CHAPTER 3

AFFECTED ENVIRONMENT

MONTANA

CHAPTER 3: AFFECTED ENVIRONMENT

Introduction

This chapter contains a description of the natural resources, economic, and social conditions found in the planning area and within the two Indian reservations adjacent to the planning area.

Air Quality

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is affected by local topography and meteorology. In the mountainous western United States, topography is particularly important in channeling pollutants along valleys, creating up slope and downslope circulations which may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. In general, local effects are superimposed on the general synoptic weather regime and are most important when the large-scale wind flow is weak.

Although site-specific quality monitoring is not conducted throughout most of the CBM emphasis area, air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations.

Air quality monitoring data collected throughout the southeastern Montana and northeastern Wyoming are presented in Table 3-1. Although monitoring is primarily conducted in urban or industrial areas, the data are considered to be the best available representation of background air pollutant concentrations through out the CBM emphasis area.

Regulated air pollutants include: carbon monoxide (CO), nitrogen dioxide (NO_2; a portion of oxides of nitrogen, or NO_x), inhalable particulate matter less than 10 microns in effective diameter (PM-10), fine particulate matter less than 2.5 microns in effective diameter (PM-2.5), sulfur dioxide (SO_2), and volatile organic compounds (VOC).

The assumed background pollutant concentrations are below applicable National Ambient Air Quality Standards (NAAQS) and applicable Montana Ambient Air Quality Standards for most pollutants and averaging times, although hourly background concentrations of nitrogen dioxide, ozone and sulfur dioxide are not available.

TABLE 3-1
BACKGROUND CONCENTRATIONS, APPLICABLE AMBIENT AIR QUALITY STANDARDS, AND PSD INCREMENT VALUES (IN Φg/m^3)

Pollutant	Averaging Time[1]	Background Concentration	National Standards	Montana Standards	PSD Class I Increments	PSD Class II Increments
carbon monoxide[2]	1-hour	15,000	40,000	26,286	—	—
	8-hour	6,600	10,000	10,000	—	—
nitrogen dioxide[3]	1-hour	n/a	—	566	—	—
	Annual	11.3	100	94	2.5	25
ozone[4]	1-hour	n/a	235	196	—	—
	8-hour	100	157	—	—	—
PM_{10}[3]	24-hour	105	150	150	8	30
	Annual	29.9	50	50	4	17
$PM_{2.5}$[3]	24-hour	20	65	—	—	—
	Annual	8.1	15	—	—	—

TABLE 3-1
BACKGROUND CONCENTRATIONS, APPLICABLE AMBIENT AIR QUALITY STANDARDS, AND PSD INCREMENT VALUES (IN Φg/m^3)

Pollutant	Averaging Time[1]	Background Concentration	National Standards	Montana Standards	PSD Class I Increments	PSD Class II Increments
sulfur dioxide[2]	1-hour	n/a	—	1,300	—	—
	3-hour	291	1,300	—	25	512
	24-hour	73	365	260	5	91
	Annual	15.7	80	52	2	20

Footnotes:
Φg/m3 micrograms per cubic meter
n/a not available
[1]Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
[2]Data collected in Billings, MT (1998-2000)
[3]Data collected in Rosebud County, MT (1998-2000)
[4]Data collected in Flathead County, MT (1998-2000)

Cultural and Historical

Cultural resources consist of the material remains of or the locations of past human activities, including sites of traditional cultural importance to both past and contemporary Native American communities. Cultural resources within the planning area represent human occupation throughout two broad periods: the prehistoric and the historic. The prehistoric period is separated into the Paleo-indian Period (circa 10,000 B.C. to 5,500 B.C.), the Archaic Period (circa 5,500 B.C. to A.D. 500), the Late Prehistoric Period (circa A.D. 500 to 1750), and the Proto-historic Period (circa 1750 to 1805+). The prehistoric period began with the arrival of humans to the area around 12,000 years ago, and is generally considered to have ended in 1805 when the Lewis and Clark Expedition passed through the area. Cultural resources relating to the prehistoric period may consist of scatters of flaked and ground stone tools and debris, stone quarry locations, hearths and other camp debris, stone circles, wooden lodges and other evidence of domestic structures, occupied or utilized rock shelters and caves, game traps and kill sites, and petroglyphs, pictographs, stone cairns and alignments, and other features associated with past human activities. Some of these sites contain cultural resource features that are in buried deposits.

The historic period is characterized by the arrival of fur traders and explorers to the area and is the start of the period for which written records exist. Cultural resources within the planning area that are associated with the historic period consist of fur trading posts, homesteads, settlements, historic emigrant and stage trails, Indian war period battle sites, ranch development, railroad installations, mining operations, oil and gas fields, and Native American sites from the extensive continuing occupation throughout historic times.

The following areas are designated cultural Areas of Critical Environmental Concern (ACECs):

- Powder River Resource Management Plan (RMP) area—Battle Butte ACEC is a 120-acre site in Rosebud County. Reynolds Battlefield ACEC is a 336-acre site in Powder River County.
- Billings RMP area—Pompeys Pillar is a 470-acre site in Yellowstone County. Castle Butte ACEC is a 185-acre site in Yellowstone County. Petroglyph Canyon is a 240-acre in Carbon County. The Stark Site is an 800-acre site in western Musselshell County. Weatherman Draw is a 4,268-acre site in Carbon County.

Each of these ACECs have their own management plans that include restrictions on activities and development (BLM 1999a). Two additional cultural resource sites, the Mill Iron and Powers-Yonkee sites in the Powder River RMP area, have been designated Special Management Areas (SMAs) that also have their own management plans that include restrictions on activities and development.

The existence of cultural resources within a specific location is determined through examination of existing records, on-the-ground surveys, and subsurface testing of areas that are proposed for disturbance on federal and state lands. Cultural resources are further suspected if federal or state minerals are involved and, for traditional cultural properties, consultation with appointed tribal government representatives who have knowledge of and can address issues of traditional cultural significance. Section 106 of the National Historic Preservation Act (NHPA) requires an inventory of cultural resources if federal involvement is present either in terms of surface or mineral estate, federal funds, federal grant, or federal license. The Montana State Historical Preservation Officer (SHPO) maintains a register of all identified sites within each of Montana's counties as well as all sites that are listed or eligible for listing on the National Register of Historic Places (NRHP). Table 3-2 contains information about the number of cultural resource sites that have been identified to date by SHPO for each of the counties within the planning area. Also included in this exhibit is information about the number and density of sites that are known to be located within the current area of CBM production.

TABLE 3-2
CULTURAL RESOURCE SITES IDENTIFIED BY SHPO WITHIN EACH COUNTY OF THE PLANNING AREA

RMP Area County	Number of Cultural Resource Sites Identified	Number of Acres Surveyed	Number of Sites Per Surveyed 1,000 Acres	Number of Acres Within the County	Extrapolated Number of Sites In the County
Powder River RMP Area					
Carter	444	122,652	3.62	2,141,781	7,753
Powder River	1460	91,500	15.96	2,109,764	33,664
Custer	700	42,211	16.58	2,425,137	40,217
Rosebud	1465	196,576	7.45	3,213,997	23,953
Treasure	101	17,051	5.92	629,181	3,727
Billings RMP Area					
Wheatland	137	5,694	24.06	913,056	21,969
Sweet Grass	209	24,866	8.41	1,190,775	10,009
Stillwater	257	9,417	27.29	1,154,183	31,499
Carbon	919	34,326	26.77	1,319,462	35,326
Golden Valley	97	9,309	10.42	752,063	7,837
Musselshell	482	33,267	14.49	1,196,012	17,329
Yellowstone	801	36,700	21.83	1,693,917	36,971
Big Horn	1819	278,802	6.52	3,207,937	20,930
Additional Counties					
Blaine	1111	89,285	12.44	2,711,308	33,738
Gallatin	810	95,682	8.47	1,683,524	14,252
Park	614	43,570	14.09	1,799,751	25,363
CBM Production Area*	3,297	525,427	6.27	2,699,992	16,942

*CBM Production Area includes portions of Big Horn, Rosebud, and Powder River counties where active coal mining is currently conducted and where non-federal CBM production wells currently exist.

Approximately 4 percent of the planning area has been surveyed for cultural resources resulting in a total of 11,426 cultural resource properties or sites being identified. This represents an average density of 10.10 sites per 1,000 surveyed acres or, assuming an equal distribution of sites, one site per 98.97 surveyed acres. Assuming this data across the total acreage contained within the counties of the planning area yields a total of 364,535 cultural resource properties or sites that might be expected. A total of 3,297 sites have been identified in those portions of Big Horn, Rosebud, and Powder River counties that represent the area with the greatest potential for CBM production, with an average density of 6.27 sites per 1000 surveyed acres or, assuming an equal distribution of sites, one site per 159.49 acres. Extrapolated data yields a total of 16,942 sites that might be expected within the CBM production area.

The site densities estimated above are, of course, extrapolated assuming a consistent distribution within each county. This is not necessarily valid since some sites can be clustered around geographical features such as broad, heavily vegetated river floodplains. Certain types of cultural resource sites will be more densely located in such riparian areas than atop barren ridgelines. Nonetheless, easily accessible geographical classification data does not exist for these sites and the above estimates are the best that can be made at the present time.

Two typical field compressors. These four-stage, 6.0 million cubic feet per day, reciprocal compressors operate at 380 horsepower and use natural gas as a fuel.

Geology and Minerals

Stratigraphy

The sedimentary strata of the planning area extend backward in time from recent age alluvium found in stream valleys, to strata at the surface that is largely Tertiary and Cretaceous (ALL 2001b). These older sediments correspond to the Laramide tectonism that gave rise to most of the uplifted areas in Montana. Though the area contains significant regional thicknesses of older stratigraphic units, the Tertiary basin fills are of particular interest for coal, CBM, and groundwater production (Ellis et al. 1999). Conventional oil and natural gas occur in the older, pre-Laramide section but coals in the Powder River Basin are confined to the Early Tertiary units.

A number of regional stratigraphic units occur beneath the major basin fill units within the Powder River Basin. These formations are broadly present across Montana including the Powder River Basin. Penetrations of these formations by conventional oil and gas wells have been few and hydrocarbon production is scattered. The Cretaceous age Judith River, Shannon, Eagle, and Dakota/Lakota Formations are present in the subsurface between approximately 2,200 feet below ground surface (bgs) and 9,000 feet bgs. These four sandy formations are encased and overlain by thick Cretaceous shales of the Colorado and Pierre Formations (Noble et al. 1982). Reservoir quality sands are not present everywhere within each of these formations but each could locally be a suitable disposal zone for produced CBM water. In addition, the shales of the Colorado and Pierre Formations could perhaps accept produced water under injection pressures higher than fracture pressure. Only the Shannon Formation produces gas within the Powder River Basin.

The Upper Cretaceous Eagle Formation carries coals in Blaine, Park, and Gallatin counties (Noble et al. 1982). These coals are prospective for CBM resources but currently do not produce.

