, and the Fort Union Aquifers which underlie the coal (Martin et al. 1988). Detailed, site-specific groundwater

Table 3.3 Maximum Allowable Increments of Deterioration for PM_{10} (WDEQ 1995).

		Maximum Allowable Increment ($\mu g/m^3$)		
Air Pollutant	Averaging Period	Class I	Class II	Class III
Particulate matter (PM_{10})	24-hr[1]	8	30	--
	Annual arithmetic mean	4	17	--

[1] May not be exceeded more than once per year at any receptor site.

information is not currently available for aquifers within the proposed LBA tract. However, information is available for the adjacent North Rochelle, Black Thunder, and Rochelle Mines, and this information was utilized to evaluate existing groundwater resources (see Figure 3.1 for locations of adjacent mines).

Wasatch Aquifer. The Wasatch Aquifer overlies the Wyodak coal beds and is hosted by the Wasatch Formation and the overlying alluvium. The Wasatch Formation was formed by the deposition of sediments on a broad low-lying floodplain with shallow lakes and swamps. The organic material that was deposited in the swamps was subsequently buried, compacted, and heated to form the coal stringers in the Wasatch today. The thick sandstones were deposited by ancient stream channels, the interbedded fine grained sandstones, siltstones, and shales represent crevasse splay and levee deposits, and other shales and limy siltstones represent lake deposits. The alluvium and discontinuous sandstones and coal seams of the Wasatch can provide water where they are saturated, but the Wasatch Formation is not a regional aquifer.

Recharge to the aquifer is from infiltration of precipitation and lateral movement of water from adjacent clinker formations. Very dense drilling patterns are usually required to accurately delineate the discontinuous water-bearing sands. On a regional scale, the discontinuous nature of the sandstone results in low permeability and slow movement of groundwater in the overburden. Because of the varied nature of the aquifer, hydraulic characteristics also vary. Wells completed in sandstone and channel sands are considerably more productive than wells in shale and siltstone. On a regional scale, transmissivity (movement of water) of the Wasatch Aquifer is typically less than 97 gallons per day (gpd)/ft and is commonly less than 9.7 gpd/ft (Martin et al. 1988). Aquifer tests conducted at the North Rochelle Mine indicated that the mean transmissivity of the overburden is 7.0-8.0 gpd/ft, with a range of 1.3-39.0 gpd/ft (Shell Oil Company Mining 1982).

Groundwater from the Wasatch Aquifer is generally used for livestock watering. Regional data indicate median total dissolved solids (TDS) concentrations of 2,215 milligrams per liter (mg/l) with observations exceeding 9,000 mg/l (Martin et al. 1988). TDS in the immediate vicinity of the LBA tract show considerable variation. Black Thunder Mine data show TDS of 820-9,430 mg/l in the Wasatch overburden (ARCO Coal Company 1995), and data from North Rochelle are consistent with these observations (Shell Oil Company Mining 1982). Data also show that sodium and sulfate concentrations in the Wasatch Aquifer are elevated. At the Black Thunder Mine, sodium concentrations ranged from 67 to 1,020 mg/l, and sulfate concentrations ranged from 9 to 5,390 mg/l. Therefore, concentrations

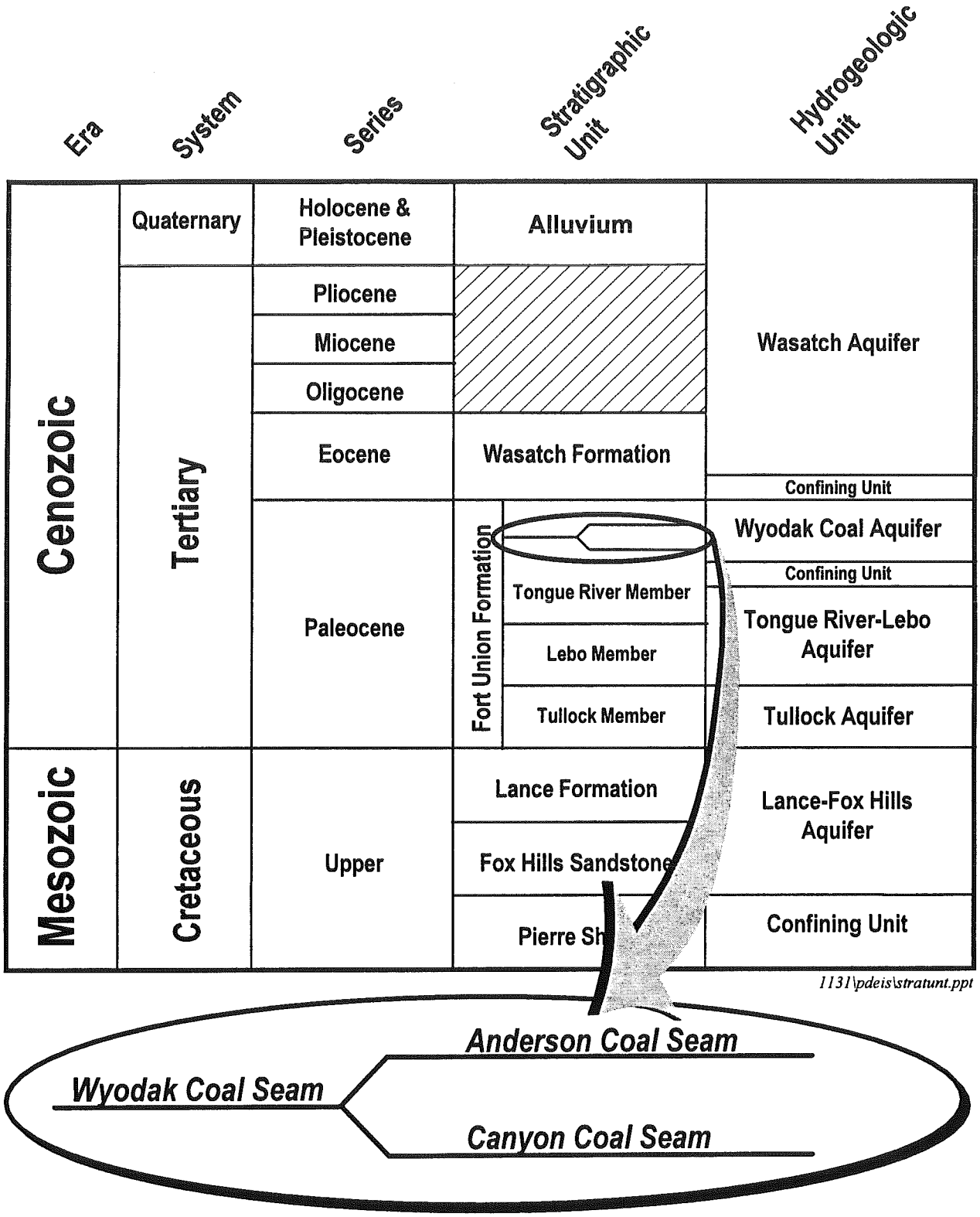


Figure 3.7 The Relationship of Stratigraphic Units to Hydrogeologic Units (Modified from Martin et al. 1988).

of TDS and sulfate generally preclude the use of the Wasatch Aquifer from uses other than livestock watering.

Clinker is baked and partially fused Wasatch overburden. The heat required for this metamorphism was supplied in prehistoric times when the underlying Wyodak-Anderson coal burned. When the coal burned, 80-90% of its original volume was lost, causing the overlying clinker to collapse into the ensuing void. A highly permeable aquifer composed of coarse, resistant fragments resulted from these processes. Wells completed in clinker are often capable of yielding 250 gallons per minute or more. Clinker is frequently in good hydraulic connection with both coal and unbaked overburden. Water levels and flow directions in the coal and overburden are often strongly influenced by the presence of saturated clinker. Regionally, saturated clinker is an important aquifer, particularly as a recharge source for the coal.

Water quality in clinker is generally better than is reported for the overburden and somewhat worse than that found in the coal. Clinker water chemistry is generally of a calcium-magnesium-sodium sulfate composition, and sulfate concentrations are often high enough to exceed Wyoming's Class II water quality standard for irrigation.

Wyodak Coal Bed Aquifer. The Wyodak coal bed is the most continuous hydrogeologic unit in the PRB and generally exists under confined conditions. Near the outcrop, the aquifer is generally unconfined (Martin et al. 1988). As the coal dips westward, it generally becomes progressively more confined between the overlying Wasatch and underlying Tongue River sediments. These sediments are comprised primarily of shale and siltstone, with occasional interbedded sandstones lenses (see Figure 3.3).

Solid, undisturbed coal is basically impermeable; therefore, the hydraulic properties of the coal are functions of the amount of fracturing which has occurred (i.e., faulting and flexing). As a result, aquifer properties are highly variable. Transmissivity in the coal formation is typically less than 1,002 gpd/ft and wells completed in the coal generally yield 10-50 gallons per minute (Martin et al. 1988).

Premining water level data from the Black Thunder and North Rochelle Mines indicate groundwater in the coal aquifer generally flows to the west. Due to current dewatering associated with the strip mining occurring at the adjacent Black Thunder Mine, a cone of depression currently exists in the LBA tract.

Water quality in the coal aquifer varies with location. In areas where the aquifer is unconfined (eastern portions of the study area), the dominant ions are calcium, magnesium, sodium, and sulfate. In the western portion of the study area where the aquifer becomes more confined, the water is a sodium-bicarbonate type (Shell Oil Company Mining 1982; ARCO Coal Company 1995). The median dissolved solids concentration reported by Martin et al. (1988) is 1,310 mg/l, with a maximum of 5,180 mg/l. Data from both the Black Thunder and North Rochelle Mine permits are within this range.

As with the Wasatch Aquifer, water quality of the coal aquifer generally does not meet WDEQ drinking water standards, but does meet livestock standards, and is also suitable for some industrial and irrigation purposes. Dissolved solids, sodium, and sulfate are the principal constituents contributing to its general unsuitability as drinking water.

Underlying Aquifers. The aquifers which underlie the Wyodak Coal Aquifer include the Tongue River-Lebo and the Tullock Aquifers, which are members of the Fort Union Formation. These aquifers generally have significantly higher quality than the Wasatch or coal aquifers. Therefore, wells completed in these aquifers are used throughout the PRB for domestic, industrial, municipal, and stock water supplies. The Fort

Union Formation below the coal is described as interbedded fine-grained sandstone, shale, carbonaceous shale, and coal. The average thickness of the Fort Union Formation, including the Wyodak coal, is 1,800 ft (Crist, 1991).

Aquifer tests conducted within the existing North Rochelle permit boundary demonstrate that the underlying Fort Union confining unit is only slightly permeable, with underburden transmissivities of 1.1-13.2 gpd/ft. The low permeability minimizes vertical communication between the coal and the underburden. Therefore, water quality of the underburden is protected.

Water quality of the underlying Tongue River-Lebo Aquifer often meets Wyoming drinking water standards, and these aquifers are typically utilized as sources of drinking water for mining operations. However, data from the North Rochelle permit indicate that the underlying aquifer exhibits highly variable water quality. Sulfate, sodium, and TDS were observed in several underburden wells at levels exceeding standards for all but livestock use. Total dissolved solids concentrations ranged from 1,700 mg/l to 3,700 mg/l.

The deeper Tullock Aquifer is of much higher quality. Limited monitoring data at the North Rochelle Mine indicate that this aquifer is a sodium bicarbonate type with a slightly alkaline pH (8.4) and TDS of 330 mg/l (Shell Oil Company Mining 1982).

North Rochelle's existing water supply well is completed in sands in the Tullock Aquifer at a depth of 1,072 ft to 1,926 ft. The total depth of this well is 1,930 ft, and it is located in the northeast corner of the proposed rail loop with a legal description of the NW¼, NW¼ of Section 9, T42N, R70W.

3.6.2 Surface Water

Surface water features in the analysis area are displayed in Figure 3.8 and on the LBA tract in Figure 3.9. The LBA tract lies almost entirely within the Trussler Creek drainage, and all of the stream channels are ephemeral, that is, they flow only in direct response to precipitation events and snowmelt. Trussler Creek flows northward through the LBA tract and joins Little Thunder Creek near the center of Thunder Basin Coal Company's Black Thunder Mine permit area. Olson Draw enters the LBA tract from the west and joins Trussler Creek near the center of the tract. A small portion of the northeastern corner of the LBA tract lies within an unnamed drainage area which is a tributary to Little Thunder Creek. Little Thunder Creek flows easterly to join Black Thunder Creek, a tributary of the Cheyenne River.

The channels of Trussler Creek, Olson Draw, and their tributaries are typically meandering, ephemeral grassed swales. As a result, the channels are dry for the majority of the year. When runoff does occur, it is typically of high intensity and short in duration. Typically, over 75% of the annual runoff occurs during May, June, and July, in response to snowmelt. Peak discharges typically occur in June; however, they may occur as early as January and as late as September (Shell Oil Company Mining 1982). Annual peak discharges are generally associated with thunderstorm activity. On the average, streams in the study area experience from three to five runoff events in a typical year. Discharge in Trussler Creek within the LBA tract is controlled to a large extent by an impoundment located immediately upstream of the site.