The Hell Creek and Fox Hills Formation are Late Cretaceous in age and underlay the Fort Union in the Montana portion of the Powder River Basin. The sands are difficult to separate in outcrop, very difficult to separate in the subsurface, and appear to be in hydrologic continuity. Together, the Hell Creek and Fox Hills total approximately 500 feet of non-marine coastal plain sediments that have been shed from the mountains to the east and west (Perry 1962). They are made up of variable, shaley sands that contain some of the youngest dinosaur fossils in the world. The sands are scattered over most of Eastern Montana but are not present everywhere in the Powder River Basin; the sands outcrop at the edges of the basin and are found as deep as 3,700 feet bgs near the axis of the basin in Montana (Miller 1981). The Fox Hills Formation lies conformably upon approximately 2,000 feet of Upper Cretaceous Pierre Shale. The Hell Creek is overlain by the thick Tertiary Fort Union Formation.

The Fort Union forms most of the sedimentary fill within the Montana Powder River Basin. It consists of approximately 3,500 feet of non-marine silty and shaley clastics and coal beds whose individual thicknesses can be as much as 37 feet near the Decker mine (Roberts et al, 1999a). The Fort Union also contains clinker deposits, formed by the natural burning of coal beds and the resultant baking or fusing of clayey strata overlying the burning coal, which are present throughout much of the area and can be more than 125 feet thick (Tudor 1975). Stratigraphically the clinker bodies are part of the Fort Union but the clinker is a lithological unit composed of baked and fused siltstone, clay, and sandstone units that have undergone diagenetic changes during the combustion of the coal within the past 3.0 million years (Heffern et al. 1983).

The Fort Union is split into three stratigraphic members: the lowest being the Tullock Member, overlain by the Lebo Shale Member, overlain by the Tongue River Member (McLellan et al. 1990). In the Montana portion of the Powder River Basin, the bulk of the coals are confined to the Tongue River Member, while the Lebo and Tullock Members are predominantly shale and shaley sand (McLellan et al. 1990). The Members are discussed in detail below:

The Tullock Member

This is the stratigraphically lowest part of the Fort Union, consisting of approximately 300 feet to more than 500 feet of interbedded sands and shales with minor coals near the base (Tudor 1975). The Tullock rests unconformably upon the Upper Cretaceous Hell Creek Formation throughout the Powder River Basin. While generally sandier, the Tullock is difficult to separate in outcrop and in the subsurface from the overlying Lebo Member.

The Lebo Member

This middle member ranges from 75 feet to more than 200 feet of claystones, limestones, and mudstones with the Big Dirty coal (3 to 13 feet of thickness) at the very base (Tudor 1975). The Lebo

is, in part, stratigraphically equivalent with the overlying Tongue River (McLellan et al. 1990).

The Tongue River Member

The thickness of the Tongue River varies from 750 feet at the outcrop edge near the fringe of the basin to 3,000 feet near the axis of the basin (Williams 2001). Total coal isopach ranges up to approximately 150 feet (Ellis et al. 1999). The Tongue River Member is divided into three units. The lower unit includes that portion below the Sawyer coal seam. The Middle unit includes the Sawyer through the Wall coal seam. The Upper unit includes that portion above the Wall coal seam (Ellis et al. 1999).

The Lower Tongue River unit is present across most of the Montana portion of the basin. It includes, from the base up, the Stag, Terret, Witham, Robinson, Rosebud-McKay, Flowers-Goodale, Nance, Calvert, and Knobloch coals. In the Ashland coalfield, the Lower Tongue River unit is up to 1,660 feet in thickness, and individual coals can be up to 71 feet thick (Roberts et al. 1999b).

The Middle Tongue River unit is present over a large part of the Montana portion of the Powder River Basin. It includes, from the base up, the Sawyer, Mackin-Walker, Cache, Odell, Brewster-Arnold, Pawnee, and Wall coals.

The Upper Tongue River unit is present only in the southern part of the Montana portion of the Powder River Basin. It includes, from the base up, the Otter, Cook, Carney, Canyon, Dietz, Anderson, and Smith coals. At the Decker mine, the Upper Tongue River is up to 1,500 feet thick; coals can attain an individual thickness of 57 feet and an aggregate thickness up to 111 feet (Roberts et al.1999a).

The Eocene Wasatch Formation is present in the Montana portion of the Powder River Basin as fine-to medium-grained sandstone lenses and channel-fill interbedded with siltstones, shales, and minor coal. The thickness of the Wasatch Formation ranges from near zero at the outcrop edge to 400 feet near the southern state boundary (Roberts et al. 1999a). It is present in outcrop in the extreme southwest corner of the basin where it overlies the Fort Union.

Quaternary age sediments are those that are Pleistocene (the latest glacial episode) and Recent (post-glacial episode) in age; the sequence is dominated by events and effects associated with continental glaciation, including glacial till and exaggerated peri-glacial valley fill. Quaternary sediments in the Powder River Basin and most of the state are present as variable fill in stream and river valleys. Quaternary alluvium consists of unconsolidated sand, silt, and gravel that make up the floodplains and stream terraces of creek valleys in the Powder River Basin (BLM 1999b). Thickness is highly variable, but maximum thickness is not expected to exceed 90 feet. Lithology is somewhat dependent on bedrock outcrop; alluvium overlying the Tertiary strata are mostly fine-grained to medium-grained sands and silts. Coarser-grained alluvium may be associated with some of the larger rivers where provenance has been outside the Powder River Basin (Hodson et al. 1973). Alluvium aquifers are largely unconfined and connected to active river flow. Because alluvial aquifers can deliver large quantities of water to water supply wells, they are important stratigraphic features. They are also important to this report because they are vulnerable to impact and are often connected to surface water resources. Alluvial aquifers can be impacted by surface activity and can act as a conduit to carry those impacts to valuable surface water resources.

Powder River RMP Area

The Powder River RMP area is centered over the broad, flat-lying Powder River Basin, with basin margins rising up to the Black Hills (South Dakota) on the southeast and the Big Horn Mountains to the west. The Powder River Basin has seen oil production since 1954, including Belle Creek field in Powder River County. During 2000, eight conventional oil and natural gas fields were active in the RMP area (MBOGC 2001a). Production, summarized in Figure GMA-2 (ALL 2001b), shows a sharp decline of oil production during the past 15 years caused by the aging of the several Muddy Formation fields on the edge of the basin. During the same time, conventional natural gas production from shallow Cretaceous reservoirs has increased, although it has remained at minor levels.

Billings RMP Area

The Billings RMP area centers on the Montana portion of the Big Horn Basin, the largest structural element in the area. The RMP area also includes the Big and Little Snowy and Little Belt Mountains to the north that combine to make up the Central Montana Uplift. Oil and gas is produced from the Big Horn Basin and oil is also produced from the Central Montana Uplift. Natural gas and oil were produced from 68 fields in the year 2000. Production statistics for 2000 show a 50 percent decline of both natural gas and oil production in the past 15 years, although

significant quantities of both commodities are still being produced in the area (ALL 2001b).

Map 3-1 shows location and type of geological outcrops in the area.

Conventional Oil and Gas

Conventional oil and gas resources are scattered across Tertiary and older basins of the state, as well as in faulted and thrusted sedimentary rocks at the edges of some of the basins. The type of hydrocarbon fluids that are produced (oil, natural gas, or both) varies with the local geology and position in the field. Natural gas can be produced along with oil in some reservoirs or it can be produced "dry"—without associated oil. Most oil and gas reservoirs will also produce associated water. Produced water is mostly reinjected into the producing formations to maintain reservoir energy or into non-productive, salt-water bearing reservoirs although there are currently 24 surface water discharge permits that have been issued for producing conventional oil and gas fields.

- The Williston Basin produces the majority of the oil for the State of Montana and small amounts of natural gas associated with the oil; except for shallow gas fields along the Cedar Creek Anticline, little dry gas is produced.
- North-central Montana produces mainly dry natural gas from shallow fields.
- Northwestern Montana produces shallow oil with little associated natural gas.
- Central Montana produces oil with virtually no natural gas.
- The Big Horn Basin produces small amounts of both oil and natural gas.
- The Powder River Basin produces small amounts of oil at the eastern edge of the basin and very small amounts of conventional natural gas from shallow reservoirs (MBOGC 2000).

Conventional oil and gas production for the RMP areas is summarized in the Geology and Minerals Appendix.

Coal

Coal occurs in all of the RMP areas discussed in this EIS. Coal mining has also historically occurred in Park and Gallatin Counties (Roberts 1966, and Calvert 1912a, and Calvert 1912b). Coal mining is underway at five mines in the Powder River RMP area, but has historically been accomplished in the Billings RMP area and Blaine County (USDL 1999). A more detailed description is included in the *Final Environmental Impact Statement, Resource Management Plan, Powder River Resource Area* (BLM 1984).