The drainage area of Trussler Creek is relatively small. At the upstream (southern) limit of the LBA tract, the Trussler Creek drainage area is approximately 2,507 acres (3.9 mi^2). At the downstream (northern) limit, the drainage area increases to 6,400 acres (10.0 mi^2) including the 2,755-acre (4.3-mi^2) watershed of Olson Draw. Upstream from the LBA tract, Trussler Creek will be disturbed by mining at the North Rochelle Mine, and downstream from the LBA tract, it has been disturbed by mining at the Black Thunder Mine. The drainage area of Olson Draw has not

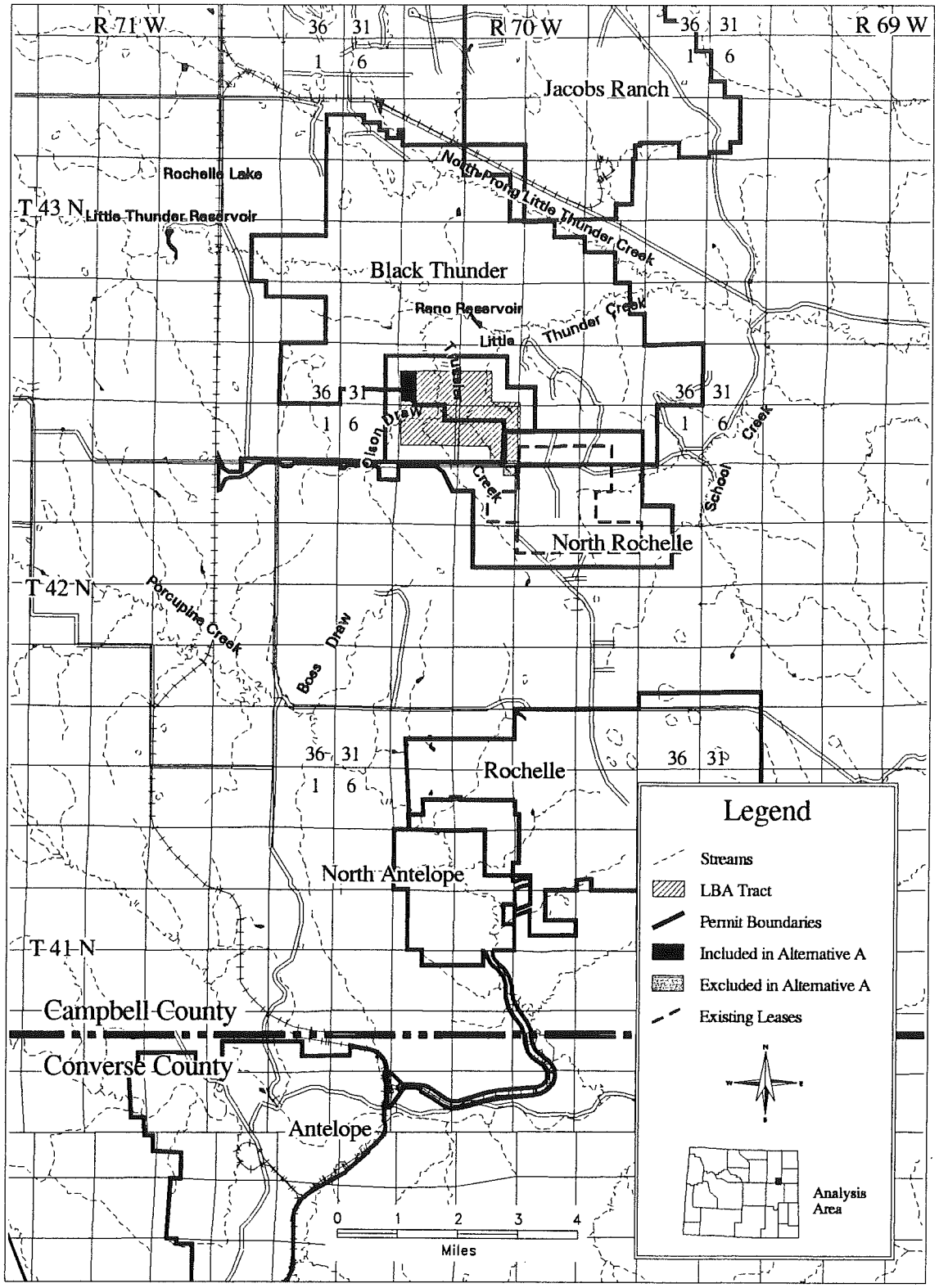


Figure 3.8 Surface Water Features in Analysis Area.

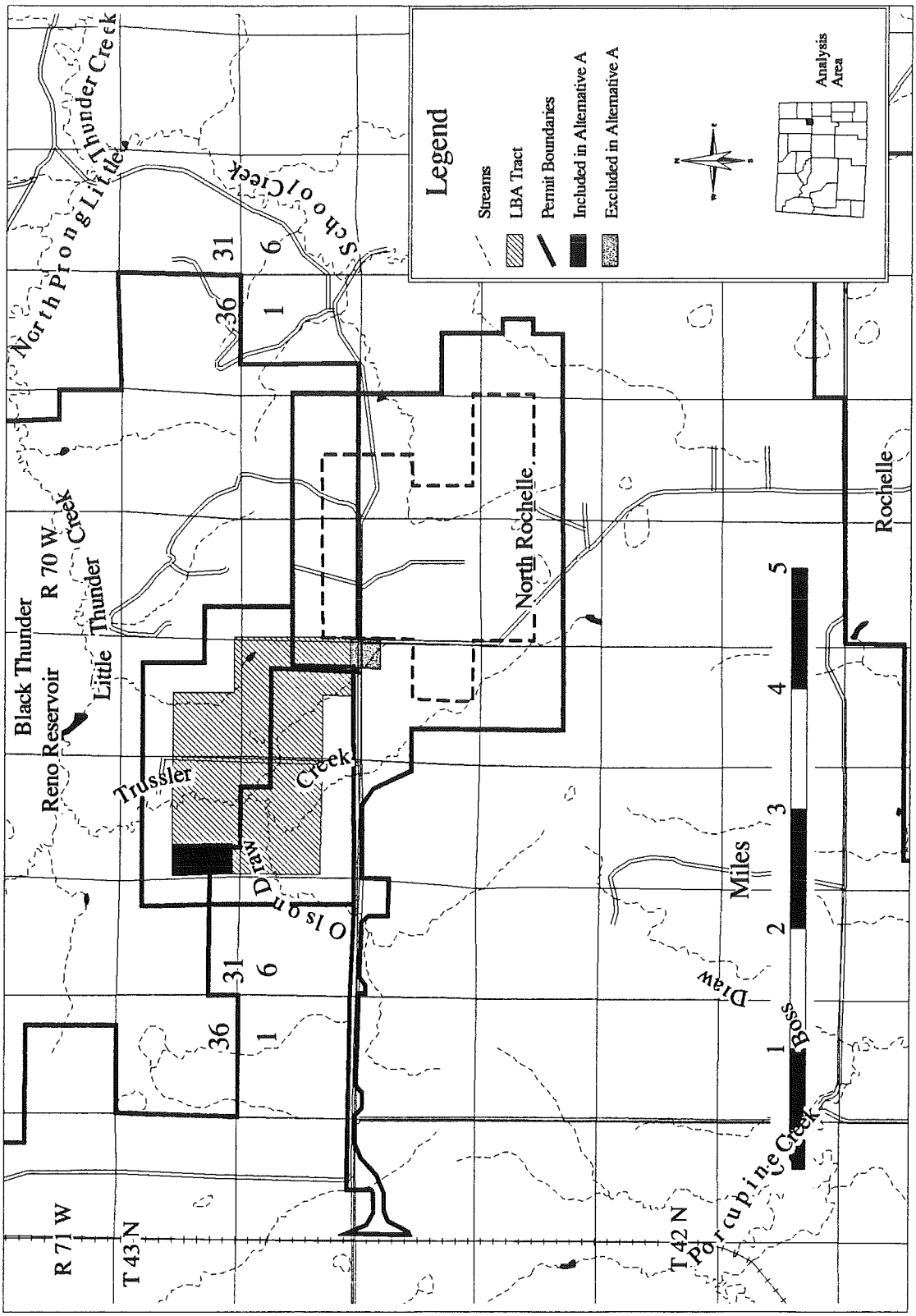


Figure 3.9 Surface Water Features on the LBA Tract.

been disturbed by mining and is currently rangeland. A series of pothole depressions in the stream channel of Trussler Creek have been created for stock watering. There is little evidence of headcutting or other geomorphic instabilities within the watershed.

Surface water quality information for Trussler Creek was obtained from the North Rochelle and Black Thunder Mine permits and indicates that the water quality is significantly higher than the shallow groundwater. Total dissolved solids concentrations are generally an order of magnitude lower than groundwater sources. The water is a calcium-bicarbonate type, and sodium is not present in detectable levels. In general, surface water in the analysis area has been determined to meet standards for livestock and is commonly used for wildlife and stock watering. No irrigation facilities exist within the LBA tract, and stock-watering ponds are limited to the several pothole depressions in Trussler Creek.

3.6.3 Water Rights

Wyoming State Engineer's Office records were searched for groundwater rights within 3 mi of the LBA tract on March 2, 1994, as required for WDEQ permitting. These data indicate that there are 282 water wells within 3 mi of the LBA tract. The majority (232) of these wells are owned by coal mining companies. Of the 50 noncoal-related wells, 15 are permitted for stock-watering purposes, and only one is permitted for domestic use. This well is shallow and completed within the Quaternary alluvium of Boss Draw approximately 3 mi south of the LBA tract. The remaining noncoal-related wells are monitoring wells owned by either the USFS or the Water Resources Research Institute of the University of Wyoming. Figure 3.10 presents the location of both North Rochelle's and Black Thunder's current monitoring wells for their existing mines.

A newer record search for all water wells registered within the general analysis area was conducted on October 14, 1996. This search area included T41N, T42N, and T43N and R69W, R70W, and R71W. A total of 1,052 wells was identified in this search, with 12 being identified for domestic use, 186 for stock use, 572 for monitoring, 40 for dewatering, 21 for reservoir supply, 54 for industrial use, 1 for irrigation, 159 for miscellaneous use, 1 temporary, and 6 unclassified. Appendix E presents the results of this search and identifies each well's location, depth, use, estimated yield, and ownership.

Wyoming State Engineer's Office records (June 17, 1994) indicate that surface water rights within the immediate vicinity of the LBA tract are predominately associated with coal mining activity at Black Thunder Mine (downstream of the LBA tract) or North Rochelle Mine (upstream of the LBA tract). These mine-related permits consist of impoundments for flood and sediment control, stream diversions, and industrial use (dust control). No surface water rights (within 3 mi) were found which were not related to the coal mining industry.

3.7 ALLUVIAL VALLEY FLOORS

Alluvial valley floors are unconsolidated stream-laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. The designation of a valley as an alluvial valley floor has significant bearing on mining and reclamation plan requirements.

Two drainage valleys occur in the general area--Trussler Creek and Olson Draw. Both have been studied in detail to determine the presence or absence of alluvial valley floors (Shell Oil Company Mining 1982; ARCO Coal Company 1995). There is no evidence of flood irrigation or subirrigation activities along either of these ephemeral streams, and the stream-laid deposits along these drainages are typically too narrow (less than 50 ft) to be mapped as alluvial valley floors. Therefore, no areas within the LBA tract are expected to meet the criteria of an alluvial valley floor.

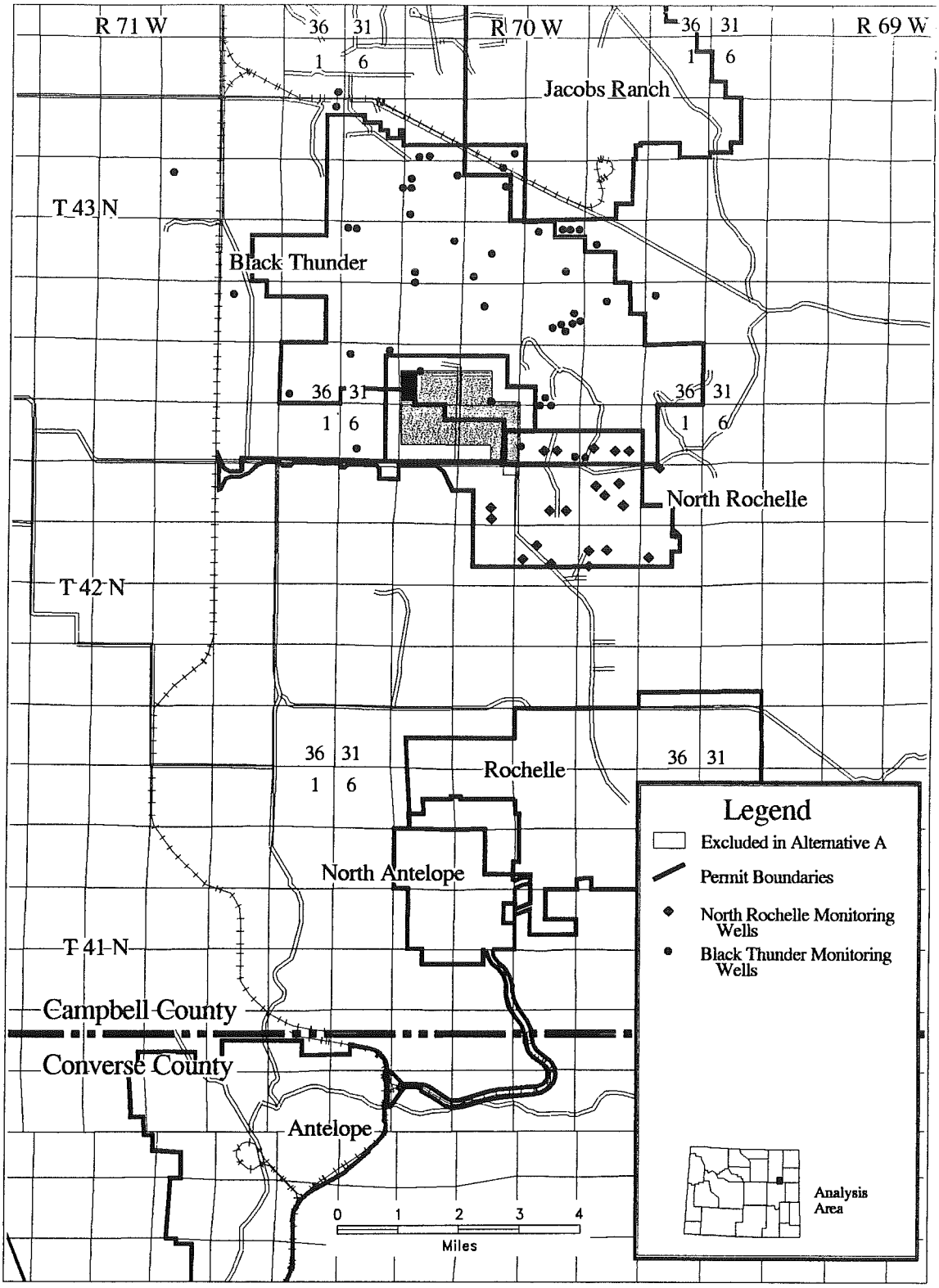


Figure 3.10 Existing Groundwater Monitoring Wells for the North Rochelle and Black Thunder Mines.

3.8 WETLANDS

Wetlands, which are protected under Section 404 of the Clean Water Act (33 CFR 1251 et seq.), are considered sensitive and valuable resources. National Wetlands Inventory (NWI) maps (USFWS 1991) were examined to identify potential wetlands in the analysis area and on the LBA tract (Figures 3.11 and 3.12). Jurisdictional wetland delineations using U.S. Army Corps of Engineers criteria would be performed during the WDEQ permitting process if a lease is issued for this tract. At that time, the U.S. Army Corps of Engineers and EPA would evaluate compliance with the Clean Water Act provisions under Section 404.

According to NWI maps, 10 wetlands totaling approximately 6 acres are scattered throughout the LBA tract (Figure 3.12). Palustrine (nontidal marshes) emergent wetlands occur along Trussler Creek, and a single palustrine, open water wetland (approximately 2 acres) occurs along an unnamed tributary to Little Thunder Creek in the eastern portion of the LBA tract. One playa (an approximately 3-acre ephemeral pond with no external drainage) located on the LBA tract is classified as an NWI wetland.

3.9 VEGETATION

The vegetation on the LBA tract is typical of that found in the southern part of the eastern PRB and is very similar to the premining vegetation on adjacent mines. Vegetation for approximately 80% of the LBA has been mapped in association with permitting the North Rochelle and Black Thunder Mines (Triton Coal Company 1980; ARCO 1995). The remainder of the LBA (approximately 292 acres), including portions of the SW¼ of Section 33, T43N, R70W, and the S½ of Section 32, T43N, R70W, have not been mapped. The following description of vegetation on the LBA is limited to the mapped area of the LBA and is based on information from the North Rochelle and Black Thunder Mine permits (Triton 1980; ARCO 1995). Table 3.4 gives the types and acreages of vegetation on the 1,440-acre LBA tract.