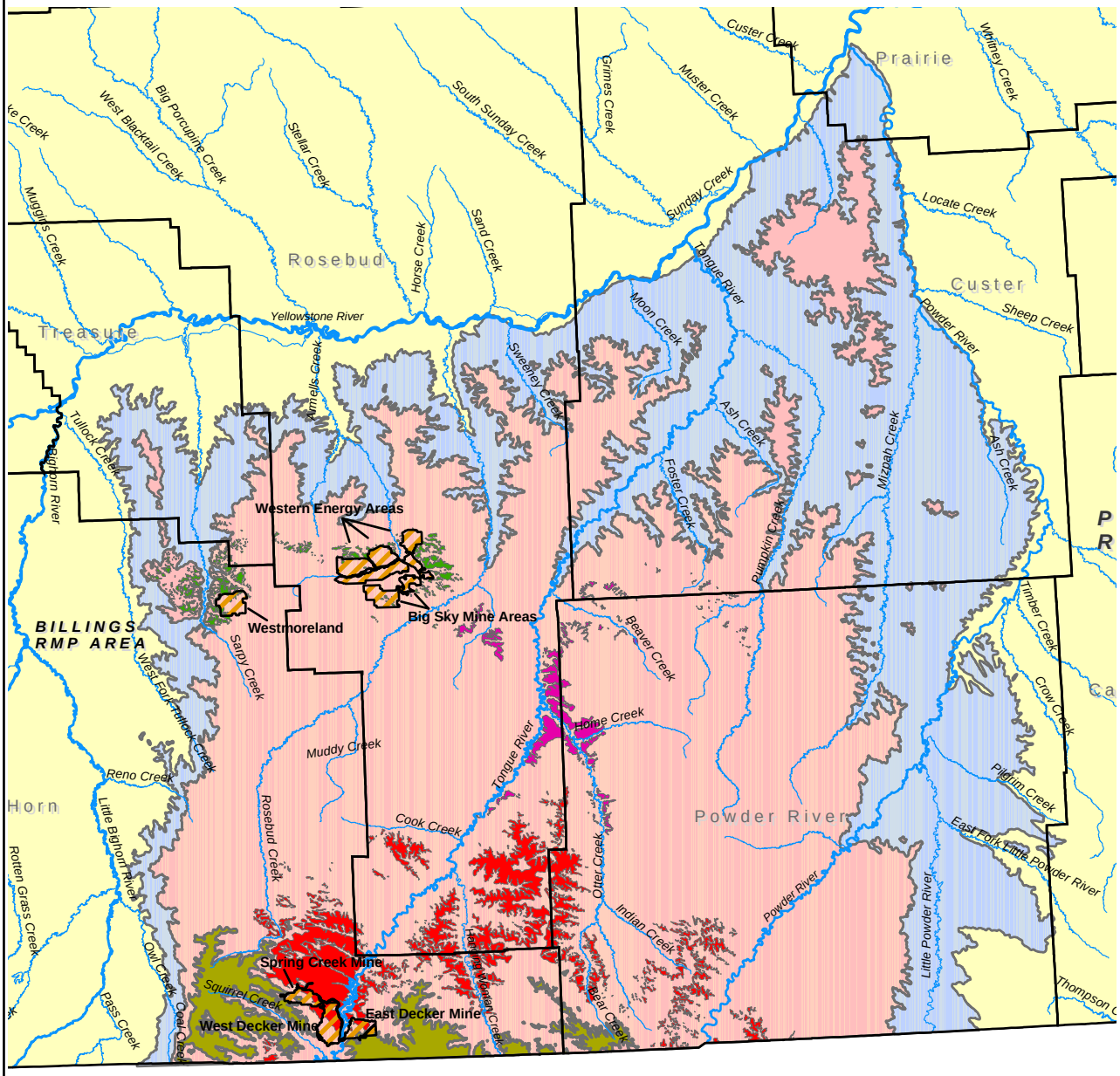
Mineral Materials

Construction materials that are classified as saleable minerals are found in the RMP areas. These include sand and gravel, scoria, common clay, and crushed common stone not subject to regulation under the 1872 Mining Law. Descriptions of these materials are given under Mineral Materials and Locatable Minerals in *the Final Oil and Gas RMP/EIS Amendment* (BLM 1992) and in the *Final Environmental Impact Statement, Resource Management Plan, Billings Resource Area* (BLM 1983) as well as the Final EIS Amendment for the Billings, Powder River, and South Dakota Resource Areas of the Miles City District (BLM 1992).

Locatable Minerals

Locatable minerals are subject to provisions of the 1872 Mining Law. Minerals such as vanadium, uranium, gold, silver, gypsum, and uncommon varieties of bentonite are found in the various planning areas. Detailed descriptions of management practices for locatable minerals on federally managed lands are given in the *Final RMP/EIS* for the Billings and Powder River Resource Areas of the Miles City District (BLM, 1983, 1984).

Map 3-1: Map of Coal and Clinker Deposits Montana Portion of Powder River Basin



Legend

- Coal Mines
- Wyodak - Anderson Coal Clinker
- Knoblock Coal Clinker
- Colstrip Coalfield Clinker

GEOLOGY

- Wasatch Fm.
- Tongue River Mbr.
- Lebo Mbr.

1:1,300,000

20 10 0 20 Miles

20,000 10,000 0 20,000 40,000 Meters

N W E S

DATA SOURCES

Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
Rivers: 1:100,000 scale, rivers, Montana State Library/NRIS, Helena, Montana
RMP Areas: BLM Miles City Field Office.
Geology and Coal: 1:250,000 scale, 1999, USGS Professional Paper 1625a.
Coal Mine Boundaries: Montana Bureau of Mines & Geology

FIGURE 3-1

ERA	Period	Principal Aquifers	Age:
CENOZOIC	Quaternary	Alluvium & Fluvial-Glacial Gravels	10,000 Years 1.6 MYBP
	Tertiary	Alluvium Fluvial-Glacial Gravels (and equivalents) Terraces Fort Union Formation	66.4 MYBP
MESOZOIC	Cretaceous	Lower Hell Creek-Fox Hills Formation Judith River Formation Eagle Formation	
	Jurassic	Kootenai Formation	
	Triassic	Ellis Group	245 MYBP
PALEOZOIC	Permian	No Principal Aquifers	
	Pennsylvanian	No Principal Aquifers	
	Mississippian	Madison Group	
	Devorian Silurian Ordovician Cambrian	No Principal Aquifers	570 MYBP

MYBP – Millions of Years Before Present

Hydrological Resources

Hydrology within the planning area consists of surface water flow from several rivers and their associated tributaries, and the production of groundwater from a variety of geological formations—the combination of which comprises the aquifer systems within any specific portion of the planning area. Of particular importance to residents is the protection of surface water and groundwater in the vicinity of CBM development. CBM development typically involves the necessary and unavoidable production of large volumes of water from coal aquifers and the appropriate use or disposal of this produced water. Continuous

CBM water production and disposal has the ability to impact both groundwater and surface water. As such, it is the subject of the Montana Department of Natural Resources and Conservation (DNRC) Final Order: In the Matter of the Designation of the Powder River Basin Controlled Groundwater Area. This order describes the authorities that pertain to CBM development. A copy of the order is included as an appendix to the Water Resources Technical Report (ALL 2001b). The order outlines water rights issues, mitigation, monitoring plans, and jurisdiction. Jurisdiction is summed up by this paragraph of the Order:

> "With this designation of a controlled groundwater area the withdrawal of groundwater associated with coal bed methane production will be under the prior jurisdiction of the Montana Board of Oil and Gas. However, water rights matters and hydrogeologic issues are not within the ordinary technical expertise and area of concern to the Board. These are matters ordinarily dealt with by the Montana Department of Natural Resources and Conservation and the Montana Bureau of Mines and Geology.
>
> The Montana Department of Natural Resources may petition the Board for hearings in regard to the production, use, and disposal of water from coal bed methane development wells that could effect existing water rights in the area based upon information gathered concerning water withdrawals."

Protection of groundwater will focus on maintaining beneficial uses. The coal seams are the primary aquifers for the agricultural community in southeastern Montana. In many areas the coal aquifer supplies water for livestock and wildlife. In the Bull Mountain coal field, the coal seams are also used as aquifers, though to a lesser degree than in southeastern Montana. In other coal bearing areas of the State, coal seams are not used as aquifers, or that use is limited and not well known.

Surface Water

Surface water is the primary source of water for all uses in Montana, representing 97 percent of the water used throughout the State (Solley et al. 1995). The quality of groundwater from surficial aquifers within the west half of the Billings RMP area, as well as in Park and Gallatin Counties, is usually very good. Maps 3-2 and 3-3 show the occurrence of surficial aquifers as well as the quality of the groundwater produced from these aquifers. Map 3-4 shows that portion of the planning area with the greatest potential for CBM development. The map outlines those areas of continuous surface drainage termed watersheds; each watershed is drained by a single main stream element. The map emphasizes those watersheds vulnerable to impact from CBM water. The volume and quality of surface water can best be interpreted on a watershed basis. Table 3-3 lists basic data on volume and quality. Volume is summarized by two values—an average high-flow figure and a base-flow figure. High-flow conditions typically occur during times of significant melt-water runoff or significant rainfall events. Base-flow conditions occur during dry periods when water input is restricted to inflow of groundwater.

Generally, water quality in a certain watershed varies inversely with volume. High-flow periods correspond to the seasonal influx of relatively high-quality, low-SAR surface water typically during spring snow-melt and early summer rains. Base-flow periods correspond to periods of scarce surface water typically during the winter when streams are fed only by the influx of lower quality, high-SAR groundwater from shallow aquifers. Surface water varies with season; during times of high flow, streams receive runoff water while during times of base-flow, streams receive little runoff and are fed primarily by groundwater. Table 3-3 lists basic flow and Sodium Adsorption Ratio (SAR) data for the major streams in the watersheds of primary CBM potential. The Upper Tongue River near Decker illustrates the variation with rate of 1467 cfs and high quality water (SAR=0.4) during high-flow periods and rate averaging 175 cfs of lower quality water (SAR=1.1) during base-flow periods.

TABLE 3-3
SURFACE WATER QUALITY BY WATERSHEDS

TABULATION OF SURFACE WATER QUALITY IN SELECTED WATERSHEDS OF MONTANA WITH HIGH CBM POTENTIAL

Watershed	USGS Gaging Station #	Average Base-Flow			Average High-Flow	
		7Q10[1] (cfs)	Rate (cfs[2])	SAR[3]	Rate (cfs)	SAR
Little Big Horn (near Wyola)	06290500	36	61.8	1.2	526	0.2
Little Big Horn (near Crow Agency)	06293900	7.6*	123	N/A	782	N/A
Little Big Horn (near Hardin)	06294000	83.17*	138	2.0	851	0.5
Lower Yellowstone (Myers)	06294840	1530*	4200	1.7	42,000	0.7
Lower Yellowstone (Hysham)	06294940	N/A	0.01	8.5	280	1.5
Lower Yellowstone (Colstrip)	06294930	N/A	0.6	4.5	65	1.5
Little Powder (near Broadus)	06325500	0.0*	0.35	N/A	69	N/A
Lower Bighorn (near St. Xavier)	06287000	633	1750	2.5	10,300	1.7
Lower Bighorn (near Big Horn)	06294500	841	640	3.7	21,500	1.2
Mizpah (near Mizpah)	06326300	0.0*	26	21.0	60.1	6.5
Middle Powder (near Moorhead)	06324500	0.89	153	5.2	1433	2.5
Middle Powder (near Broadus)	06324710	1.27*	198	N/A	1077	N/A
Rosebud (at Reservation Boundary near Kirby)	06295113	0.07	1.78	0.8	15.7	0.6
Rosebud (near Colstrip)	06295250	0.0	7.5	1.5	56.5	1.1
Rosebud (at mouth near Rosebud)	06296003	0.0	9.02	3.7	77.0	1.6
Upper Tongue (at state line)	06306300	39	181	N/A	1724	N/A
Upper Tongue (at Tongue R. Dam near Decker)	06307500	20	175	1.1	1467	0.4
Lower Tongue (near Birney Day School)	06307616	39	185	1.4	1202	0.4
Lower Tongue (near Ashland)	06307830	43.49	206	N/A	2073	N/A
Lower Tongue (at Miles City)	06308500	4.5	194	2.4	1305	0.6

Gathered from USGS stream gauging points

[1]7Q10—seven day, ten year low stream flow (calculated by USGS)
[2]CFS—Cubic Feet per Second
[3]SAR—Sodium Adsorption Ratio (unitless)
*Estimated Values
N/A—Data Not Available