Of the 1,148 acres for which vegetation is mapped, the big sagebrush shrubland is most common (38.1%, or 438 acres). The primary species in this type are big sagebrush (*Artemisia tridentata*), followed by blue grama (*Bouteloua gracilis*), prickly pear cactus (*Opuntia* spp.), needle-and-thread grass (*Stipa comata*), western wheatgrass (*Elymus smithii*), and prairie Junegrass (*Koeleria cristata*). Shrubs--especially big sage--generally account for >30% of the total ground cover in this type.

Mixed grass is the second most abundant vegetation type mapped in the LBA tract, accounting for 29.8% (342 acres) of the 1,148 mapped acres. Mixed grass is common throughout upland areas but may also occur adjacent to ephemeral drainages (i.e., the southern banks of Trussler Creek). Primary species include blue grama, prickly pear cactus, needle-and-thread grass, prairie Junegrass, and western wheatgrass. Grasses account for the greatest percent of vegetative cover, followed by shrubs (<20% cover) and forbs. Big sagebrush is the most common shrub in this vegetation type.

Agricultural land is common in the southeastern portion of the LBA, accounting for 260 acres (22.6% of the mapped area). Agricultural areas consist primarily of cultivated barley fields and are probably rotated with other crops on a yearly basis. Portions of the agricultural lands were fallow at the time of the North Rochelle vegetation survey (Triton 1980).

Streamside meadows occur on the LBA primarily in association with Trussler Creek and Olson Draw. This vegetation type occurs on approximately 7.1% (82 acres) of the mapped portion of the LBA and is characterized by Kentucky bluegrass (*Poa pratensis*), western wheatgrass, field sedge (*Carex praegracilis*), common dandelion (*Taraxacum officinale*), foxtail barley (*Hordeum jubatum*), and prairie cordgrass

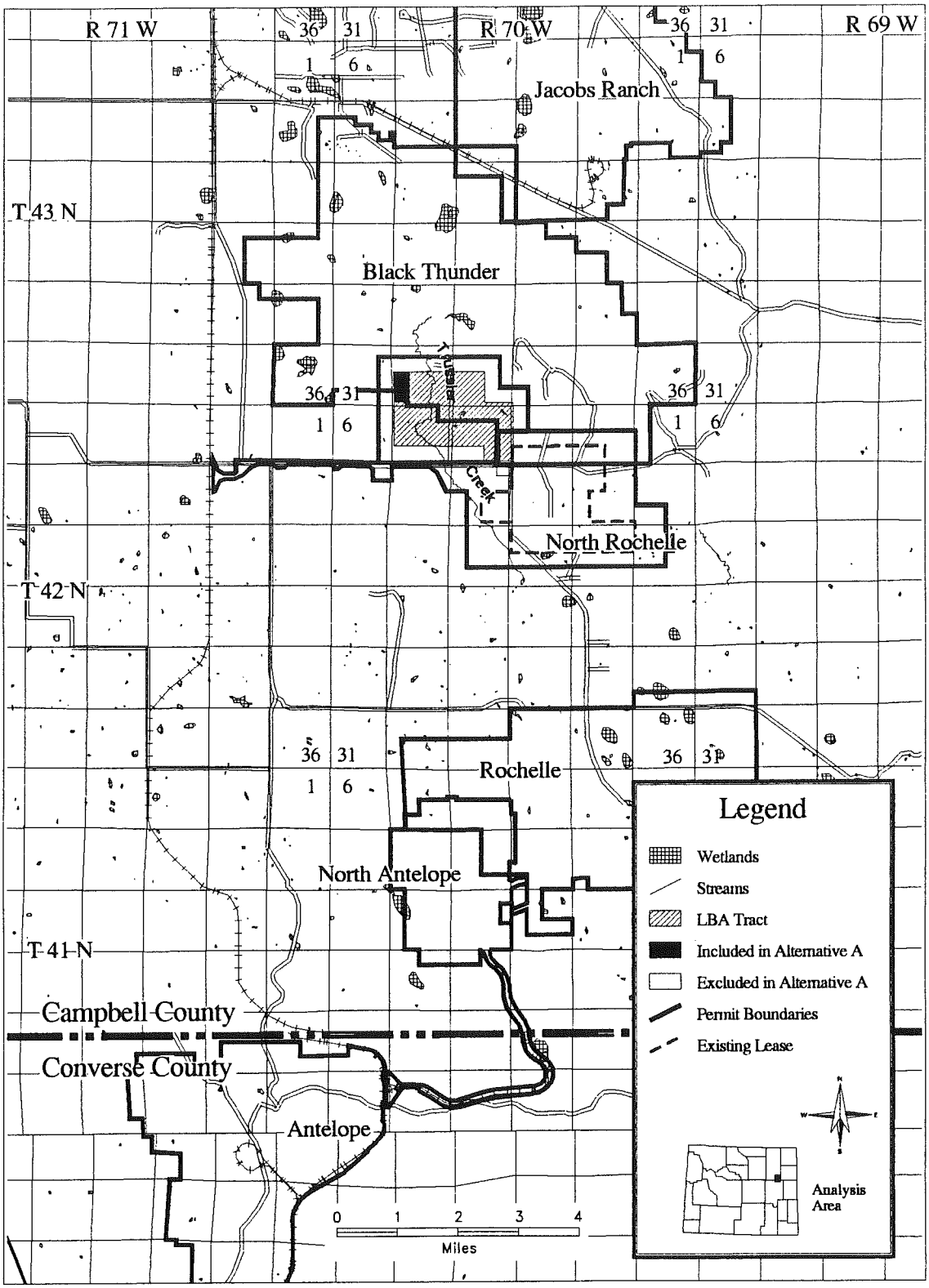


Figure 3.11 National Wetland Inventory Wetlands in the Analysis Area.

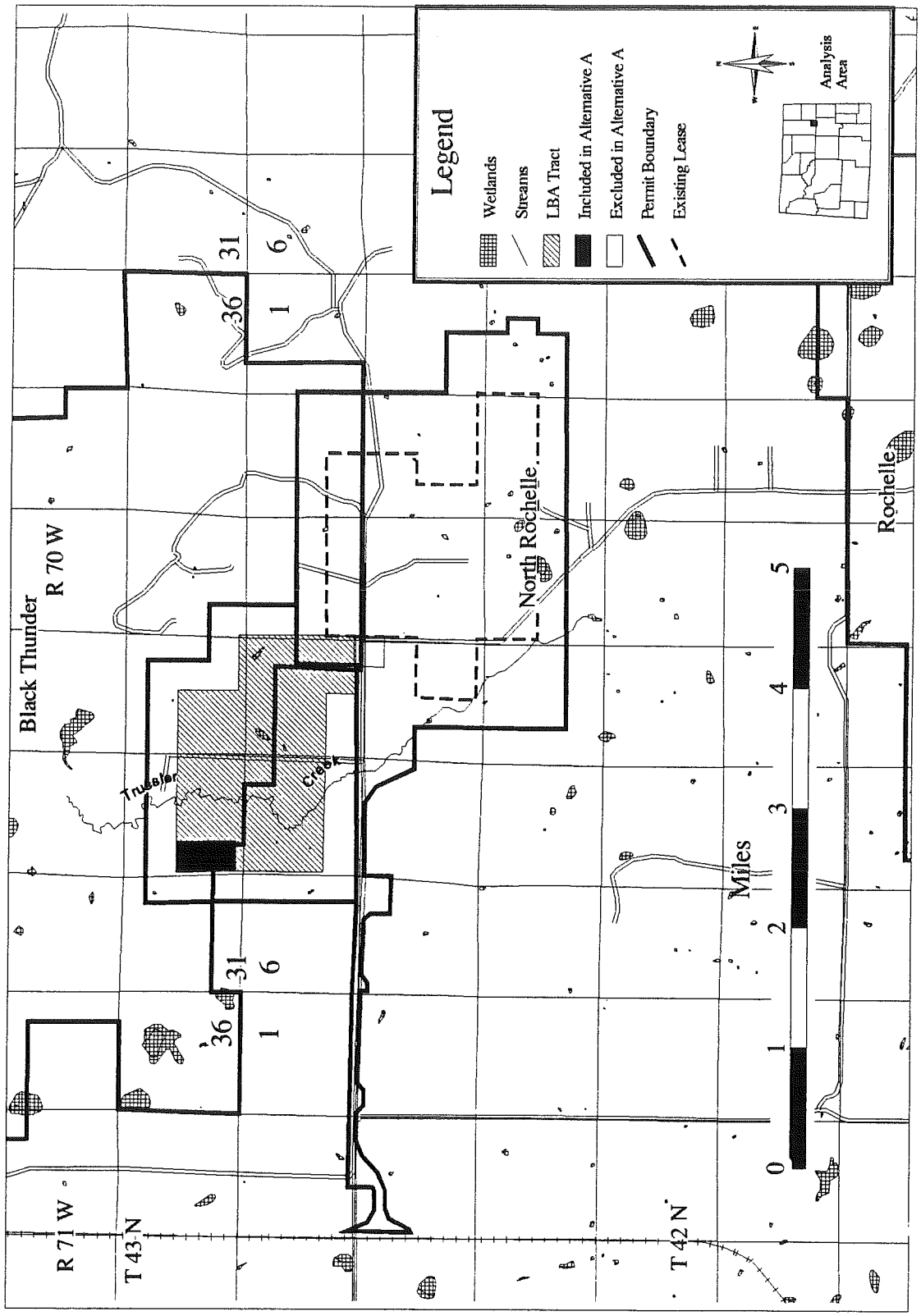


Figure 3.12 National Wetland Inventory Wetlands on the LBA Tract.

Table 3.4 Vegetation Types and Acreages for the LBA Tract.[1]

Vegetation Type	Number of Acres	Percent of LBA
Big sage shrubland	438	30.1
Mixed grass prairie	342	23.8
Agricultural land	260	18.3
Streamside meadow	82	5.7
Disturbed	9	0.6
Playa	8	0.6
Rough breaks shrublands	7	0.5
Open water/reservoir	2	0.1
Unmapped-vegetation unknown	292	20.3
Total	1,440	100.0

[1] Based on Triton (1980) and ARCO (1995).

(*Spartina pectinata*). Streamside meadows are some of the wettest areas in the LBA, receiving runoff and snowmelt. Although the streams flow only intermittently, scattered ponded areas may occur in low spots along the channel.

Two small playas occur on the mapped portion of the LBA (8 acres total, or 0.7%). These seasonal lake beds are either barren or support primarily grassland vegetation. Over time, evaporative processes have created saline soil conditions which determine the amount and type of vegetation these sites can support. Because of the range of water availability and soil salinity, playa vegetation can be quite variable; however, common species generally include western wheatgrass, common spikerush (*Eleocharis macrostachya*), needle-leaf spikerush (*E. acicularis*), and speedwell (*Veronica peregrina*). Species diversity in playa vegetation is normally substantially lower than most other vegetation types due to the more severe environmental conditions (e.g., salinity).

Rough breaks shrublands and disturbed vegetation types account for 0.6% and 0.8% of the mapped portion of the LBA, respectively; approximately 2% of the area (2 acres) is mapped as open water habitat. Rough breaks vegetation occurs on eroded uplands and is typically sparsely vegetated. Soils are generally shallow and poorly developed. Common species include western wheatgrass, big sagebrush, broom snakeweed (*Gutierrezia sarothrae*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Shrubs account for $\geq$30% of the cover, and total vegetative cover is typically low. Disturbed areas on the mapped portion of the LBA are limited to roads and associated ROWs.

Figure 3.13 presents a vegetation map of the analysis area obtained from satellite imagery and computer enhancement techniques using the Wyoming Gap Analysis Land Cover Map (University of Wyoming 1996). This map was created on a regional rather than a local scale;

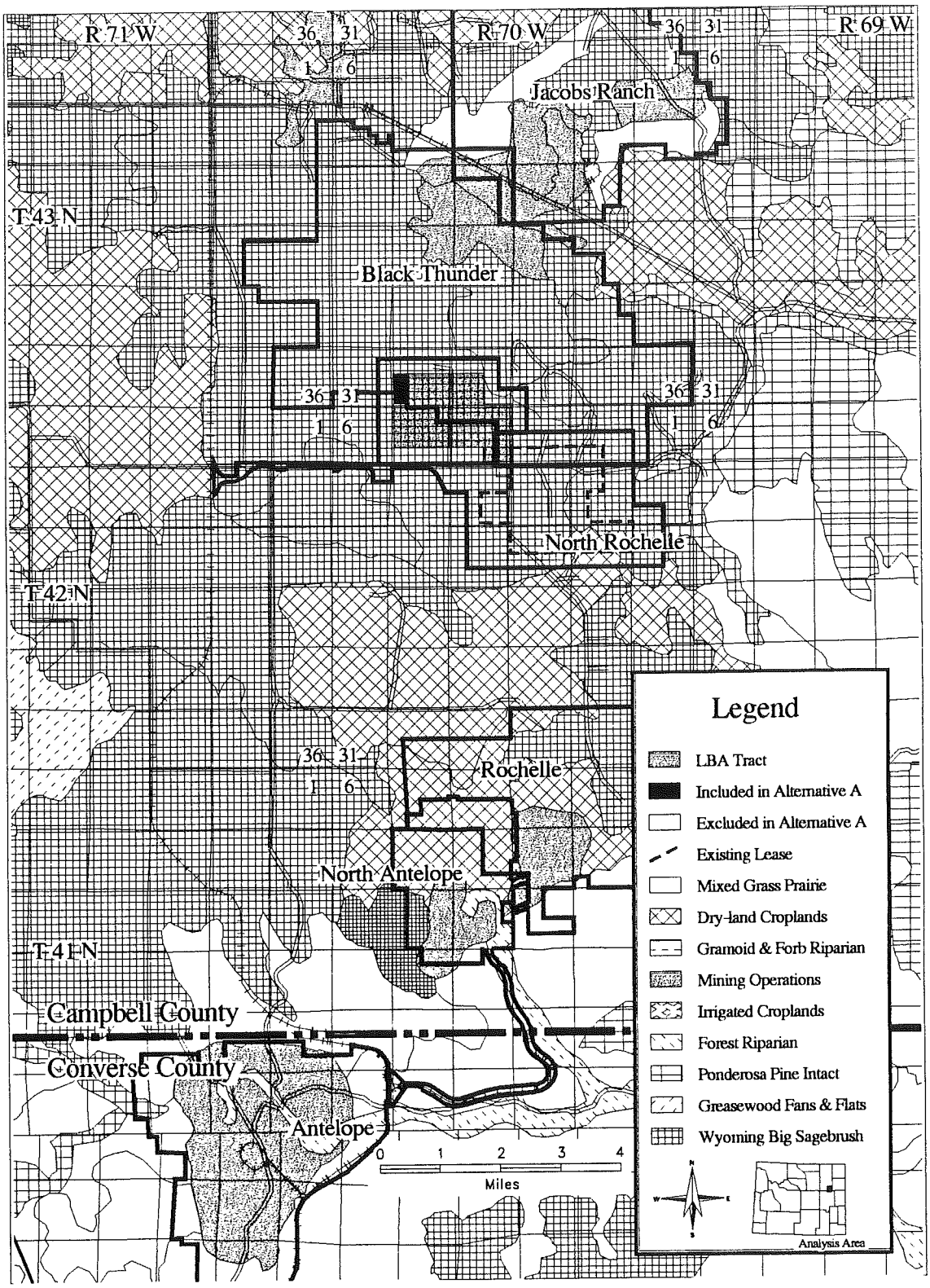


Figure 3.13 Vegetation Map of the Analysis Area (Data Source: Wyoming Gap Analysis Land Cover Map).

thus, the entire LBA tract was classified as Wyoming big sage (the most common vegetation type on the LBA). An in-depth discussion of vegetation types and distribution in the general analysis area is presented below.

Nine primary vegetation types (mixed grass prairie, greasewood fans and flats, graminoid- and forb-dominated riparian, dryland crop, irrigated crop, mining operations, ponderosa pine, forest-dominated riparian, and Wyoming big sagebrush) occur in the general analysis area. Approximately 65% of the analysis area is dominated by native big sagebrush and mixed grass prairie types (approximately 40% and 25%, respectively). Areas in or adjacent to stream channels are typically native graminoid/forb riparian or forest-dominated riparian. The ponderosa pine type typically occurs in the Rochelle Hills area on the eastern edge of the analysis area. Dryland crop and irrigated crop types occupy approximately 18% and 1% of the analysis area, whereas the mining operations type (6%) occurs on recently mined areas.

3.10 WILDLIFE

Numerous wildlife species have traditionally used the PRB for seasonal and year-round habitation. Changes in land use from native rangeland to livestock grazing, agricultural crop production, and mineral extraction have had an impact on wildlife habitat and subsequent wildlife use of the area. The Wyoming Game and Fish Department (WGFD) has summarized the history of the wildlife resources in this general area as follows.

> Wildlife habitat has generally declined since pre-Euro-American settlement. Wildlife habitat once occupied by buffalo, wolves, black-footed ferrets, and grizzly bears is now vacant of these species. Populations of antelope, elk, bighorn sheep, mountain lion, black bear, sage and sharp-tailed grouse, game fish, waterfowl, bald and golden eagles, and peregrine falcon have decreased since pre-Euro-American settlement. The decline in habitat is a result of man's developments, alteration of vegetation, and introduction of domestic livestock. The decline may be more pronounced in the plains and foothills/escarpments land type areas where greater development has occurred. Populations of mule deer, white-tailed deer, moose, turkey, and small game may be higher than pre-Euro-American settlement. Populations of predators, furbearers, and raptors appear to be relatively stable (personal communication, 1994, to Bruce Daughton, BLM, RMP Team Leader, for use in Buffalo RMP Update, from Roger Wilson, State Wildlife Biologist).

Reports and references used in this description of the area's wildlife include the WGFD Wildlife Observation System (WGFD 1994a, 1996); WGFD Job Completion Reports (WGFD 1994b), WGFD comment letters; USFWS comment letters; USFS wildlife maps and comments; The Nature Conservancy Wyoming Natural Diversity Database (WNDDB) searches (The Nature Conservancy 1994, 1996); the DEIS for North Rochelle Mining and Reclamation Plan (OSM 1982); the North Rochelle Mine Permit Application (Shell Oil Company Mining 1982); the FEA for the West Black Thunder Coal Lease Application (BLM 1992a), the Black Thunder Mine Permit Renewal/Amendment (ARCO Coal Company 1995); North Rochelle Mine 1996 Wildlife Monitoring data (Triton Coal Company 1996); and personal contacts with WGFD and BLM biologists. Site-specific wildlife surveys have not been conducted for this lease application, but will be as part of the mine permitting process if a lease sale is held. Listings of all wildlife observed or recorded in the area are available from the references listed above. General descriptions of wildlife and habitat use in the analysis area follow. Detailed analysis of big game hunting and fishing data is provided in the recreation portion of the landownership and use section on pages 3-33 and 3-35. This includes designated seasonal use areas.

The most common big game species in the area are pronghorn antelope and mule deer. Antelope are widely distributed throughout the sagebrush and grassland vegetative types. Mule deer use all habitats, although they show a marked preference for the ponderosa pine/juniper breaks habitat in the Rochelle Hills east of the mines. Elk also prefer this habitat, although they make extensive use of reclaimed coal lands north of the LBA tract on Jacobs Ranch Mine. White-tailed deer are occasionally seen in the area. No designated big game crucial habitat or migration corridors exist in the LBA tract.

Other common mammals include predators such as coyote, red fox, striped skunk, raccoon, and feral cat. Lagomorphs (jackrabbits and cottontails) are abundant and widespread throughout the PRB and, along with numerous rodents (mice, shrews, and voles) and sciurids (chipmunks, ground squirrels, and prairie dogs), are important prey items for raptors and other predators.

Sage grouse habitat occurs throughout the PRB and is typically characterized by an interspersed mixture of sagebrush and grassland. In winter, sage grouse are dependent on tall, dense stands of sagebrush that remain relatively exposed through deep snow. During spring, sage grouse gather on breeding grounds (leks), which are characterized by open areas (meadows in low sagebrush) surrounded by denser sagebrush cover. Year after year, grouse return to these leks, although the exact location of the lek may shift slightly. Sage grouse tend to nest within 2 mi of the lek, and this area is considered nesting habitat. Sage grouse have been documented to select sagebrush-grassland habitats with relatively tall sagebrush and canopy coverage ranging from approximately 10 to 40% in which to build nests. Figure 3.14 shows the location of known sage grouse leks in the analysis area. No leks have been reported on the LBA tract, and the entire tract was searched this year as part of North Rochelle's annual wildlife monitoring (Triton Coal Company 1996).

Several common species of waterfowl, shorebirds, and waders have been recorded in the analysis area. Most individuals observed were on or and around larger water bodies (Reno Reservoir, Rochelle Lake, Little Thunder Reservoir, etc.), although ephemeral streams and associated stock ponds also provide suitable habitat.

The WGFD, USFWS, and WDEQ have expressed concern for several avian species or subspecies that may occur in the PRB coal region. These species have been designated as Migratory Birds of High Federal Interest (MBHFI). Table 3.5 lists the MBHFI in the PRB and their expected occurrence on or near the LBA tract.

The most common MBHFI recorded in the analysis area are raptors (hawks, eagles, and falcons). Ferruginous hawks and golden eagles are known to nest in the PRB. Ferruginous hawks migrate out of the PRB in the winter, whereas golden eagles are year-round residents. Bald eagles are winter residents and have been observed flying over the LBA tract. No bald eagle roosts or feeding sites occur in the immediate vicinity of the LBA tract. Other raptors documented in the analysis area include prairie falcon, merlin, osprey, and peregrine falcon. The latter species are listed as uncommon to rare and were likely migrating through the area, as little suitable habitat exists for them and very few sightings have been recorded. Figure 3.15 presents known locations of all historical raptor nest sites within the vicinity of the LBA tract (however, many of these nests are no longer in existence).

Two ferruginous hawk nest sites and two golden eagle nest sites have been documented within the proposed LBA permit area, but all four of these nests are now destroyed and are no longer used (Triton Coal Company 1996). Numerous other historical raptor nest sites (the majority of which are either ferruginous hawk or golden eagle) occur in close proximity to the LBA tract (see Figure 3.15). Triton Coal Company's 1996

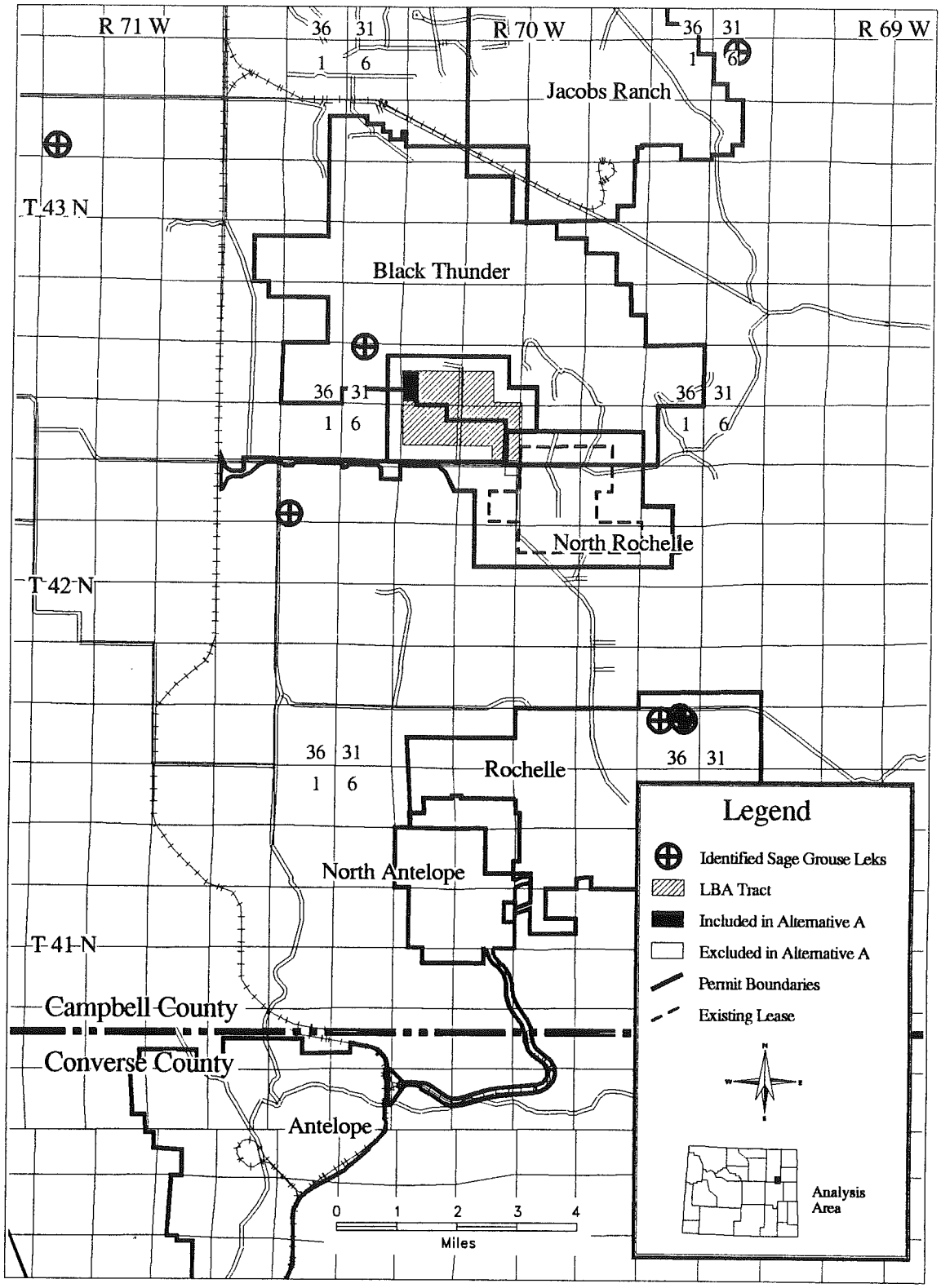


Figure 3.14 Known Sage Grouse Leks in the Analysis Area.

Table 3.5 MBHFI Status in Northeastern Wyoming and Expected Occurrence on the North Rochelle LBA Tract.

Species	Seasonal Status/Breeding Records in Northeastern Wyoming[1]	Potential Occurrence on LBA Tract	Record of Sighting Near LBA Tract
White pelican	Summer/nonbreeder	Rare/migrant	Yes
Double-crested cormorant	Summer/breeder	Rare/migrant	Yes
Canvasback	Summer/one record	Rare/migrant	No
Ferruginous hawk	Summer/breeder	Common	Yes
Golden eagle	Resident/breeder	Common	Yes
Bald eagle	Winter/nonbreeder	Common in winter	Yes
Osprey	Summer/has nested	Rare/migrant	Yes
Prairie falcon	Resident/breeder	Uncommon	Yes
American peregrine falcon	Migrant/historical	Rare	Yes
Richardson's merlin	Resident breeder	Rare	Yes
Whooping crane	Never recorded	Very rare/migrant	No
Sandhill crane	Migrant/nonbreeder	Uncommon/migrant	Yes
Mountain plover	Summer/breeder	Uncommon	Yes
Long-billed curlew	Summer/possible breeder	Rare/migrant	Yes
Burrowing owl	Summer/breeder	Uncommon	Yes
Lewis' woodpecker	Summer/breeder	Rare	No
Dickcissel	Summer/breeder	Rare	No

[1] Compiled from USFWS (1980) and Oakleaf et al. (1991) and includes Campbell County and adjacent counties.

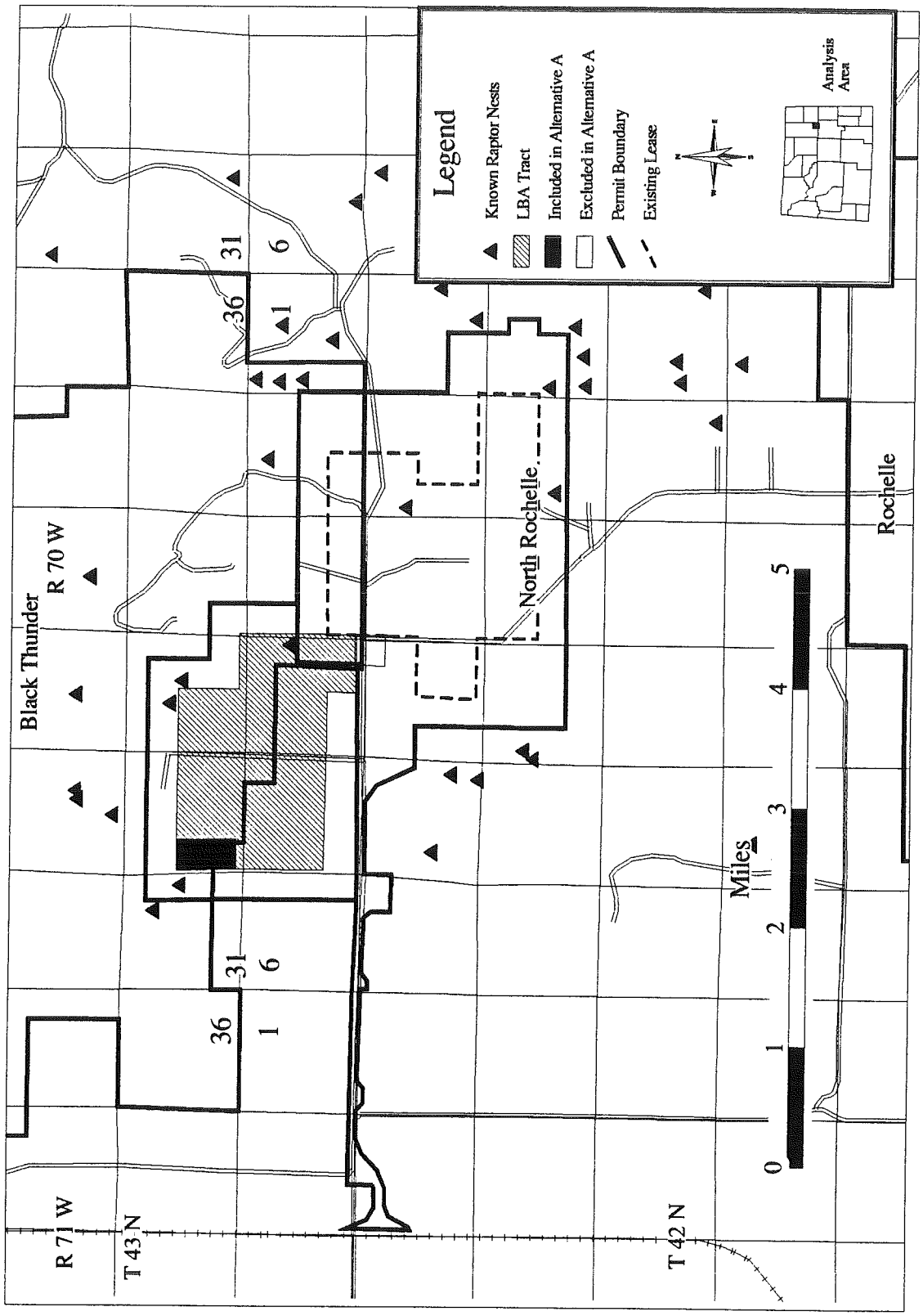


Figure 3.15 Known Historical Raptor Nest Sites on the LBA Tract.

wildlife monitoring report contains detail concerning each of these nests and is incorporated by reference into this EIS. Nesting habitat for burrowing owls (black-tailed prairie dog towns and badger burrows) is present in the PRB, and burrowing owls have been reported nesting several miles south of the LBA tract within the North Antelope Mine permit area (Oelklaus 1989) and on the eastern edge of the existing North Rochelle permit area (Triton Coal Company 1996). However, burrowing owls have not been reported nesting in the LBA tract. Mountain plover habitat does occur within the LBA tract, but no plovers have been documented during annual wildlife monitoring at the adjacent North Rochelle and Black Thunder Mines and associated 2-mi buffers, which includes the entire LBA tract. The USFS has identified certain sensitive species that they must consider in making land use decisions for lands they administer. Prior to mining, the LBA tract will have to be evaluated for habitat for these species, and the USFS will have to make a determination as to how mining could impact these species. A list of USFS Region 2 Sensitive Species that the LBA tract will have to be evaluated for prior to mining is included as Appendix F.