TABLE 3-4
STREAM FLOW STATISTICS FOR SELECTED WATERSHEDS IN THE POWDER RIVER BASIN

Watershed	Period of Record	Low Mean Monthly Flow (cfs)[1]	Irrigation Season Low Mean Monthly Flow (cfs)	Median Mean Monthly Flow (cfs)
Little Powder River at Dry Creek near Weston	1972-2000	3	4	12
Little Powder River near Broadus	1978-2000	4	7	21
Powder River at Moorhead	1929-2000	149	149	260
Powder River at Broadus	1975-1992	173	173	256
Tongue River at State Line near Decker	1960-2000	180	182	246
Tongue River at Birney Day School near Birney	1979-2000	185	236	272
Tongue River by Brandenberg Bridge near Ashland	1974-2000	207	321	330
Tongue River at Miles City	1938-2000	188	188	274
Rosebud Creek at Reservation Boundary near Kirby	1979-2000	2	2	4
Rosebud Creek near Colstrip	1974-2000	8	8	18
Rosebud Creek at Mouth near Rosebud	1974-2000	9	9	20
Little Bighorn River by Pass Creek near Wyola	1939-2000	105	111	121
Little Bighorn River near Hardin	1953-2000	123	123	183
Lower Bighorn River near ST. Xavier	1934-2000	2612	2759	2936
Lower Bighorn River at Tullock Creek near Bighorn	1945-2000	2884	2884	3325
Mizpah Creek near Mizpah	1974-1986	0.3	2	11

[1]cfs—cubic feet per second

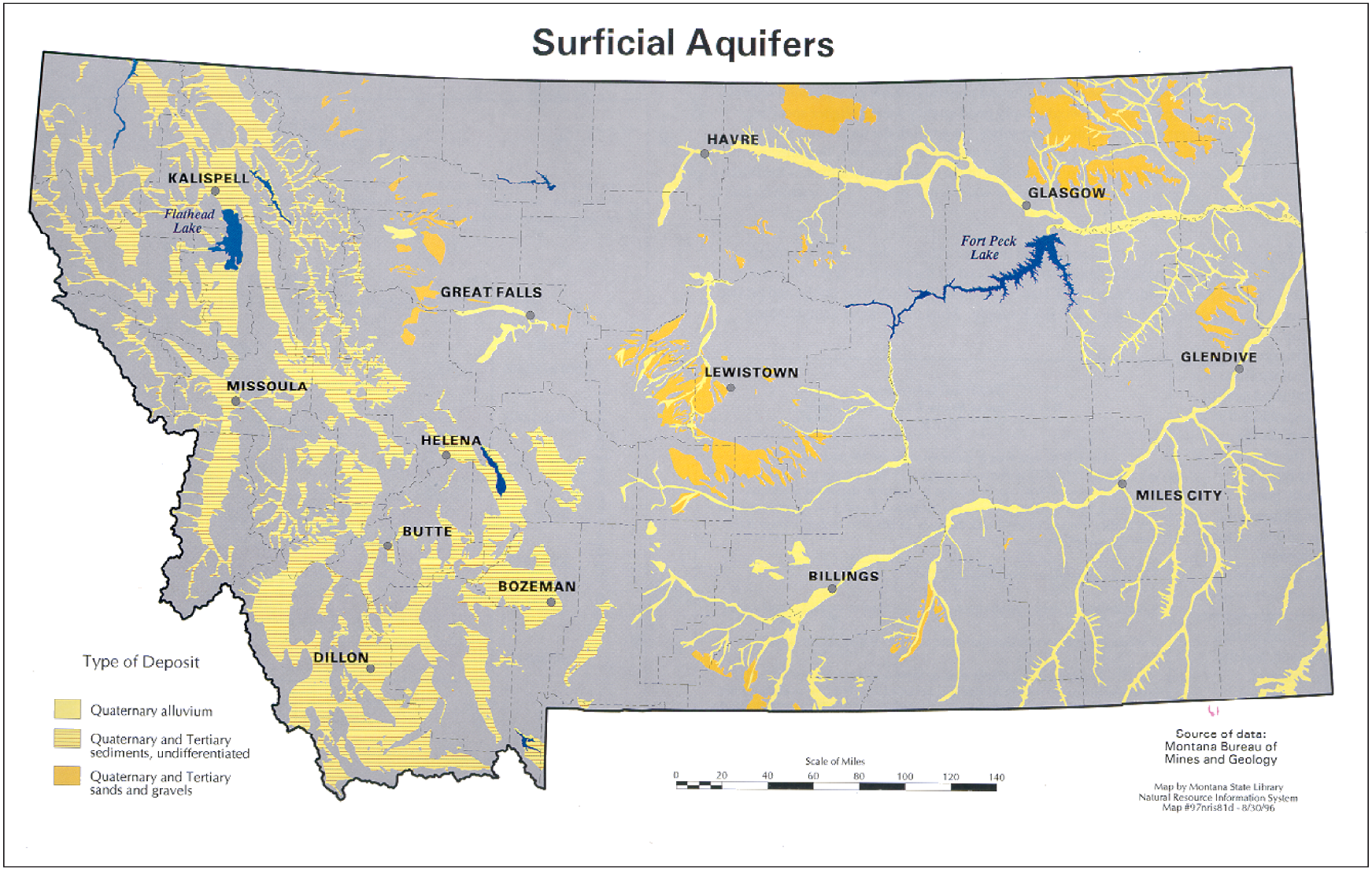
TABLE 3-5
ELECTRIC CONDUCTIVITY (EC) AND SODIUM ADSORPTION RATIO (SAR) FOR SELECTED WATERSHEDS IN THE POWDER RIVER BASIN

Watershed	Period of Record	Median EC (μS[1]/cm)	Average EC (μS/cm)	N[2]	Median SAR	Average SAR	N
Little Powder River at Dry Creek near Weston	1979-1999	2890	2890	178	5.5	5.5	197
Little Powder River near Broadus	1978-2001	2110	2110	16	9.4	9.4	16
Powder River at Moorhead	1969-1999	1950	1950	264	4.5	4.5	154
Powder River at Broadus	1978-1989	2025	2052	62	4.7	4.7	13
Mizpah Creek near Mizpah	1975	1980	1980	104	11	13	73
Tongue River at State Line near Decker	1985-1999	610	673	115	0.56	0.67	25
Tongue River at Birney Day School near Birney	1979-1999	670	719	153	0.87	0.94	93
Tongue River by Brandenberg Bridge near Ashland	1974-2001	818	871	113	1.6	1.8	87
Tongue River at Miles City	1959-1999	840	840	548	1.5	1.5	408
Rosebud Creek at Reservation Boundary near Kirby	1979-1999	950	942	149	0.7	0.7	41
Rosebud Creek near Colstrip	1974-1999	1380	1376	190	1.5	1.4	95
Rosebud Creek at mouth near Rosebud	1974-1999	1590	1720	223	3.1	3.1	16
Little Bighorn River by Pass Creek near Wyola	1993-1999	452	453	44	0.2	0.2	16
Little Bighorn River near Hardin	1969-1999	712	723	368	1.22	1.1	212
Lower Bighorn River near ST. Xavier	1966-1999	847	837	388	2.0	2.0	223
Lower Bighorn River at Tullock Creek near Bighorn	1959-1999	935	953	525	2.1	2.2	73

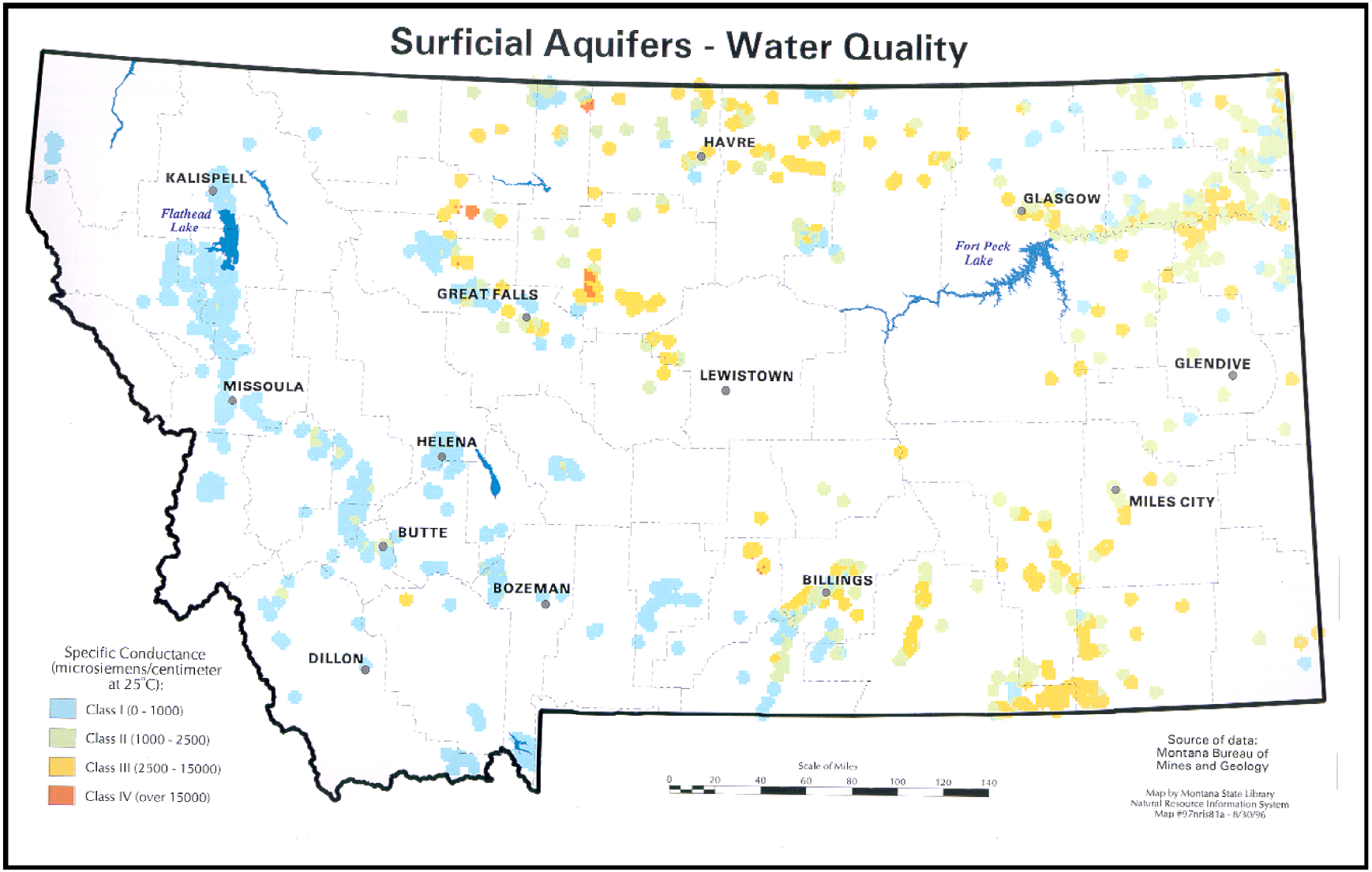
[1]μS—micro Seimens

[2]N—Number of Samples

Map 3-2


Surficial Aquifers
HAVRE
KALISPELL
Flathead Lake
GLASGOW
Fort Peck Lake
GREAT FALLS
GLENDIVE
LEWISTOWN
MISSOULA
HELENA
MILES CITY
BUTTE
BILLINGS
BOZEMAN
DILLON
Type of Deposit
Quaternary alluvium
Quaternary and Tertiary sediments, undifferentiated
Quaternary and Tertiary sands and gravels
Scale of Miles
0 20 40 60 80 100 120 140
Source of data:
Montana Bureau of Mines and Geology
Map by Montana State Library
Natural Resource Information System
Map #97nris81d - 8/30/96