3.11 THREATENED, ENDANGERED, AND CANDIDATE SPECIES

The Endangered Species Act (16 U.S.C. 1531-1543) protects plant and animal species that are listed as T&E, as well as their critical habitats. Endangered species are defined as those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. An additional classification--"candidate species" (formerly Category 1 candidate species)--includes species for which the USFWS has sufficient data to list as T&E, but for which proposed rules have not yet been issued.

A list of T&E species potentially occurring in the lease area was obtained from the USFWS (Table 3.6). Observation records of T&E and candidate species in the project area were collected from WGFD (1994a, 1996), the WNDDB (The Nature Conservancy 1994, 1996), and mine permit applications and associated annual wildlife monitoring reports for the operating coal mines adjacent to the LBA tract. T&E surveys specific to this lease application have not yet been conducted.

T&E animal species potentially occurring on the LBA tract are the black-footed ferret (endangered), bald eagle (threatened), and peregrine falcon (endangered). One listed (threatened) plant, Ute lady's tresses may occur on the LBA tract. Two candidate animal species, mountain plover and swift fox, may occur on the LBA tract.

The black-footed ferret was once distributed throughout the high plains of the Rocky Mountain and western Great Plains. Prairie dogs are the main food source of black-footed ferrets, and few ferrets have historically been collected away from prairie dog colonies. No prairie dog colonies exist within the LBA tract, but several occur in the analysis area (Figure 3.16). Surveys of these colonies conducted for adjacent mine permit applications have revealed no evidence of black-footed ferrets.

Bald eagles are relatively common winter residents in the PRB. They require cliffs, large trees, or sheltered canyons associated with concentrated food sources (e.g., fish or waterfowl concentration areas) for nesting and/or roosting areas. Although bald eagles apparently do not nest within the LBA tract, it is likely that they use the area for foraging. They forage widely during the non-nesting season (i.e., fall and winter) and scavenge on animal carcasses such as deer and elk; however, no concentrated bald eagle food sources exist in the LBA tract. A communal winter bald eagle roost exists approximately 2.5 mi east of the LBA tract.

Table 3.6 Threatened, Endangered, and Candidate Animal and Plant Species and Their Potential Occurrence Within the North Rochelle Lease Area.

Common Name	Scientific Name	Status	Expected Occurrence
Mammals			
Black-footed ferret	*Mustela nigripes*	Endangered	Potential resident in prairie dog colonies
Swift fox	*Vulpes velox*	Candidate	Potential resident in grasslands of southern/eastern Wyoming
Birds			
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Common winter resident
Peregrine falcon	*Falco peregrinus*	Endangered	Migrant
Mountain plover	*Charadrius montanus*	Candidate	Grasslands statewide, breeder
Plants			
Ute lady's tresses	*Spiranthes diluvialis*	Threatened	Potential occurrence along riparian edges, gravel bars, old oxbows, and moist to wet meadows

Peregrine falcons feed almost exclusively on birds, many of which are associated with riparian zones and large bodies of water (e.g., waterfowl). The PRB is occasionally used by peregrines for hunting, and several ponds and lakes in the PRB provide an abundant source of potential waterfowl and shorebird prey. Peregrines have been observed during annual wildlife monitoring surveys at the Antelope Mine approximately 10 mi south of the LBA tract, and it is likely that wintering or migrating peregrine falcons hunt over the LBA tract on occasion. Peregrine falcons nest on tall cliffs, usually within 1.0 mi of a stream or river. These habitats provide concentrated food sources and open areas to hunt. No known peregrine falcon nests have been recorded on or adjacent to the LBA tract, and neither peregrine nesting habitat nor concentrated food sources exist in the area.

Ute lady's tresses, a member of the orchid family, was first identified in Wyoming in 1993. This threatened plant has been identified in a few locations in Goshen and Converse Counties of eastern Wyoming, and its presence could be expected throughout appropriate habitats in southeastern Wyoming. The plant grows in moist soils along with grasses and sedges and may be found along streams, rivers, ponds, and reservoirs, as well as in bogs, wetlands, and riparian or seep areas. Ute lady's tresses were identified on a sandy bank of Antelope Creek near a cattail marsh approximately 10 mi southwest of the LBA tract in 1994. These particular plants were identified as being 2-8 inches tall and difficult to find beneath a moderately dense canopy of grass. They occurred on a 2-3 ft wide moist to wet meadow-like bank with sandy soils, on a 45° south-facing slope, which was located between

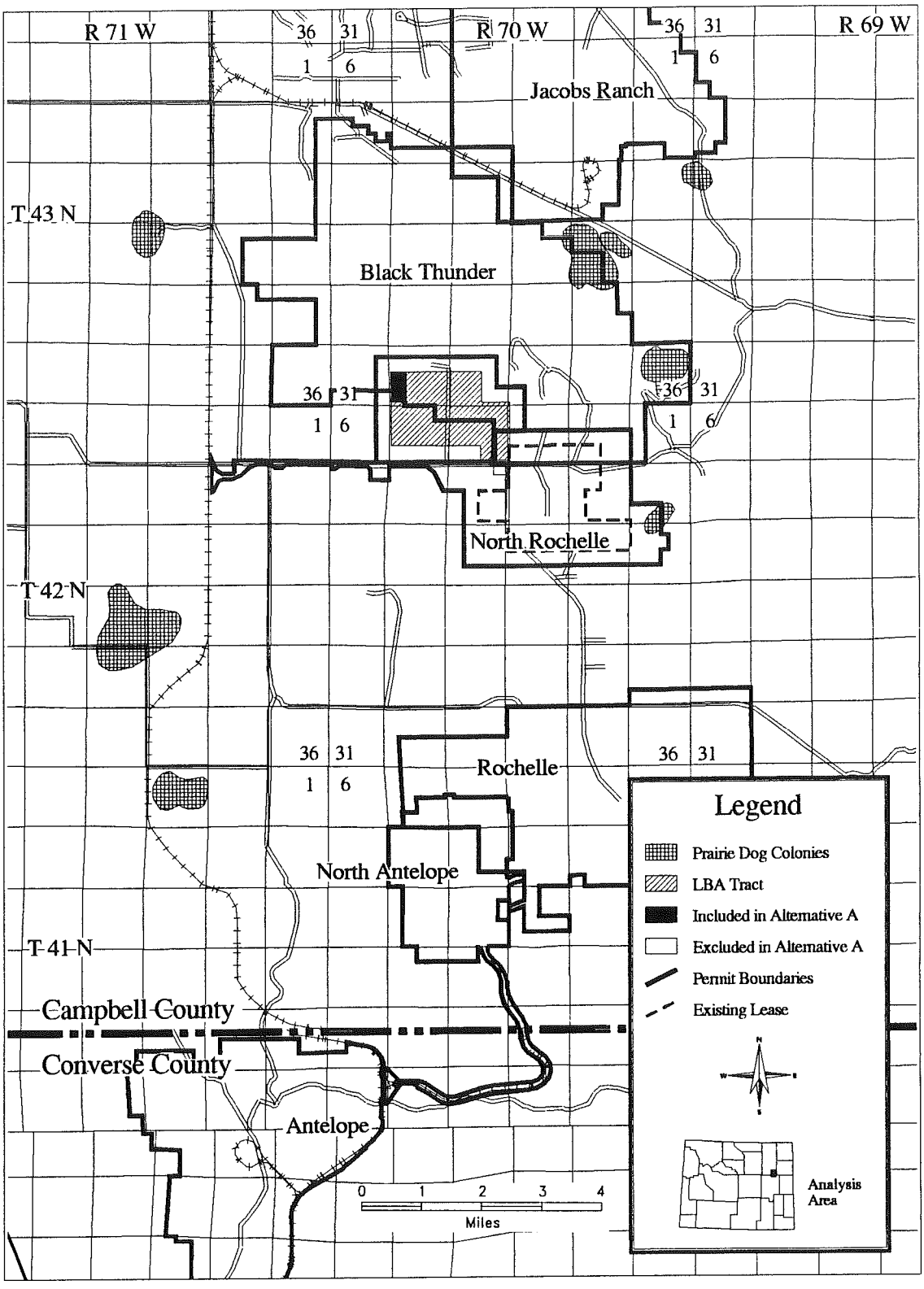


Figure 3.16 Known Prairie Dog Colonies Within the Analysis Area.

cattails and a sandy bench. Surveys of the adjacent North Rochelle Mine permit area conducted in June and August of 1995 (BKS Environmental Associates, Inc. 1995), using the USFWS interim guidelines for Ute lady's tresses surveys found no orchids, and the lack of suitable habitat was noted in the area. The LBA tract is located directly northwest of the areas surveyed in 1995, and suitable habitat for Ute lady's tresses is likely to be limited on the LBA tract. Site-specific surveys would be conducted on the LBA tract as part of the WDEQ permitting process if a lease is issued.

The mountain plover is a candidate species inhabiting the high, dry short-grass plains east of the Rocky Mountains. Breeding bird surveys have shown an overall decline in the continental population of mountain plovers. The main reason cited for this decline is degradation in the quality of wintering habitats in southern Texas and California. The loss of breeding habitat due to cultivation and land use changes, as well as prey base declines resulting from pesticide use, are also listed as threats to mountain plover survival. Cattle grazing that maintains the open short-grass habitat favored by mountain plovers may however benefit the species. Nesting mountain plovers have been documented on the Antelope Mine located approximately 10 mi south of the LBA tract. Studies conducted in this area theorized that suitable nesting habitat exists throughout the area. Parrish (1988) noted that mountain plover nests in the PRB were found in areas of short (<4 inches) vegetation on slopes of less than 3%, and any short-grass, very short shrub, or cushion plant communities could be considered potential nesting habitat. Black-tailed prairie dog colonies are reported to provide favored nesting habitat. Mountain plover habitat occurs on the LBA tract, but no plovers have been documented during annual wildlife monitoring on the adjacent North Rochelle and Black Thunder Mines and associated 2-mi buffers which includes the LBA tract. Site-specific surveys of the LBA tract will be conducted as part of the WDEQ mine permitting process if a lease is issued for this tract.

The swift fox, also a candidate species, is a resident of the northern Great Plains from the Rocky Mountain foothills to Texas. In Wyoming, this species inhabits the eastern Great Plains grasslands, occasionally utilizing agricultural lands and irrigated native meadows. Prey includes small mammals, insects, and birds. No recent sightings of swift fox have been reported on or near the LBA tract; however, much of the PRB, including the LBA tract, is potential swift fox habitat.

3.12 LANDOWNERSHIP AND USE

Surface landownership in the analysis area is both private and public (U.S. government) (Figure 3.17). The majority of the U.S. government lands are administered by the USFS as part of the Thunder Basin National Grasslands. Coal ownership on the LBA tract is entirely federal (Figure 3.18). This land and mineral ownership pattern influences land use. These lands have traditionally supported (and continue to support) numerous wildlife species. Livestock grazing became a dominant land use in the early 1900s, and approximately half of the native rangeland in the PRB has been converted to pasture and cultivated crop land. The PRB has been referred to as "The Energy Capital of the United States," with Campbell County producing about 25% of all U.S. coal and 88% of the coal mined in Wyoming (Campbell County Economic Development Corporation 1993; BLM 1996g). Campbell County is also the largest oil producer in Wyoming, and if recent plans for coal bed methane development materialize, the county may soon produce substantial quantities of methane gas.

Private surface lands within the LBA tract are owned by Atlantic Richfield Company (ARCO) and Powder River Coal Company (Figure 3.19). The public surface lands are part of the Thunder Basin National Grasslands, administered by the USFS. The coal ownership of all the lands in the LBA tract (both private and federal surfaces) is federal and administered by the BLM (see Figure 3.18).