Map 3-3


Surficial Aquifers - Water Quality
KALISPELL
Flathead Lake
HAVRE
GLASGOW
Fort Peck Lake
GREAT FALLS
LEWISTOWN
GLENDIVE
MISSOULA
HELENA
MILES CITY
BUTTE
BOZEMAN
BILLINGS
DILLON
Specific Conductance (microsiemens/centimeter at 25°C):
Class I (0 - 1000)
Class II (1000 - 2500)
Class III (2500 - 15000)
Class IV (over 15000)
Scale of Miles
0 20 40 60 80 100 120 140
Source of data: Montana Bureau of Mines and Geology
Map by Montana State Library Natural Resource Information System Map #97nris81a - 8/30/96

Surface water within the planning area is supplied by runoff from precipitation and snowmelt to a network of streams and tributaries that flow into larger rivers. Drainage within the Powder River Basin RMP area is to the Tongue River and Powder River, which both flow north-northeast into the Yellowstone River. The central and southern portions of the Billings RMP area are drained by a series of tributaries that also flow north-northeast into the Yellowstone River; these tributaries are the Boulder, Stillwater, Rock/Red Lodge Creeks, Clarks Fork, Bighorn, and Little Bighorn. Drainage within the northern portion of the Billings RMP area is to the Musselshell River, which flows eastward until it meets the boundary between Musselshell and Rosebud Counties—at which point it turns northward and flows into the Missouri River. The three additional counties of Park, Gallatin, and Blaine each have separate watersheds. Park County is drained by the Yellowstone River, which flows to the northeast. Much of the drainage in Gallatin County is to the Gallatin River, which flows northerly to the Missouri River. However, the eastern portion of Gallatin County is drained by streams that flow into the Yellowstone River. Blaine County is drained by the Milk River, which flows to the east and into the Missouri River. Groundwater flowing into the streams and rivers within the planning area also contributes to the supply of available surface water.

Surface water can be impacted by cultural activity such as agriculture and industry. When groundcover is broken it exposes soil to wind and water erosion, leading to suspended sediment being brought to bodies of surface water. Artificial impoundments can cause infiltration into the soil and migration into surface water. Accidental releases of wastes can migrate into water bodies.

Watershed water-use statistics in Table 3-4 apply to those watersheds shown in Map 3-3. Table 3-4 presents data about the quantity of surface water and groundwater used in each water-use category. These data cover the area projected to have maximum CBM potential but similar data is available for other areas of the state (USGS 1995). Surface water in these watersheds is the dominant source of water, locally, however, groundwater use is important for public and domestic drinking water.

TABLE 3-6
WATER USE (IN MILLIONS OF GALLONS PER DAY [gpd]) STATISTICS IN 1995 BY WATERSHED SURFACE AND/OR GROUNDWATER USE

Watershed	Public Supply	Domes-tic	Indus-trial	Thermo-Electric	Mining	Livestock	Irrigation	Total Ground-water	Total Surface Water
Little Bighorn	0.01/0.15	0.0/0.12	0.0/0.0	0.0/0.0	0.0/0.0	0.9/0.37	84.01/1.46	2.1	84.24
Lower Bighorn	0.61/0.02	0.0/0.25	0.0/0.01	0.0/0.0	0.0/0.44	0.3/0.73	221.6/3.67	5.12	222.51
Lower Yellowstone	2.37/0.19	0.0/0.17	0.0/0.12	16.1/0.0	0.45/0.0	1.48/0.4	250/2.56	3.44	270.4
Rosebud	0.01/0.43	0.0/0.08	0.0/0.0	0.0/0.0	0.0/1.04	0.2/0.25	8.04/0.1	1.90	8.25
Upper Tongue	0.0/0.06	0.0/0.09	0.0/0.0	0.0/0.0	0.0/0.0	0.11/0.27	23.75/0.34	0.76	23.86
Lower Tongue	0.01/0.11	0.0/0.17	0.0/0.0	0.0/0.0	0.0/1.18	0.45/0.61	36.29/0.36	2.43	39.75
Middle Powder	0.01/0.12	0.0/0.04	0.0/0.0	0.0/0.0	0.0/0.0	0.02/0.24	3.18/0.04	0.44	3.21
Mizpah	0.0/0.0	0.0/0.03	0.0/0.0	0.0/0.0	0.0/0.0	0.1/0.19	6.41/0.06	0.28	6.51
Little Powder	0.0/0.12	0.0/0.04	0.0/0.0	0.0/0.0	0.0/0.0	0.05/0.24	2.18/0.03	0.43	2.23
Lower Powder	0.0/0.0	0.0/0.06	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.24	9.65/0.09	0.39	10.15

USGS 1995

The Clean Water Act of 1972 and amendments require states to adopt standards for the protection of surface water quality. These standards are designed to maintain water quality sufficient to support the waterbody's beneficial uses. Montana waterbodies are classified according to the present and future beneficial uses that they normally would be capable of supporting (75-5-301 MCA). The state Water-Use Classification System (ARM 17.30.604-629) identifies the following beneficial uses:

- Drinking, culinary use, and food processing
- Aquatic life support for fishes and associated aquatic life, waterfowl, and furbearers
- Bathing, swimming, recreation and aesthetics
- Agriculture (crop irrigation, stock watering, etc.) water supply
- Industrial (coal mining, electrical power generation, etc.) water supply

The current use classification of each waterbody in Montana was assigned on the basis of its actual or anticipated uses in the early 1970s. Waterbodies are classified primarily by: 1) the level of protection that they require; 2) the type of fisheries that they support (warm water or cold water) or; 3) their natural ability to support use for drinking water, agriculture etc. The water quality standards employed to maintain these uses address changes from natural conditions for such parameters as coliform bacteria, dissolved oxygen, pH, turbidity, temperature, color, toxics, and other harmful substances.

When streams and other waterbodies are impacted by outside agents, their support of beneficial uses can become impaired. In Montana, surface water quality is tracked by the MDEQ. Table 3-7 is a compilation of impaired and threatened waterbodies in need of water quality restoration. Waterbodies included in this list do not currently support their original beneficial uses. This list is commonly referred to as the "303(d) List" because it is prepared in accordance with the requirements of Section 303(d) of the Federal Clean Water Act.

TABLE 3-7
IMPAIRED WATERBODIES IN AREA OF MAXIMUM CBM POTENTIAL

Watershed	Impaired Waterbody	Probable Causes of Impairment	Probable Sources of Impairment
Lower Yellowstone	Yellowstone River (MT42K001-1) from the Forsyth to the mouth of the Powder River	Metals Nutrients Other Habitat Alterations Pathogens Salinity/TDS/Chlorides Suspended Solids pH	Agriculture Irrigated Crop Production Municipal Point Sources Natural Sources Range Land Streambank Modification/Destabilization
Lower Yellowstone	East Fork of the Armells Ck. (MT42KJ002-3) from Colstrip to the mouth of the West Fork of the Amells Ck.	Nutrients Salinity/TDS/Chlorides Suspended Solids	Agriculture Natural Sources Range Land
Lower Yellowstone	East Fork of the Armells Ck (MT42KJ002-9) above Colstrip	Nutrients Suspended Solids	Agriculture Range Land
Lower Yellowstone	West Fork of the Armells Ck (MT42KJ002-4)	Flow Alteration Nutrients Salinity/TDS/Chlorides Suspended Solids	Agriculture Natural Sources Range Land
Lower Yellowstone	East Fork of the Sarpy Ck (MT42KJ002-2)	Salinity/TDS/Chlorides Suspended Solids	Natural Sources Resource Extraction Silviculture Surface Mining

TABLE 3-7
IMPAIRED WATERBODIES IN AREA OF MAXIMUM CBM POTENTIAL

Watershed	Impaired Waterbody	Probable Causes of Impairment	Probable Sources of Impairment
Little Bighorn	None		
Lower Bighorn	Bighorn R. (MT43P003-1) Excludes Tribal reservation Waters	Metals Salinity/TDS/Chlorides Suspended Solids Thermal Modifications pH Other Inorganics Siltation	Agriculture Flow Regulation/Modification Natural Sources Upstream Impoundments
	Bighorn R. (MT43P005-1)	Metals Salinity/TDS/Chlorides Suspended Solids Thermal Modifications pH Flow Alteration Nutrients Other Inorganics	Agriculture Flow Regulation/Modification Natural Sources Upstream Impoundments
Lower Big Horn	Tullock Creek (MT43P006-1)	Metals Salinity/TDS/Chlorides Suspended Solids Nutrients Other Inorganics	Agriculture Irrigated Crop Production Natural Sources
Upper Tongue	Hanging Woman Creek (MT43B002)	Flow Alteration Metals Salinity/TDS/Chlorides	Agriculture Irrigated Crop Production Natural Sources
Upper Tongue	Hanging Woman Creek from Stroud Creek to the mouth	Siltation	Grazing and Agriculture
Upper Tongue	Tongue River Reservoir	Nutrients Organic Enrichment/DO Suspended Solids	Agriculture Municipal Point Sources
Upper Tongue	Upper Tongue River (MT43B001-1) above reservoir	Flow Alteration	Agriculture Irrigated Crop Production Natural Sources
Upper Tongue	Tongue River (MT43B001-2) from the Reservoir to mouth of Hanging Woman Ck.	Flow Alteration	Agriculture Flow Regulation/Modification Irrigated Crop Production
Lower Tongue	Tongue River (MT42C001) from reservoir to the mouth	Flow alteration Metals Other Organics Salinity/TDS/Chlorides Suspended Solids	Agriculture Flow Regulation/Modification Irrigated Crop Production Natural Sources

TABLE 3-7
IMPAIRED WATERBODIES IN AREA OF MAXIMUM CBM POTENTIAL

Watershed	Impaired Waterbody	Probable Causes of Impairment	Probable Sources of Impairment
Lower Tongue	Otter Creek (MT42C002-2)	Metals Other Habitat Alterations Salinity/TDS/Chlorides Suspended Solids	Agriculture Highway/Road/Bridge Construction Land Development Natural Sources
Lower Tongue	Pumpkin Creek (MT43C002-6)	Flow Alteration Salinity/TDS/Chlorides Thermal Modifications	Agriculture Irrigated Crop Production
Rosebud	Rosebud Creek (MT42A001)	Flow Alteration Metals Nutrients Other Organics Salinity/TDS/Chlorides Suspended Solids	Agriculture Irrigated Crop Production Natural Sources
Mizpah	Mizpah Creek (MT42J005-1)	Organic Enrichment/DO Other Inorganics Suspended Solids	Irrigated Crop production Natural Sources Range Land
Little Powder	Little Powder River (MT42I001)	Flow Alteration Other Organics Salinity/TDS/Chlorides Suspended Solids Siltation	Irrigated Crop Production Natural Sources Streambank Modification/Destabilization
Lower Powder	Stump Creek (MT42J004-2)	Suspended Solids	Agriculture Range Land
Lower Powder	Lower Powder River (MT42J003-1) from mouth of Little Powder to the mouth	Flow Alteration Metals Nutrients Other Organics Pathogens Salinity/TDS/Chlorides Suspended Solids	Agriculture Irrigated Crop Production Natural Sources Petroleum Activities Resource Extraction Range Land Streambank Modification/Destabilization

Final Year 1996 Montana 303(d) List. A Compilation of Impaired and Threatened Waterbodies in Need of Water Quality Restoration, Part A, Water Quality Assessment Results.