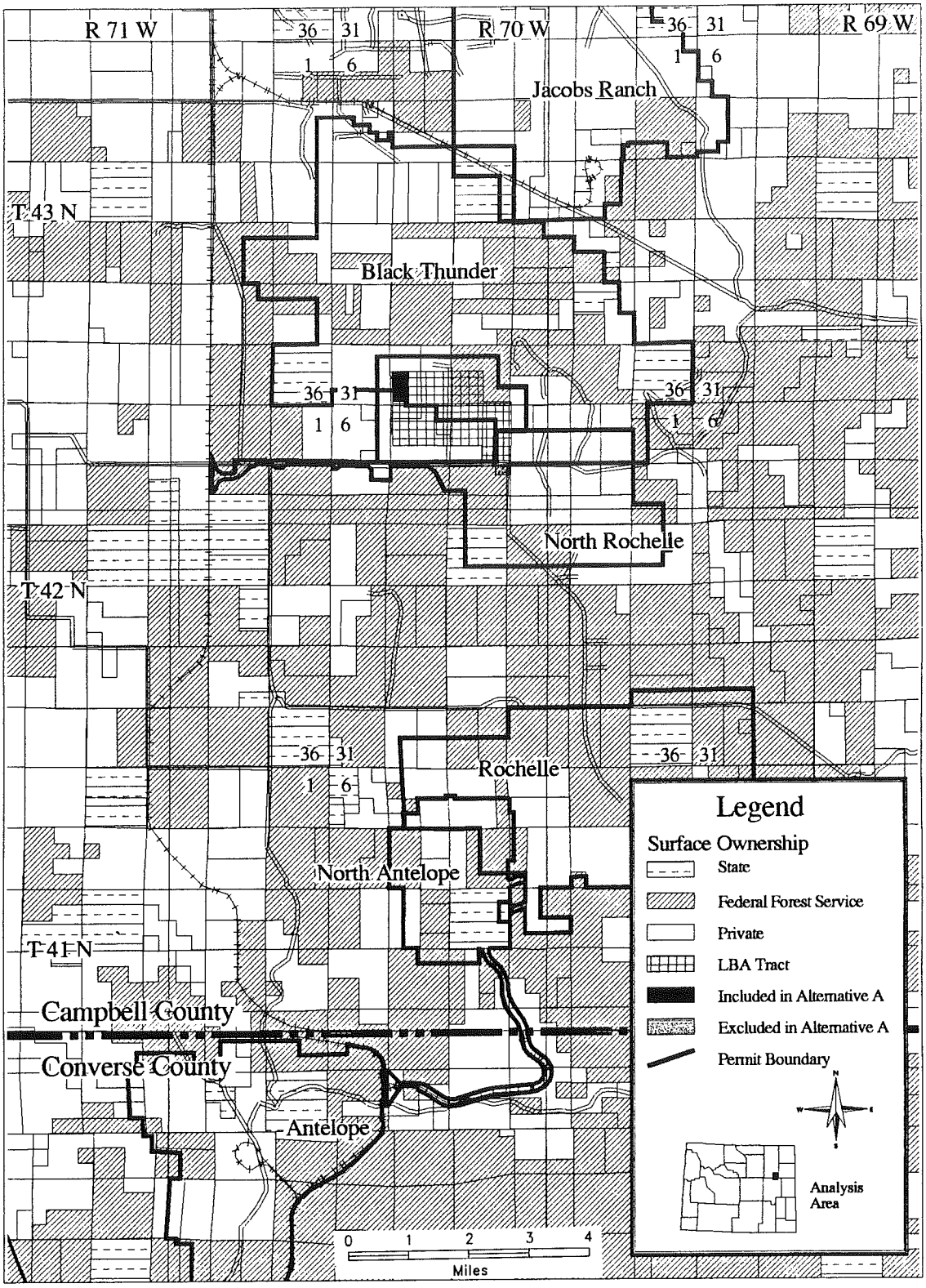


Figure 3.17 Surface Ownership in the Analysis Area.

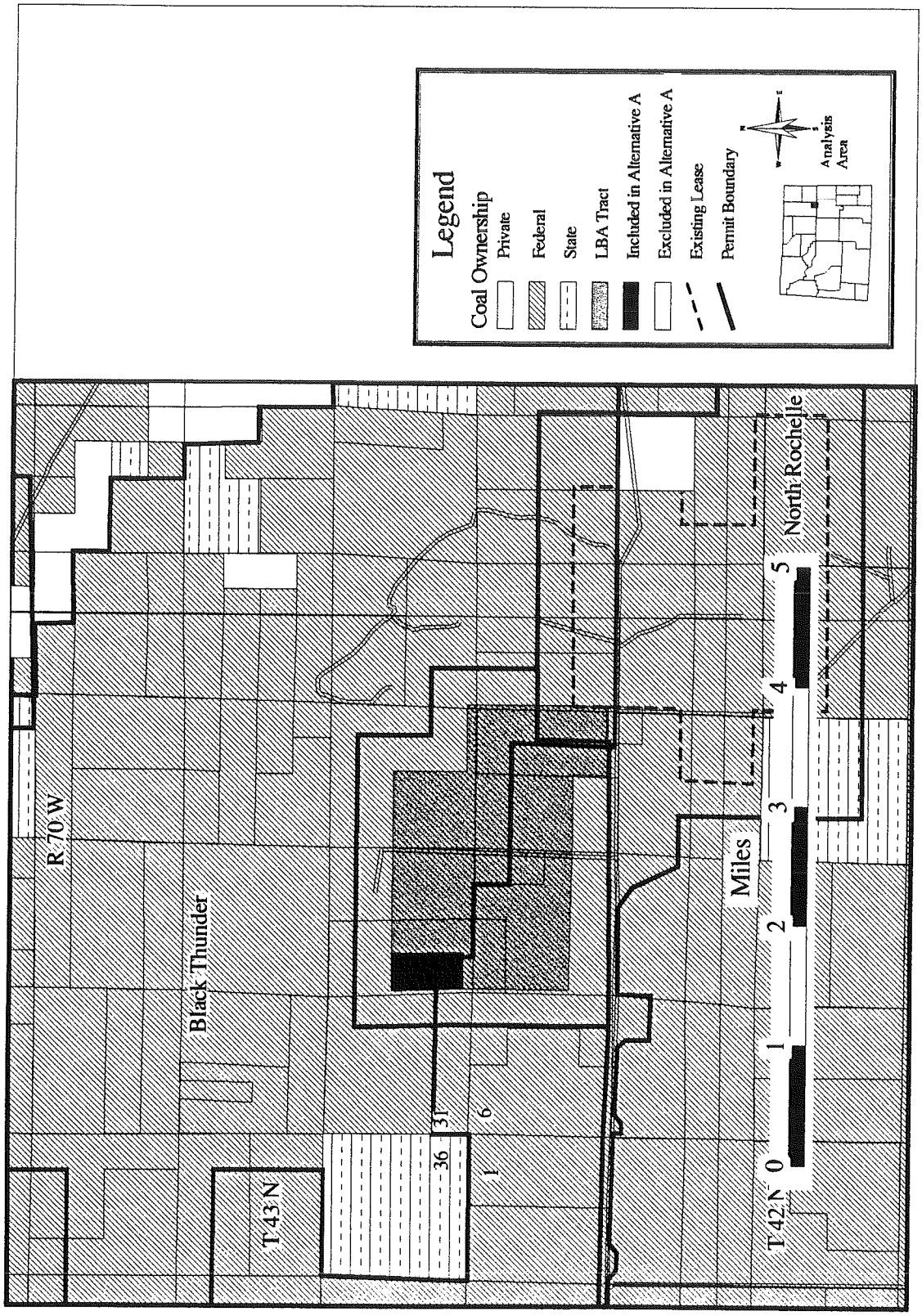


Figure 3.18 Coal Ownership in the LBA Tract Area.

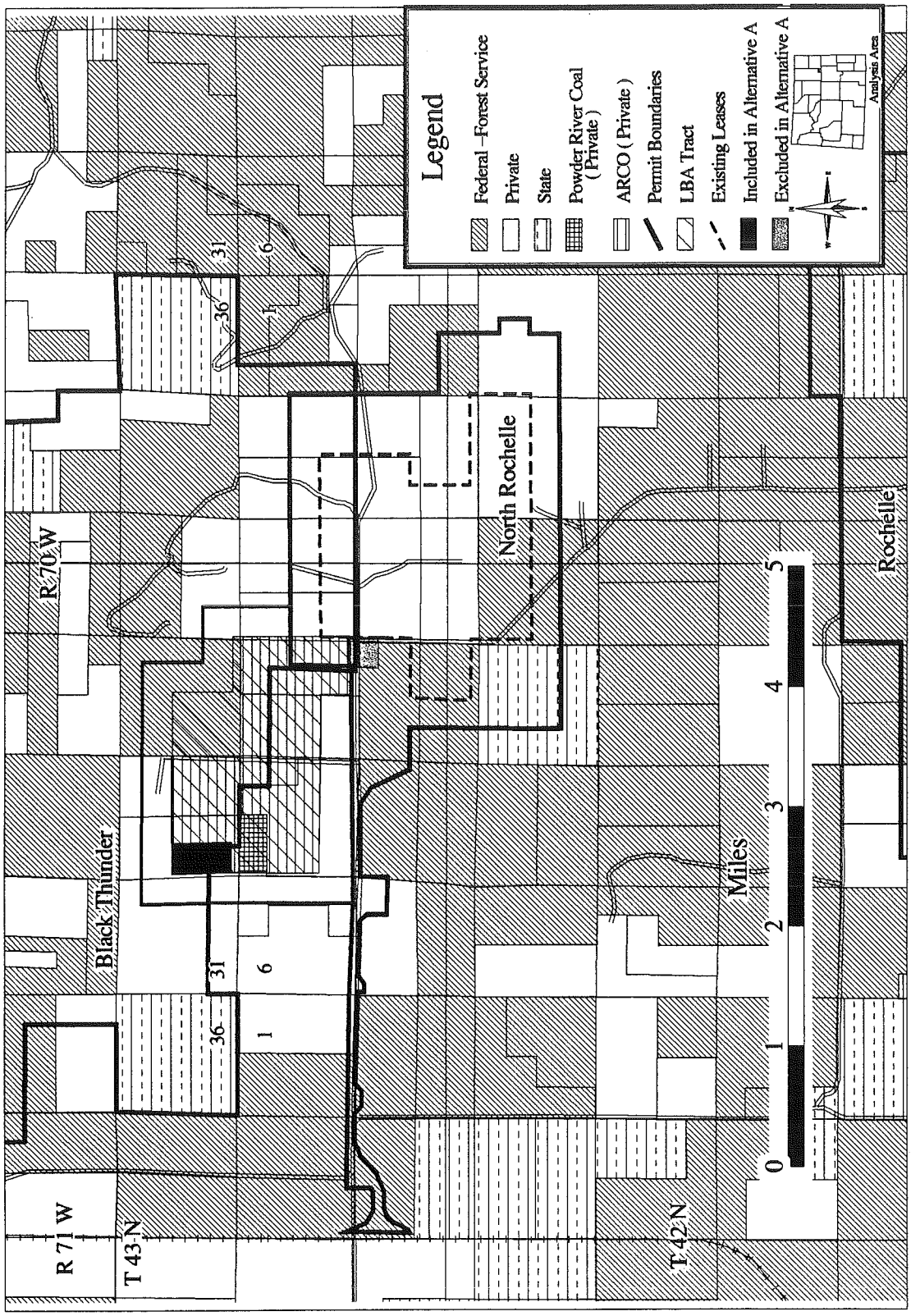


Figure 3.19 Surface Ownership in the LBA Tract Area.

The lands involved in this lease application are native rangelands currently used for wildlife habitat and livestock grazing. The typical rangeland production supports approximately 0.25 animal unit months (AUMs) per acre. Several small stock ponds have been excavated along Trussler Creek to provide water for livestock. Tom and Guy Edwards graze cattle and sheep on the LBA tract. Numerous wildlife species common to the PRB occur on the LBA tract.

Coal mining is a dominant land use in the area surrounding the LBA tract. The existing North Rochelle Mine is located in the middle of a group of six operating surface coal mines located in southern Campbell and northern Converse Counties (see Figure 3.1). Coal production at these six mines increased by 70% between 1990 and 1995 (from about 70 million tons in 1990 to almost 120 million tons in 1995). Over that same time period, four maintenance coal leases have been issued within this group, and applications have been submitted and are being processed for three more maintenance tracts in this same group of mines. (The North Rochelle coal lease application is one of these three pending applications.) BLM has received an application for a coal lease for a potential new mine (New Keeline Mine) located north of the Jacobs Ranch Mine. The PRRCT has not reviewed this lease application, and the BLM has not begun processing it (see Figure 1.2 on page 1-3). BLM has also just received an application for a second maintenance tract for the Antelope Mine. This lease application also has not been reviewed by the PRRCT, and the BLM has not begun processing it.

The potential exists for development of oil and gas resources in the area, including coal bed methane, but there are currently no oil or gas wells on the LBA tract, and none are planned.

There are no dwellings or other buildings on the LBA tract, and none of the land is cultivated. No ROW corridors for pipelines, electric power lines, or telephone cable cross the LBA tract. Reno Road traverses the southern boundary of the LBA tract; however, there are approved plans to relocate this road to allow for current mining operations.

Campbell County has no county-wide land use plan, and the LBA tract has no designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county. The long-term land use objectives established for the Thunder Basin National Grasslands include livestock grazing and wildlife habitat.

Recreation

Big game hunting is the principle recreational use in the analysis area. Landownership within the PRB is largely private (approximately 80%), with some private landowners permitting sportsmen to cross and/or hunt on their land. Others charge an access fee, and some do not allow any access. There has been a trend over the past two decades towards a substantial reduction in lands open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created management problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as to sportsmen who desire access to these animals (WGFD 1996). Due to safety concerns, public lands contained within an active mining area are often closed to the public, further limiting recreational use. In the PRB, the publicly owned Thunder Basin National Grasslands, BLM lands, and state school sections (normally Sections 16 and 36) are generally open to hunting if legal access is available.

Approximately 10% of the surface of the LBA tract is public land (Thunder Basin National Grassland), and 40 acres are publicly accessible. The remaining lands are private, and recreational use is allowed only with landowner permission.

This situation, along with a restriction of hunting activities on adjacent operating mines, currently results in minimal sport hunting on the LBA tract. Pronghorn antelope, mule deer, and white-tailed deer do, however, occur on and adjacent to the LBA tract. Sage grouse, mourning dove, waterfowl, cottontail rabbit, and coyote may also be harvested in the vicinity, and some trapping of red fox may occur.

Specific details regarding big game herd management objectives in the project area are contained in the *District 3 Annual Big Game Herd Unit Reports* (WGFD 1995). The LBA tract is within pronghorn antelope Hunt Area 27, part of the Lance Creek Herd Unit which also includes Hunt Areas 6, 8, 9, and 29. The severe winter of 1992-93 resulted in an estimated 39% mortality in this herd, and WGFD thus reduced the number of licenses in 1993 from 3,000 to 2,000. They have issued 2,750 licenses annually in the past 2 years and anticipate the pronghorn population will continue to grow to the post-hunt population objective of 27,000 (assuming normal reproduction and good weather conditions). The actual number of antelope in the herd unit has been approximately 22,500 over the past few years. Hunters annually harvest about 2,400 animals with better than 90% success and spend about 2.1 hunting days per animal harvested. The entire LBA tract is classified as winter/yearlong habitat for antelope (habitat used by a portion of the animals yearlong and into which a significant influx of animals occurs during the winter) (Figure 3.20). The Lance Creek Herd Unit does not contain any designated crucial habitat. Antelope are widely scattered throughout the herd unit, and no important microhabitats (dense stands of sagebrush, winter relief cover, etc.) are present on the LBA tract.

The LBA tract is in mule deer Hunt Area 10, part of the Thunder Basin Herd Unit, which also includes Hunt Areas 7, 8, 9, 11, and 21. This herd was above the 13,000 post-season deer population objective prior to the winter of 1992-93, which reduced the population to near objective. The current population is estimated at about 14,000. The WGFD has managed this herd for an annual harvest of approximately 1,800 deer, with hunter success running at about 71% and 3.9 days spent per deer harvested. The hunting season is designed to allow the population to grow; however, much of the preferred habitat in this herd unit occurs in drainage bottoms on private land, where grazing-related conflicts occur with landowners. The population objective may be increased in the future if landowner and public sentiment allow. The LBA tract is not within any designated mule deer habitat (Figure 3.21), and no important microhabitats (escape and winter relief cover) occur on the LBA tract.

Although white-tailed deer and elk have been seen occasionally in the area, they are not common. The Rochelle Hills Elk Herd is located a few miles to the east. Elk Hunt Area 113 extends into the LBA tract; however, very limited use of these lands by elk occurs. Elk favor the ponderosa pine/juniper woodlands, savanna, and steeper terrain habitat in the Rochelle Hills. This small herd (about 200 elk) is hunted every 2 to 3 years. Owing to their habituation to humans, these elk provide a significant amount of nonconsumptive recreational use. Landowners appear tolerant of the elk, and the WGFD will likely increase the population objective in the future. These elk are dispersing from the designated herd unit boundary, possibly due to density-dependent population factors related to limited habitat.

White-tailed deer are managed as part of the Thunder Basin Herd Unit, an area which extends from the Montana border through Gillette, Moorcroft, Newcastle, and south to Lusk and Douglas. White-tailed deer are not managed separately in this herd unit, but generally are included in the management of the corresponding mule deer herd units. White-tailed deer habitat use is concentrated in riparian areas, which are predominantly privately owned. Doe/fawn licenses are therefore allocated to reduce grazing conflicts on private land in specific areas.

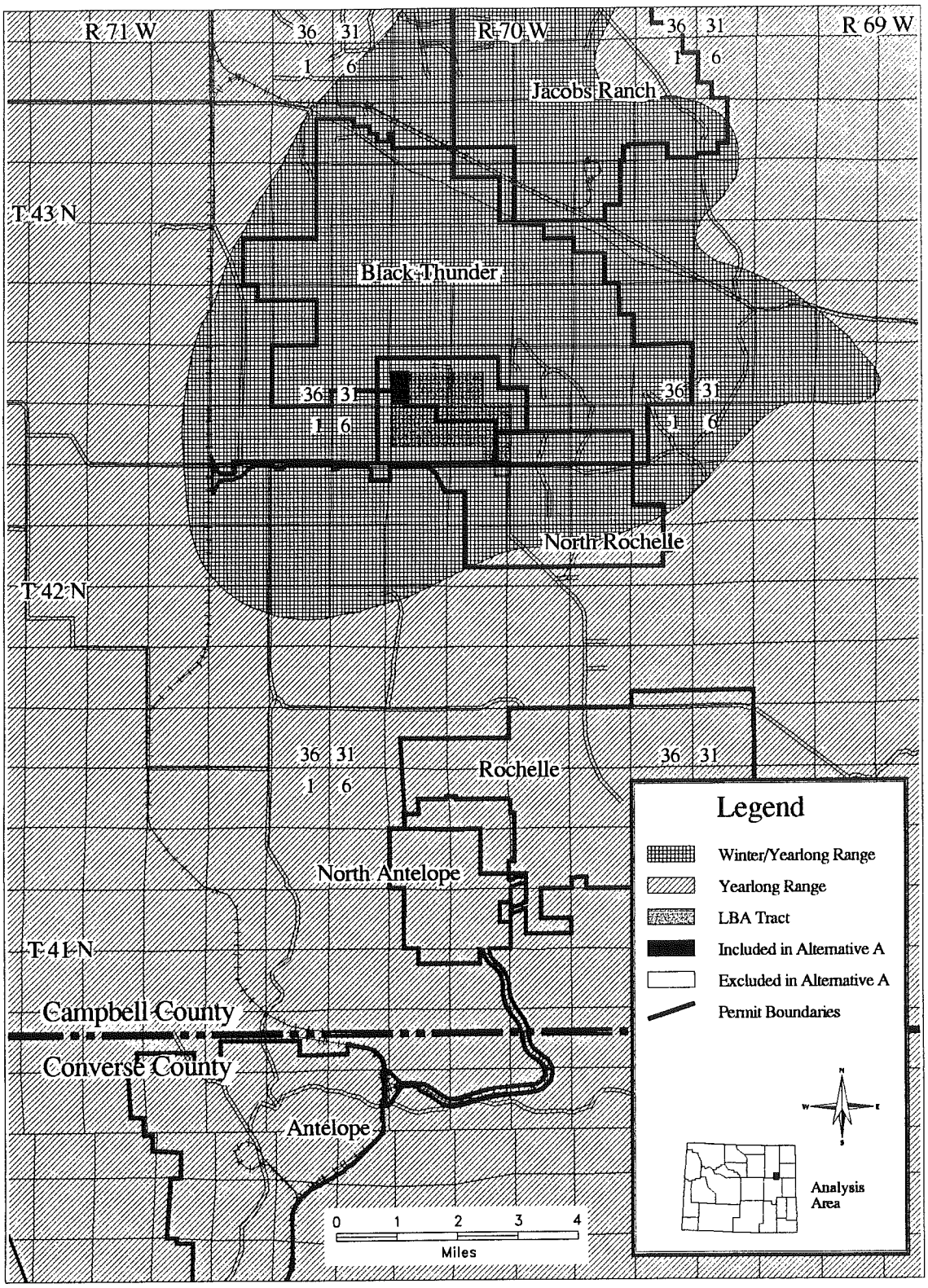


Figure 3.20 Pronghorn Seasonal Use Areas.

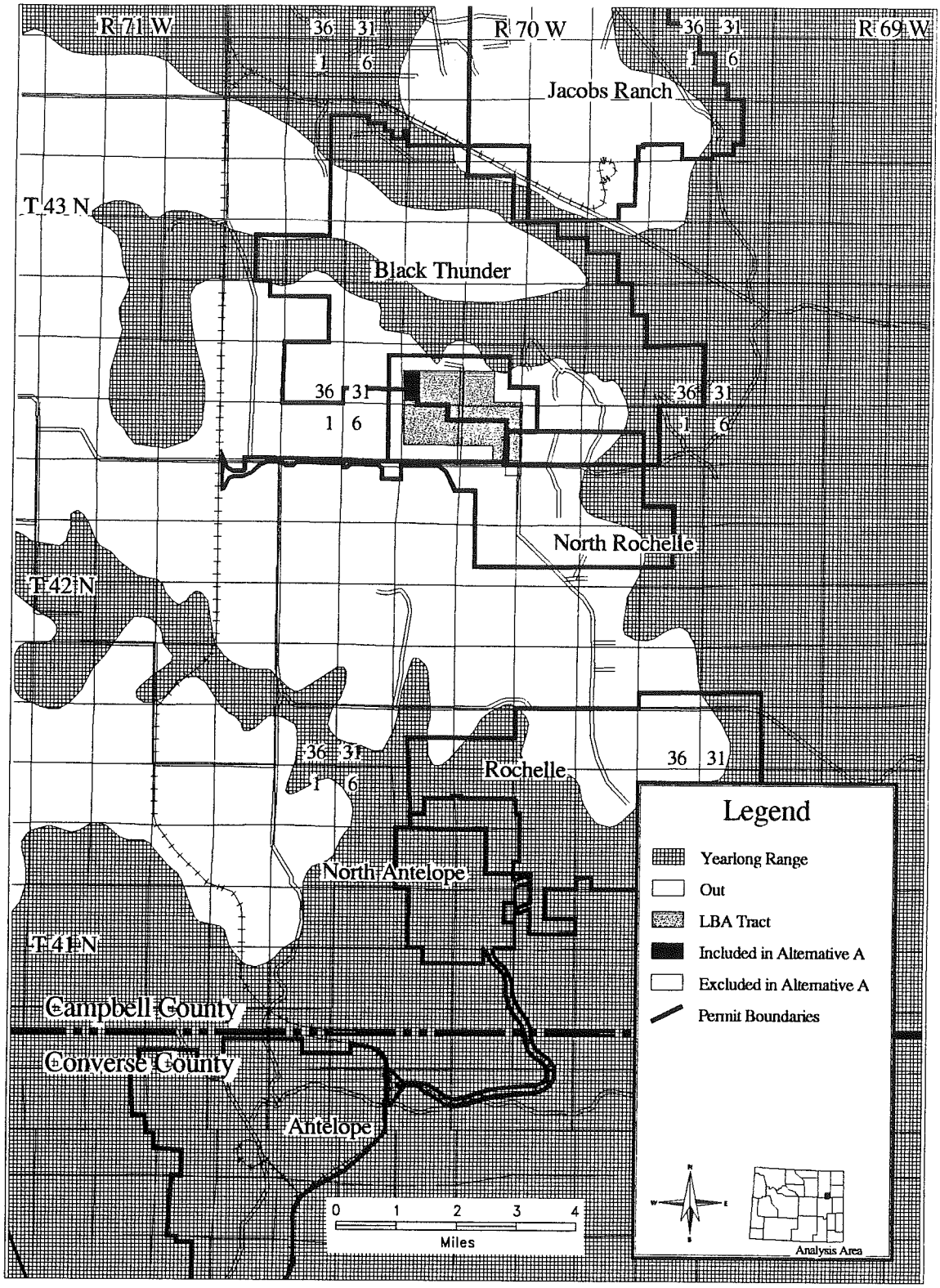


Figure 3.21 Mule Deer Seasonal Use Areas.

Public fishing opportunities are extremely limited in the PRB. Two fisheries exist in the general analysis area: Little Thunder Creek and Reno Reservoir. Little Thunder Creek supports channel catfish and a variety of nongame fish. Reno Reservoir provides public fishing and supports largemouth bass and bluegill. No fisheries exist on the LBA tract.

3.13 CULTURAL RESOURCES

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are the nonrenewable remains of past human activity. The PRB appears to have been inhabited by aboriginal hunting and gathering people for more than 11,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources.

The general chronology for aboriginal occupation (dated as years before present [B.P.]) is:

- the Paleoindian period (11,000-7,500 years B.P.),
- the Archaic period (7,500-1,800 years B.P.),
- the Prehistoric period (1,800-400 years B.P.),
- the Protohistoric period (400-200 years B.P.), and
- the Historic period (200-120 years B.P.).

The Paleoindian period includes a series of cultural complexes identified by distinctive large projectile points (spear points) often associated with the remains of large, now-extinct mammals (mammoth, bison, camel, etc.). The Archaic period is characterized by a range of smaller side-notched, stemmed, or corner-notched projectile points and by more generalized subsistence pursuits including the gathering of plant resources. This lifeway continued to the Late Prehistoric period, which is marked by a technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Archaic and Late Prehistoric periods, the PRB was occupied by small bands of hunters and gatherers whose movements were determined to a large degree by seasonal and environmental changes which influenced the occurrence of subsistence resources (BLM 1979).

Protohistoric and early Historic sites are found in the PRB, including rare historic trade goods, sites and routes associated with early trappers and military expeditions, and early ranching attempts which date to the 1880s. A few small coal mining sites also exist.

Historic sites within the analysis area have been recorded as debris scatters representing sheepherder camps and related activities. No historic trails are known or have been recorded on the LBA tract; however, the Bozeman Trail crosses the southwestern portion of the PRB. Previous inventories indicate an estimated density of three sites per section (square mile) may occur throughout the LBA tract; this low density probably reflects the surface visibility of sites. However, isolated exposed bison bones have been found 10-15 ft below the surface in nearby arroyos. Thus, much of the evidence for prehistoric occupation is not apparent on the surface and can be identified only when vegetative cover and topsoil are removed.

Seventy-six percent of the proposed LBA tract has been inventoried at the Class III level. Approximately 340 acres in the LBA tract and 480 acres in the proposed permit boundary would need to be surveyed at the Class III level prior to surface disturbance.

Based on the file search (No. 20137) conducted on October 18, 1996, by the Cultural Records Office, Wyoming State Historic Preservation Office, five sites have been recorded to date on inventoried lands within and immediately adjacent to the LBA tract (Table 3.7). Two are prehistoric and include a lithic scatter and an open camp. Dateable cultural components are rare, but artifacts attributable to the Paleoindian and Late Archaic Besant culture have been reported. One site has produced obsidian, a material useful for its

Table 3.7 Cultural Sites Recorded Within the Proposed LBA Tract.

Site No.	Site Type	Inventory History	Recommendation
48CA640	Open camp	Hauff et al. 1981	Not eligible
48CA648	Historic debris	Hauff et al. 1981	Not eligible
48CA1771	Lithic scatter	Chapman and Miller 1982	Not eligible
48CA1772	Historic debris	Chapman and Miller 1982	Not eligible
48CA1773	Lithic scatter/homestead	Chapman and Miller 1982	Not eligible

distinctive sources and implications for trading networks. Historic sites include two trash scatters. One site is multicomponent, with both prehistoric and historic associations.

None of the above sites are currently considered as eligible for listing on the National Register of Historic Places (NRHP). However, formal Wyoming State Historic Preservation Office (SHPO) consultation has not occurred for any of the sites.

It is important to recognize that surface reconnaissance provides a limited evaluation of the depositional situation; it is possible that subsurface discoveries may be made when the soils cover has been removed.

3.14 NATIVE AMERICAN CONSULTATION AND TRUST RESOURCE ISSUES

The Crow, Shoshoni, Comanche, Arapaho, Cheyenne, and Sioux were the primary Native American groups which utilized the PRB (BLM 1979). Native American tribes have been consulted at a general level for the 1995-96 draft Buffalo Resource Area RMP. Native American consultation for this specific proposal was conducted during the review of the DEIS and FEIS. Tribes were sent certified letters requesting their comments concerning any religious or cultural areas within or near the LBA tract. To date, no sites or areas of traditional cultural interest have been identified on the LBA tract or within the proposed permit boundary. Tribes will again be sent certified letters requesting their comments on the FEIS when it is issued.

3.15 PALEONTOLOGICAL RESOURCES

A limited number of paleontological surveys has been conducted in the PRB, with most attention given to fossil vertebrates. Although vertebrate, invertebrate, and paleobotanical fossils have been encountered throughout the PRB, no significant localities are known. The identified fossils are common and have limited scientific value or significance. Plant and vertebrate fossils are abundant throughout the Wasatch and Fort Union Formations and are likely to occur on the LBA tract; however, there are no known surveys from the LBA tract.

3.16 VISUAL RESOURCES

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within the LBA tract include rolling sagebrush and short-grass prairie, which are common throughout the PRB. Existing surface mines form a somewhat continuous band on the east side of Highway 59 extending from north of Gillette to northern Converse County (about 75 mi, see Figure 1.2). Other man-made intrusions include ranching activities (fences, homesteads, livestock), oil and gas development (pumpjacks, pipeline ROWs), and electric power transmission lines. The scenic quality in the immediate lease area is fairly low because of the industrial nature of the adjacent existing mining operations.

The USFS has established visual quality objectives for the Thunder Basin National Grasslands (160 acres of which occur in the LBA tract). The management objective for these lands allow activities to visually dominate the landscape; however, alternations must be blended into the surrounding area so the original character (form, line, color, and texture) is retained. All mining activities on USFS lands must apply the standards and guidelines of the National Forest Visual Management System (USFS 1985).

3.17 NOISE

Existing noise sources in the area include adjacent coal mining activities, traffic on State Highway 59 and Reno Road, rail traffic, and wind. Studies of background noise levels at adjacent mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Current noise levels in the LBA tract are estimated to be 40-60 A-weighted decibels (dBA), with the noise level increasing with increasing proximity to active mining at the Black Thunder or North Rochelle Mines. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992b). Table 3.8 presents noise levels associated with some commonly heard sounds.