Several of the above watersheds and impaired waterbodies are shared jurisdictionally between the State and Tribes. Segment MT42C001, the Tongue River from the reservoir to the mouth, for instance is shared between the State of Montana and the Northern Cheyenne Tribe, with the boundary lying in the middle of the river. The Lower Tongue Watershed intersects with the Northern Cheyenne Reservation. The Rosebud watershed includes most of the Northern Cheyenne Reservation and a part of the Crow Reservation; the Northern Cheyenne Reservation contacts the impaired portion of the Rosebud Creek. The Lower Bighorn watershed includes a large part of the Crow Reservation, which contacts both impaired portions of the Bighorn River. The Little Bighorn watershed includes a large part of the Crow Reservation but no waterbodies are determined to be impaired on the 1996 list.

In accordance with Section 303(d) of the Federal Clean Water Act, the Montana Department of Environmental Quality (MDEQ) has prepared a list of impaired and threatened waters every 2 years since 1992. This so called "303(d) list" identifies lakes, rivers and streams that are not meeting water quality standards and establishes priorities for TMDL development. However, Montana, like the rest of the nation, was slow to develop TMDLs. On June 21, 2000, the United States District Court of Montana ordered EPA to work with the State of Montana to develop and adopt a schedule that would result in developing all necessary Total Maximum Daily Loads (TMDLs) for waterbodies on Montana's 1996 Section 303(d) list (Table 3-7) by May 5, 2007. On November 1, 2000, MDEQ and EPA published a schedule that divided the state into 91 TMDL Planning Areas each with a deadline for completing all necessary TMDLs. The surface waters likely to be affected by CBM development are located in the Tongue and Powder TMDL Planning Areas. The TMDL completion dates for these planning areas are 2005 and 2006, respectively. Impacted waterbodies and TMDL issues are discussed in detail in the Hydrology Appendix.

Groundwater

Groundwater within the planning area is found within a variety of aquifers, ranging from shallow unconsolidated alluvial aquifers associated with modern rivers to deep bedrock aquifers consisting of consolidated sandstone, limestone, or coal. The occurrence of specific bedrock aquifers and the quality of groundwater produced from these aquifers vary throughout the planning area. Maps 3-4 and 3-5 are maps that show the occurrence of bedrock aquifers and the quality of groundwater produced from these aquifers. In general, the quality of groundwater produced from bedrock aquifers is best near their recharge or outcrop areas. Water enters the aquifers or reservoirs during deposition of the sedimentary unit as formation water that can be salty or fresh. Later, meteoric water can enter the aquifer through outcropping recharge zones where runoff water infiltrates and is conducted into the subsurface. Groundwater comes to the surface by way of natural springs that conduct groundwater onto the surface or into bodies of surface water. Aquifer pressure can be measured in pounds per square inch (psi) or in feet of head and can vary from a low-pressure reservoir where water stands below the top of the reservoir, to an artesian aquifer where water stands above the top of the reservoir, sometimes being above ground surface and flowing from wells. Aquifer pressure can be measured in a monitoring well where water is not normally produced except for testing and sampling. Groundwater can be produced through water wells that pump or convey water from aquifers to the surface.

Water quality and quantity are variable with the primary water quality issue being salinity. Groundwater represents less than 3 percent of the total water use in the State (Solley et al. 1995). Table 3-6 presents data about the quantity of groundwater used in each water-use category on a watershed basis. Although the use of groundwater only represents 3% of the total water use it is extremely critical because it provides almost 100% of the domestic water farmsteads and constitutes the largest percentage of dependable stock water, because it is not seasonal or drought affected.

The principal aquifers within the planning area are listed in Figure 3-1 according to their geologic Era and Period. Table 3-8 contains information about the general depth of particular aquifers, their yield, geologic materials, and water quality.

Surficial aquifers within the planning area consist of Quaternary and Tertiary alluvium, Tertiary fluvial-glacial sand and gravel deposits, and Tertiary terrace deposits. These surficial aquifers are located within the floodplains and along the channels of larger streams, tributaries, and rivers, and are among the most productive sources of groundwater within the planning area. The quality of groundwater from surficial aquifers is generally good, but within the Powder River RMP area and Blaine County it can be highly variable (approximately 1500 mg/l to 2,800 mg/l and 5.0 to 10 SAR). The quality of groundwater from surficial aquifers within the west half of the Billings RMP area, as well as in Park and Gallatin Counties, is usually very good. Wells completed in coarse sand and gravel alluvial aquifers can yield as much as 100 gallons per minute (gpm), although yields of 15 gpm are the average. Alluvial deposits associated with old river beds as detached terraces will usually only yield as much as 20 gpm because they are isolated topographically and have limited saturation (Zelt et al. 1999).

The occurrence of specific bedrock aquifers and the quality of groundwater produced from these aquifers vary throughout the planning area. In general, the quality of groundwater produced from bedrock aquifers is best near their recharge or outcrop areas. Groundwater produced near an aquifer's recharge zone has only been in contact with the rocks and minerals in the aquifer material for a relatively short period of time. As a result, the water has not had time to dissolve substantial amounts of soluble salts and

minerals and so it remains fresh. The longer the water is in the aquifer, the more time it will have to dissolve salts and minerals. In general, the concentration of total dissolved solids increases with distance from an aquifer's recharge or outcrop zone.

Within the Powder River RMP area, the primary bedrock aquifers are the sandstones and coal beds of the Tertiary Fort Union Formation and the sandstones of the Cretaceous Hell Creek–Fox Hills Formation. Wells within the Fort Union Formation may produce as much as 40 gpm, but yields of 15 gpm are more typical. Where confined and artesian conditions exist, wells in the Fort Union Formation will generally flow less than 10 gpm. Groundwater yields from the Hell Creek–Fox Hills Formation may be as much as 200 gpm, but are generally less than 100 gpm. Artesian wells within the Hell Creek–Fox Hills Formation may flow as much as 20 gpm (Zelt et al. 1999). The primary aquifer within Blaine County is the Judith River Formation.

Primary bedrock aquifers within the Billings RMP area and also Park and Gallatin counties are the Jurassic Kootenai Formation in the northern part of the area and the Mississippian Madison Formation. The Kootenai aquifer consists primarily of sandstone beds, while the Madison aquifer is composed of limestone. The Eagle Sandstone is a primary bedrock aquifer in Park and Gallatin counties. The Lower Hell Creek–Fox Hills Formation and the Tongue River and Tullock Members of the Fort Union Formation also produce significant groundwater within the area of the Bull Mountains in the northeast portion of the Billings RMP area. Groundwater yields from the Hell Creek–Fox Hills Formation can be as much as 200 gpm, but yields of 70 gpm are more common. Artesian wells within the Hell Creek–Fox Hills Formation can flow up to 20 gpm. Wells within the Tullock Member of the Fort Union Formation may produce as much as 40 gpm with yields of 15 gpm being the average and artesian wells flowing less than 10 gpm. Wells within the Tongue River Member of the Fort Union Formation may produce up to 160 gpm, with 20 gpm being more common (Zelt et al. 1999). Wells within the Kootenai Formation generally yield between 10 to 30 gpm, but may be as much as 100 gpm. Groundwater production from the Madison Formation can be highly variable because of the karst and fractured nature of this limestone, which can have yields ranging from 20 to 6,000 gpm or higher in karst areas (MBMG 1982).

Of particular importance is the water quality of groundwater within the primary aquifers of the area of main CBM potential; it is these aquifers that may be impacted by CBM development. Table 3-9 lists two of the most important aspects of water quality—TDS and SAR. Water quality is detailed in the Water Resources Technical Report (ALL 2001b).

Groundwater is variable in terms of both stratigraphic depth and geography but alluvium can be seen as higher quality in terms of SAR and lower quality in terms of TDS, suggesting that these aquifers contain water higher in other ions besides sodium and chloride.

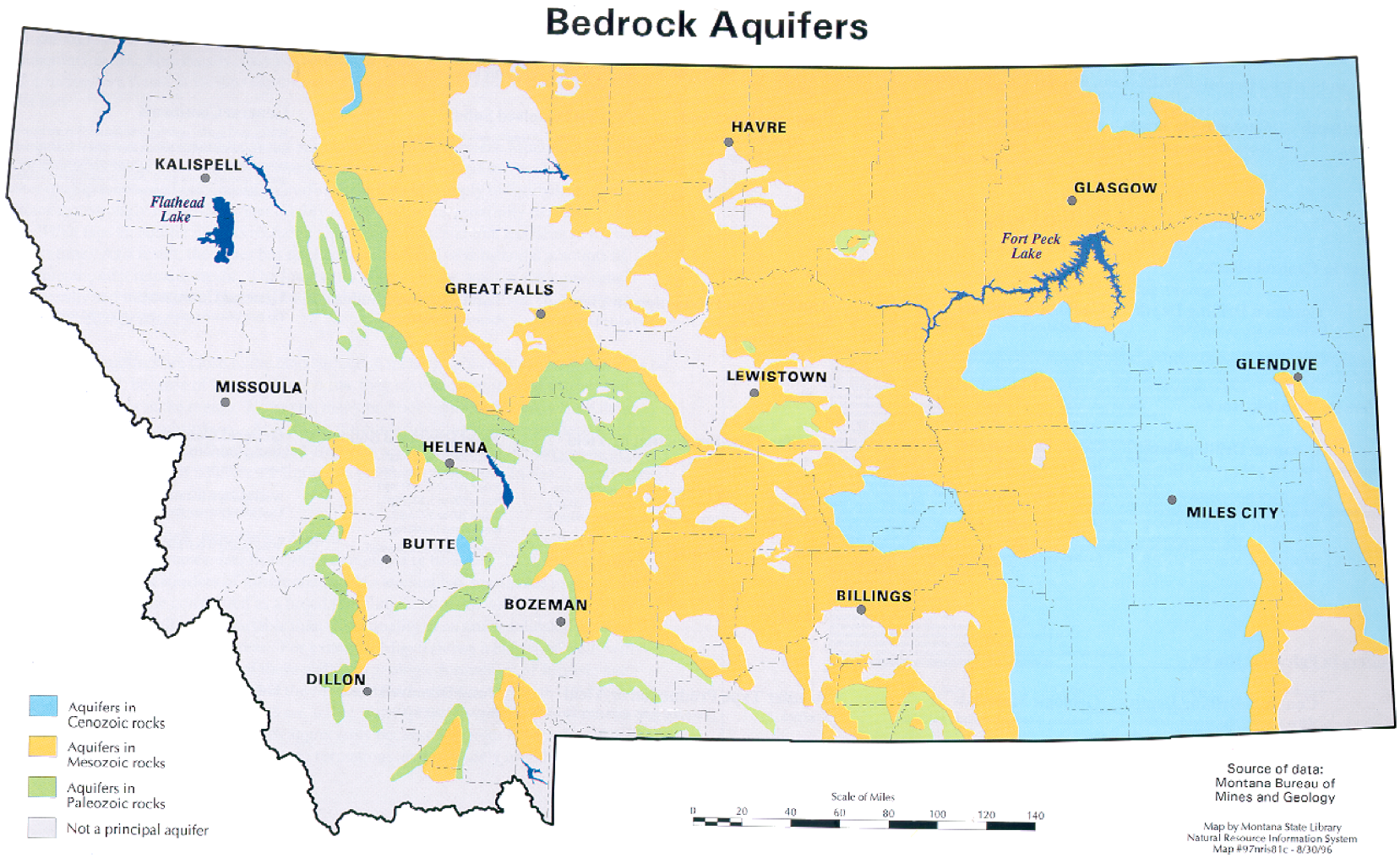
Water Rights

Water rights in Montana are the subject of The Montana Water Use Act (Title 85, Chapter 2, MCA) of 1973, which became effective July 1, 1973. Water rights existing prior to that date are to be finalized by state courts. Water rights applications since that date will be secured through a MDNRC permit system. In addition, some water rights are protected under federal and state statutes.

Water rights on some BLM lands are protected by the Federally Reserved Water Rights for Public Springs and Water Holes, Public Water Reserve 107, pursuant to Executive Order dated April 17, 1926. Compacts between the State of Montana and Northern Cheyenne Tribe have placed moratoria on new water use developments on Tribal Lands within the Rosebud, Lower Bighorn, and Pryor watersheds.

Water rights are being adjudicated on a watershed basis. The Tongue River and Little Bighorn have not yet been fully adjudicated, Rosebud is 78 percent examined prior to being adjudicated, Lower Yellowstone is 90 percent examined. Table 3-10 lists water rights developments by watershed in the area of main potential for CBM production.

Map 3-4


Bedrock Aquifers
KALISPELL
Flathead Lake
HAVRE
GLASGOW
Fort Peck Lake
GREAT FALLS
LEWISTOWN
GLENDIVE
MISSOULA
HELENA
MILES CITY
BUTTE
BOZEMAN
BILLINGS
DILLON
Aquifers in Cenozoic rocks
Aquifers in Mesozoic rocks
Aquifers in Paleozoic rocks
Not a principal aquifer
Scale of Miles
0 20 40 60 80 100 120 140
Source of data: Montana Bureau of Mines and Geology
Map by Montana State Library Natural Resource Information System Map #97nris81c - 8/30/96

Map 3-5

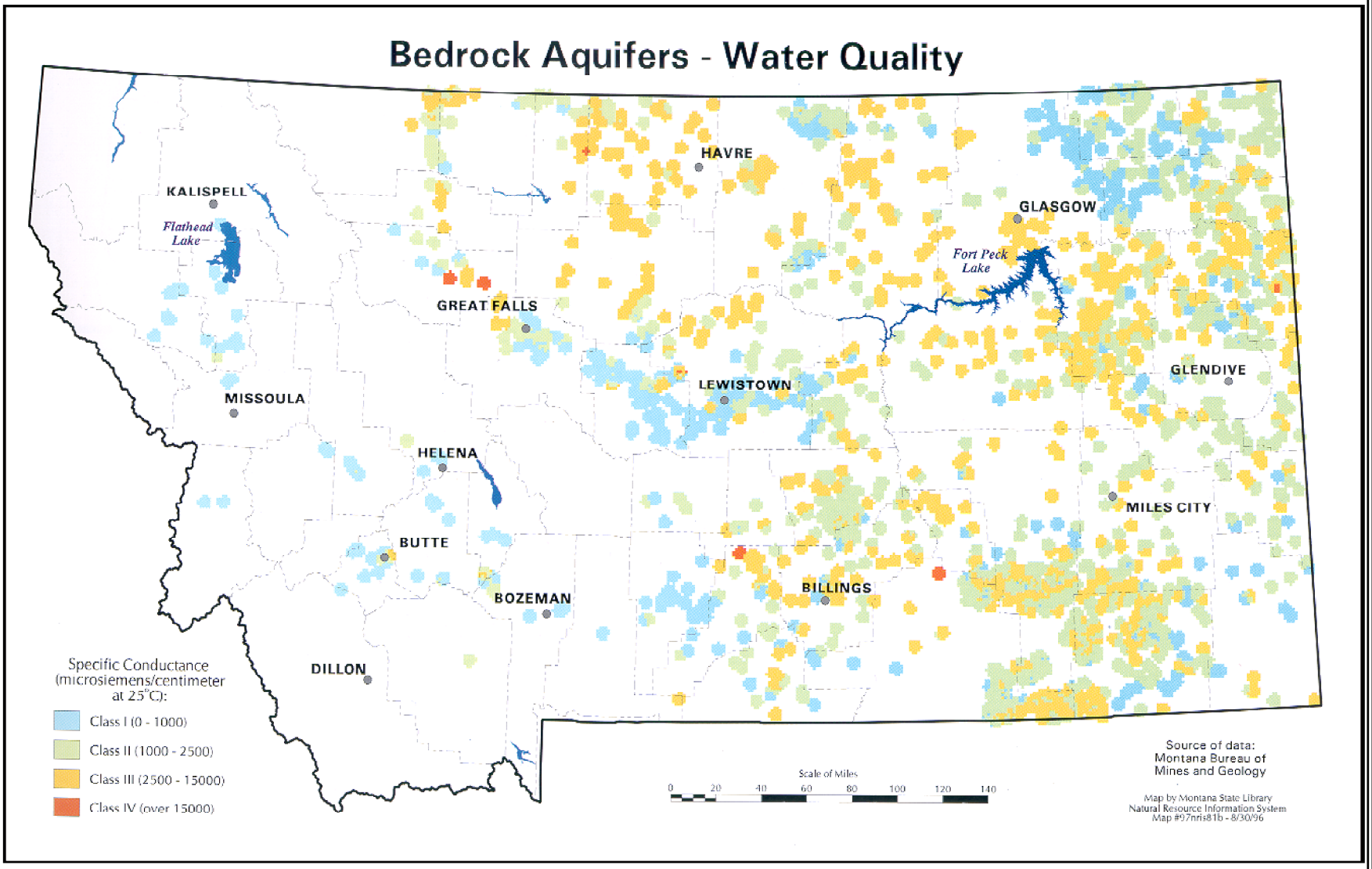

Bedrock Aquifers - Water Quality
HAVRE
KALISPELL
Flathead Lake
GLASGOW
Fort Peck Lake
GREAT FALLS
GLENDIVE
LEWISTOWN
MISSOULA
HELENA
MILES CITY
BUTTE
BILLINGS
BOZEMAN
DILLON
Specific Conductance (microsiemens/centimeter at 25°C):
Class I (0 - 1000)
Class II (1000 - 2500)
Class III (2500 - 15000)
Class IV (over 15000)
Scale of Miles
0 20 40 60 80 100 120 140
Source of data: Montana Bureau of Mines and Geology
Map by Montana State Library Natural Resource Information System Map #97nris81b - 8/30/96

TABLE 3-8
PLANNING AREA AQUIFERS AND THEIR GENERAL CHARACTERISTICS

AQUIFERS IN SURFICIAL DEPOSITS						
Aquifer	**Common Drilling Depth**	**Geologic Materials**	**Aquifer Type**	**Production or Yield**	**Total Dissolved Solids**	**General Comments**
Alluvium, Fluvial-Glacial Gravels, Terrace gravels, and Flaxville Formation Gravels and equivalents.	20 to 40 ft. May exceed 250 ft.	Unconsoli-dated clay, silt, sand, gravel	Commonly unconfined	Typically 5 to 50 gpm.	Range 300 to 2,200 milligrams/ liter (mg/l).	Widely used aquifer systems. Alluvial aquifers are most often used because they lie near the surface and are accessible via shallow wells and water yield is routinely quite good. They can be partially confined to completely confined with yields that may exceed 1,500 gpm in some areas. Yields from gravel deposits are more variable but water quality is usually quite good. Alluvial aquifers are vulnerable to human caused contamination in a variety of settings.
AQUIFERS IN CENOZOIC ROCKS						
Aquifer	**Common Drilling Depth**	**Geologic Materials**	**Aquifer Type**	**Production or Yield**	**Total Dissolved Solids**	**General Comments**
Fort Union Formation	50 to 300 ft. May exceed 1000 ft.	Interbedded shale, siltstone, sandstone, and coal.	Commonly confined, except near surface.	Typically 5 to 50 gpm.	Range 500 to 5,000 mg/l.	The Fort Union is a major source of ground water for eastern Montana. Water is suitable for watering stock but may not be suitable for irrigation.

TABLE 3-8
PLANNING AREA AQUIFERS AND THEIR GENERAL CHARACTERISTICS

AQUIFERS IN MESOZOIC ROCKS

Aquifer	Common Drilling Depth	Geologic Materials	Aquifer Type	Production or Yield	Total Dissolved Solids	General Comments
Lower Hell Creek-Fox Hills Formations	150 to 500 ft. May exceed 1,000 ft.	Mainly sandstone with some siltstone and shale.	Confined	5 to 20 gpm. May exceed 200 gpm.	Range 500 to 1,800 mg/l.	Although the Fort Union overlies the Hell Creek-Fox Hills, the latter is often the target for water well drilling as a result of its higher quality of water.
Judith River Formation	200 to 600 ft. May exceed 1,000 ft.	Sandstone, siltstone, with some coal.	Confined	5 to 15 gpm. May exceed 100 gpm.	Range 160 to 27,000 mg/l.	
Eagle Formation	100 to 800 ft. May exceed 2,000 ft.	Interbedded sandstone and shale.	Confined	10 to 20 gpm. May exceed 200 gpm.	Range 800 to 1,500 mg/l.	Water quality is best in central Montana, poorer in eastern Montana.
Kootenai Formation	100 to 1000 ft. May exceed 3,000 ft.	Interbedded sandstone, siltstone, and shale.	Confined	10 to 30 gpm. may exceed 100 gpm.	Range 200 to 500 mg/l. May exceed 14,000 mg/l.	Used heavily near the Belt Mountains where water quality is good.
Ellis Group	300 to 2,000 ft. May exceed 5000 ft.	Sandstone, shale, limestone, and dolomite.	Confined	No Data.	Generally less than 600 mg/l.	Water quality is best near outcrop areas.