3.18 TRANSPORTATION FACILITIES

Access to LBA tract is on Reno County Road via State Highway 59 and School Creek Road via Highway 450 (Figure 3.22). Reno County Road parallels the southern side of the LBA tract. A maintained dirt road runs north from Reno County Road through the LBA tract (Figure 3.23), and several two-tracks also occur in the LBA tract. The Highlight Road runs north/south about 7 mi to the west of the LBA tract, paralleling the Gillette-Douglas rail spur used jointly by the Burlington Northern, Santa Fe, and Union Pacific Railroads. This rail line serves all the existing coal mines in the southern PRB.

Much of the transportation system and facilities that would service the permitted North Rochelle Mine are not yet in place. These facilities would consist of a series of roads, a rail network, and internal transportation routes to facilitate mining operations (Figure 3.23). Reno road will be diverted south around the North Rochelle Mine in the near future (see Figure 3.23).

3.19 SOCIOECONOMICS

The social and economic study area for the proposed project involves primarily Campbell County and the cities of Gillette and Wright; however, it also includes the city of Douglas in Converse County. For example, employees of the North Antelope and Rochelle Mines, located just south of the North Rochelle Mine, reside in Gillette (33%), Wright (8%), Douglas (46%), and Glenrock (13%) (BLM 1992c). The communities of Gillette and Douglas would most likely attract any new residents due to their current population levels and the availability of services and shopping amenities.

A comprehensive socioeconomic profile of the BLM Buffalo Resource Area (which includes all of

Table 3.8 Comparison of Measured Noise Levels with Commonly Heard Sounds.[1]

Source	dBA	Description
Normal breathing	10	Barely audible
Rustling leaves	20	
Soft whisper (at 16 ft)	30	Very quiet
Library	40	
Quiet office	50	Quiet
Normal conversation (at 3 ft)	60	
Busy traffic	70	Noisy
Noisy office with machines, factory	80	
Heavy truck (at 49 ft)	90	Constant exposure endangers hearing

[1] Tipler (1991).

Campbell County) was prepared for the BLM under contract with the Department of Agricultural Economics, College of Agriculture, through the University of Wyoming's Cooperative Extension Service (University of Wyoming 1994). Much of the following discussion is derived from this report. Additional data sources include the Wyoming Department of Commerce, Wyoming Division of Economic Analysis, Wyoming Department of Employment, Wyoming Economic Development Office, and personal communications with local community development staff.

3.19.1 Population

According to 1990 census data, Campbell County had a population of 29,370, with Gillette accounting for 17,635 of the county's residents and Wright with 1,200. Converse County's population in 1990 was listed as 11,128, with 5,076 of the county's residents residing in Douglas.

3.19.2 Local Economy

Campbell County is the fastest growing coal-producing area in the U.S. and supplies about 25% of the national coal demand (BLM 1996g). The coal industry is the driving force behind the economic activity and employment in Campbell County. Currently, 16 coal mines are in operation in the county, with one more located just south of Campbell County in Converse County. Much of the remainder of the county's economy is based on oil and gas exploration and production, power generation, and agriculture.

Coal production in the area has shown a strong upward growth trend over the past several years. In 1990, nearly 153 million tons of coal were produced, generating nearly $1.4 billion of economic activity, including nearly $182 million of personal income and 8,238 full-time jobs, 2,600 of which were directly associated with mines. The indirect and induced effects of sales from the coal

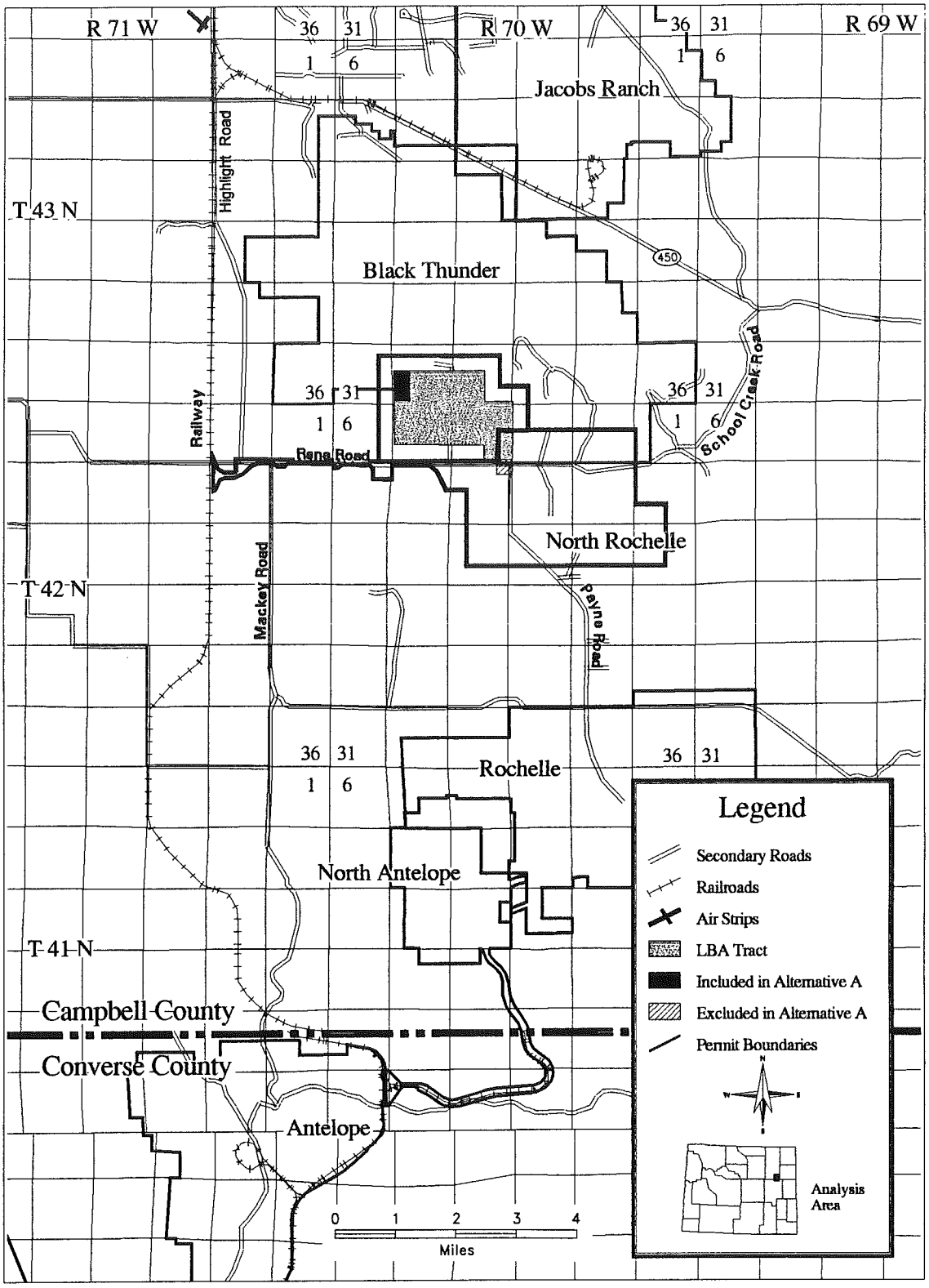


Figure 3.22 Transportation Facilities in the Analysis Area.

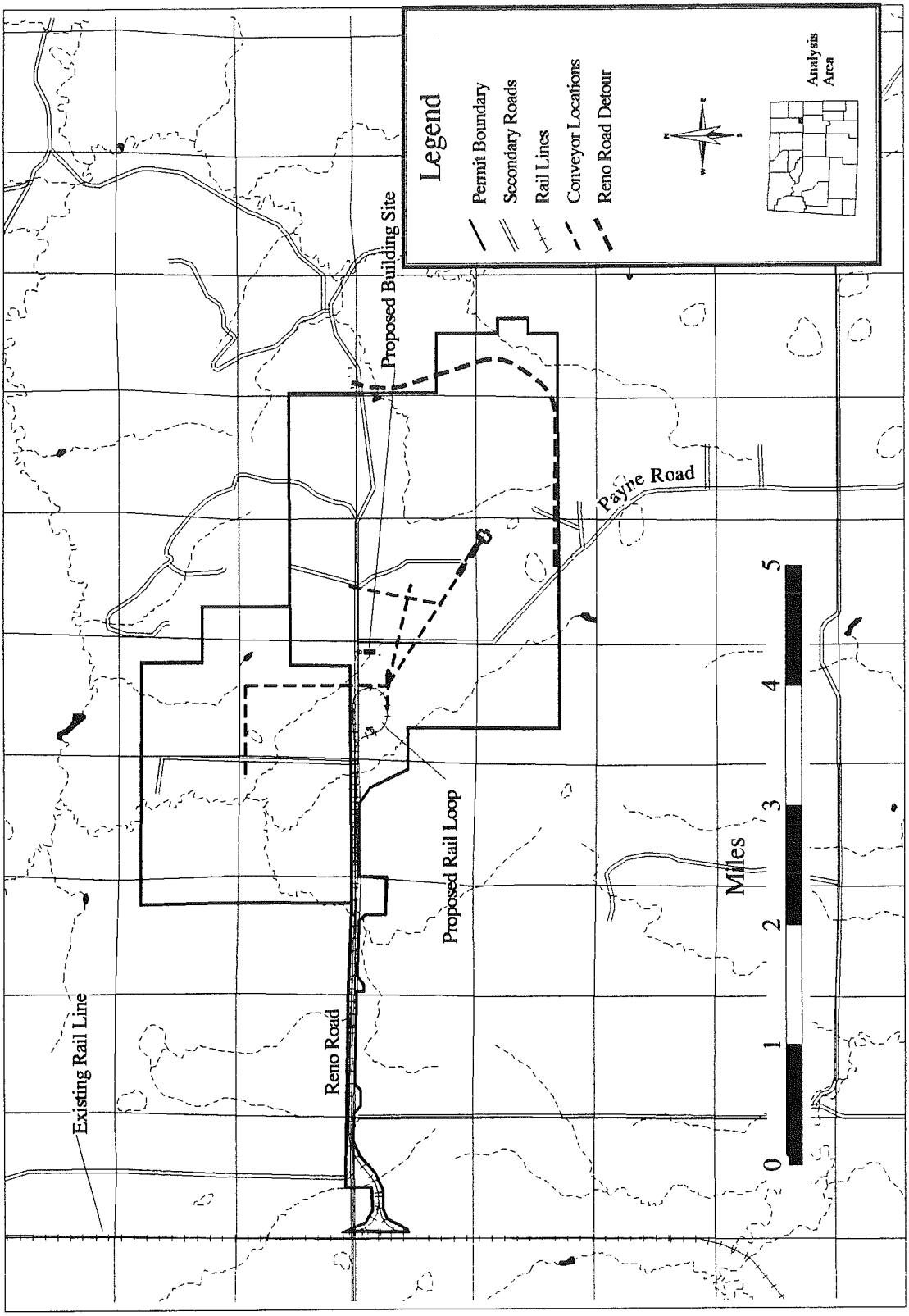


Figure 3.23 Planned Transportation System and Facilities at North Rochelle Mine.

industry are projected to contribute nearly 33% of the total economic activity for each dollar expended in the county. In 1994, 28% of the total employment and 47% of the total payroll in Campbell County was directly attributable to mining, and the average weekly mining wage ($889) was 67% greater than the overall average weekly wage for jobs in the county ($531).

Tax revenues from coal production in the area are presented in Table 3.9. Sales and use taxes are distributed to cities and towns within each county and to the county's general fund. Severance taxes are collected by the state for the removal or extraction of resources such as oil, natural gas, coal, and trona. The State of Wyoming retains approximately 83% of the severance tax, and the remainder is returned to the cities, towns, and counties. Ad valorem taxes, which include property taxes, are collected by the county and disbursed to schools, cities, towns, the state foundation, and various other subdivisions within the county. Mineral royalties are collected on the amount of production and the value of that production. The current royalty rate for federal coal leases is 12.5%, with half of this revenue returned to the state. Additional sources of revenue include lease bonus bids (also split with state) and annual rentals that are paid to the federal government. The total fiscal benefit to the State of Wyoming from coal mining in the PRB has been estimated at $1.10/ton of coal mined (University of Wyoming 1994).

3.19.3 Employment

Employment in the PRB coal mines has varied from 2,248 in 1980, to 3,174 in 1985, to 2,862 in 1990, and to 3,174 in 1995 (personal communication, January 22, 1997, with Marian Loomis, Wyoming Mining Association, Cheyenne). The present workforce at North Rochelle Mine is minimal; however, they have plans to hire 139 permanent employees, regardless of the decision made on this lease application.

3.19.4 Housing

According to the 1990 census, Campbell County contained 11,538 housing units, 7,078 of which were in Gillette. In 1993, the average cost of a new single family home was $135,808; the average cost of an existing family home was $73,753. Vacant housing in Gillette is estimated at about 549 units. Douglas contained 2,267 housing units in 1992, with an estimated 59 vacant units, including 24 single-family homes, 30 mobile homes, and five multi-family units. Housing is very limited in Wright, where an estimated 250 units existed as of June 1994, and 19 homes were for sale. All three communities currently report extremely tight housing markets with rental apartments also difficult to acquire.

3.19.5 Local Government Facilities and Services

The estimated population of Gillette (21,023) has maintained steady growth since 1987, when it totaled 17,054. Owing to the substantial revenues generated by coal production, local government facilities and services have kept pace with this growth and are adequate for the current population. The primary exception is a lack of space in the Gillette High School; however, approval of a recent bond issue will facilitate construction of a new school.

The current population of Douglas (5,275) is lower than its peak of 7,800 in 1982, and local government facilities and services are generally adequate for the current population. Primary exceptions include a shortage of physicians, although several physicians have recently moved to the area. The town also has limited building space (platted lots) available for future growth. Another concern is a lack of additional capacity in the middle and high schools. Some indoor recreational facilities may also be near or at capacity.

Table 3.9 Fiscal Revenues from Coal Production in Campbell County.

Year	Sales and Use Collections	Severance Tax Collections	Ad Valorem Tax Collections	Royalty Collections[1]	Total Collections
1990	$6.1 million	$61.2 million	$38.3 million	$107.1 million	$212.7 million
1995	$8.8 million	$87.6 million	$54.8 million	$153.3 million	$304.5 million

[1] Includes estimated royalties on nonfederal production.

Wright was established in 1976 by ARCO and is the nearest community to the southern group of mines. Wright's population peaked in 1985 at about 1,800 and decreased to 1,175 by 1994. Over the past few years, many of the coal mines have transitioned from working 10-hour shifts to 12-hour shifts. Many miners have thus relocated to Wright to cut down on commuting time, and the population has recently increased to about 1,400. Several coal service companies are also cutting back on travel allotments, which is further adding to Wright's current population growth. Wright's infrastructure is more than adequate for the current and planned population, and with the current building going on, they can double in population before services become limiting.

3.19.6 Social Conditions

Despite past boom and bust cycles in the area's economy, a relatively stable social setting now exists in these communities. Most residents have lived in the area for a number of years, social ties are well-established, and residents take great pride in their communities. Many of the people place a high priority on maintaining informal lifestyles and small town traditions, and there are some concerns that the area could be adversely affected by more than a modest growth in population. At the same time, there is substantial interest in enhancing the economic opportunities available in the area and a desire to accommodate reasonable levels of growth and development.