TABLE 3-8
PLANNING AREA AQUIFERS AND THEIR GENERAL CHARACTERISTICS

AQUIFERS IN PALEOZOIC ROCKS						
Aquifer	**Common Drilling Depth**	**Geologic Materials**	**Aquifer Type**	**Production or Yield**	**Total Dissolved Solids**	**General Comments**
Madison Group	500 to 3,000 ft. May exceed 7,000 ft.	Limestone, dolomite, anhydrite, and halite	Confined	20 to 6,000 gpm. Higher in karst areas.	Range 500 to 300,000 mg/l.	Very extensive aquifer, it underlies a large portion of the Great Plains. Water quality can be very high near recharge areas and is poorest in northeastern Montana.

TABLE 3-9
GROUNDWATER QUALITY FOR THE MONTANA PORTION OF THE POWDER RIVER BASIN SELECTED GROUNDWATER QUALITY DATA COLLECTED FROM WATER SUPPLY WELLS LOCATED THROUGHOUT MONTANA POWDER RIVER BASIN

	Judith River Formation		Hell Creek /Fox Hills Formation		Fort Union Formation		Quaternary Alluvium	
County	Avg. TDS (mg/l)	Avg. SAR	Avg. TDS (mg/l)	Avg. SAR	Avg. TDS (mg/l)	Avg. SAR	Avg. TDS (mg/l)	Avg. SAR
Big Horn	936	54	1440	14	1658	8	2118	5
Rosebud	2465	31	1376	35	1595	16	1516	9
Powder River	No data	No data	890	35	1882	15	2783	5
Custer	No data	No data	896	37	1810	31	1665	8
Treasure	2312	64	1985	56	1782	32	2437	10
Weighted Average	2100	42	1148	37	1892	18	2014	7

Note:
Avg. TDS = Average Total Dissolved Solids
Avg. SAR = Average Sodium Adsorption Ratio
Source: MBMG 2001a

TABLE 3-10
WATER RIGHTS DEVELOPMENT SUMMARY BY WATERSHED

	Number of Pre-1973 Developments		Number of Post-1973 Developments		
Watershed	Surface	Ground-water	Surface	Ground-water	Number of Pending Water Rights Permits
Rosebud	765	408	27	210	1
Upper Tongue River	820	504	35	136	3
Lower Tongue River	2407	2278	98	662	1
Little Powder	1320	741	66	166	3
Lower and Middle Powder and Mizpah	5204	2816	314	4	7
Lower Yellowstone	3398	1330	278	804	4
Little Bighorn	786	387	35	96	0
Lower Bighorn	1522	596	105	419	3

DNRC 2001

Indian Trust Assets

Indian Trust Assets (ITAs) are official interests in assets held in trust by the federal government for Indian tribes or individuals. The U.S. Department of the Interior (DOI) Departmental Manual 303 DM 2 defines ITAs as lands, natural resources, money, or other assets held by the federal government in trust or that are restricted against alienation for Indian tribes and individual Indians. Furthermore, DOI Departmental Manual 512 DM 2 requires all of its bureaus and offices to explicitly address anticipated effects on ITAs in planning, decision, and operating documents.

Beyond the maintenance of tangible assets, the federal government also has a trust responsibility to be considerate of the general well being of the tribes. This responsibility includes recognizing the Indian culture as an important value and to carefully consider Indian cultural values when conducting planning efforts. Indian cultural values include their unique way of life, ceremonial practices, spiritual beliefs, family values, and worldview. The DOI Department Manual 512 DM 2 also asserts an affirmative responsibility to ensure the tribal health and safety, to consult on a government to government basis with tribes who may be affected by proposed actions, to disclose all applicable information and to fully incorporate tribal views in its decision-making processes.

Background

Land associated with a reservation or public domain allotments are examples of ITAs. Natural resources that exist within Indian reservations such as standing timber, minerals, and oil and gas are ITAs. Treaty rights, water rights, and hunting and fishing rights may also be ITAs. Other ITAs may consist of financial assets held in trust accounts or intangible items such as Indian cultural values, ITAs are a product of the unique history and relationship of the U.S. government with various American Indian tribes and remain within the purview of federal process. There is no similar relationship between the Montana State government agencies and sovereign dependent Indian tribal nations (like the Northern Cheyenne and Crow Tribes).

Identification Methods

The BIA is mandated by the DOI to develop inventories of ITAs for all Indian tribes. The only ITAs in the EIS planning area are the actual Indian reservation lands belonging to the Northern Cheyenne, Crow, and Fort Belknap tribes.

Applicable Laws

Federal

The DOI Department Manual 512 DM 2 requires all DOI Bureaus and offices to explicitly address anticipated effects on ITAs in planning, decision, and operating documents. This order also requires descriptions of how decisions will conform to the DOI's trust responsibilities. Furthermore, DOI Department Manual 303 DM 2 outlines the principals for managing ITAs.

State

ITAs are not considered under any State standards or regulations.

The Crow

The Crow Reservation is located in south-central Montana, and comprises nearly 2,296,000 acres. Access is via Interstate 90 or U.S. Highway 87. The reservation is bordered on the south by the State of Wyoming, on the east by the Northern Cheyenne Reservation, and on the northwest by the city of Billings, which is Montana's largest metropolitan area. The reservation encompasses the Little Big Horn Battlefield and approximately 3,600 square miles of rolling prairie and rugged foothills drained by the Bighorn River. The BIA Realty Office indicated that the tribe has some 455,719 surface acres and 405,888 acres of mineral rights. There are another 1,035,850 acres that have been individually allotted, and 824,427 acres of allotted mineral rights.

There are about 10,083 Crow tribal members, the majority of which live on the reservation. The Crow language is spoken by more than 80 percent of the tribe. Headquarters are at Crow Agency, Montana, just south of Hardin, Montana. The total labor force on the Crow Reservation is 3,902. The unemployment rate is 61 percent. The average per capita income is $4,243.

Water Rights

The Crow have existing water rights held in trust, similar to the Northern Cheyenne. The Crow Tribe has not negotiated a water rights compact with the State of Montana.

Mineral Rights

The BIA Realty Office has stated that the Crow have mineral right assets totaling some 405,888 subsurface acres and another 824,427 allotted mineral acres.

Air Quality

The Crow Reservation is classified as a PSD Class II area.

Cultural Resources

The Crow also considers cultural and prehistoric resources located within their reservation to be ITAs. At present, an unknown number of archaeological resources are on the reservation. Sites are known to exist on the reservation, but the tribe reserves the information. These sites can consist of burials, trails, rock features, lithic scatters, house pits/rings, rock-shelters, caves, bison kills, and petroglyphs.

The Northern Cheyenne Tribe

The Northern Cheyenne Indian Reservation occupies about 445,000 acres in eastern Big Horn and southern Rosebud Counties, Montana. Access is provided by U.S. Highway 212. The reservation covers nearly 695 square miles and is bordered on the east by the Tongue River and on the west by the Crow Reservation. According to the BIA Realty Office, the tribe has 442,193 trust acres and 444,000 of surface and mineral estate lands. There are 138,211 individual allotted acres on the reservation.

The total tribal population is 7,473, of which approximately 4,212 Northern Cheyenne live on or near the reservation. The tribal headquarters are in the town of Lame Deer. The total work force of the tribe is approximately 2,437 and the unemployment rate is 71 percent according to the BIA Indian Labor Force Report 1999. The per capita income is estimated at $4,479.

Water Rights

The Northern Cheyenne Tribe has existing water rights held in trust by the U.S. The 1908 U.S. Supreme Court ruling in *Winters v. United States* (207 US 564) ruled that water rights needed to develop Indian reservations were reserved and this includes both groundwater and surface water rights. The Northern Cheyenne Tribe has developed draft water quality standards and is currently discussing an agreement with the State of Montana and the BLM regarding preservation. The draft water quality standards have not been submitted to the EPA for approval. The Northern Cheyenne have successfully negotiated a water rights compact with the State of Montana and owns a significant amount of water in the Tongue River Basin, including a principal portion of the Tongue River Reservoir.

Mineral Rights

The Indian Minerals Development Act (PL 97-382, 25 USC 2101) and the Federal Oil and Gas Royalty Management Act of 1982 (PL 97-451) provide that information about mineral development of Indian Trust lands are proprietary to the individual tribe and may not be disclosed without consent. The BIA Realty Office has stated that the Northern Cheyenne have mineral right assets totaling some 444,000 subsurface acres.

Air Quality

The Northern Cheyenne Reservation is classified as a PSD Class I area. Additionally, the community of Lame Deer, Montana, is classified as a moderate PM_{10} nonattainment area. Furthermore, the tribe maintains and operates three PSD monitoring sites on the reservation. Class I areas have the highest quality of air and allow for only a small degree of air quality deterioration.

Cultural Resources

The Northern Cheyenne Tribe considers cultural resources located within their reservation to be ITAs. At present, an unknown number of archaeological resources are on the reservation. Sites are known to exist on the reservation, but the information is reserved by the tribe. These sites can consist of burials, trails, rock features, lithic scatters, house pits/rings, rock-shelters, caves, bison kills, and petroglyphs.

Fort Belknap Community Council

The Fort Belknap Indian Reservation is positioned in north-central Montana near the Canadian border between the Milk River and the Little Rocky Mountains. The reservation is in Blaine and Phillips counties. The trust acreage of the reservation is roughly 618,228 acres (Madison

2001). The land is predominately rolling prairie with good grass and brush cover. There are 232,799 tribal-owned surface acres and an additional 385,429 individually allotted surface acres. The mineral rights include 54,351 tribal acres and 369,044 allotted acres.

The reservation houses two tribes that operate under one central government. The two tribes are the Gros Ventre and the Assiniboine. The combined enrollment of the two tribes is approximately 5,133. (Fort Belknap Indian Community 2001) The tribal headquarters are located at the Fort Belknap Agency, 3 miles southeast of Harlem, Montana, on U.S. Highway 2. The total labor force on the Fort Belknap Reservation is 721 and the per capita income is $4,536. The unemployment rate is 29.5 percent.

The tribes' economy is based on agriculture, which includes farming, ranching, and land leasing, including grazing permits. Crops include wheat, hay, and barley. The reservation's climate, as with most of north-central Montana, is subject to severe weather extremes, with hot, dry summers and harsh winters. Both fishing and hunting are popular, and trout, deer, antelope, and some migratory waterfowl are plentiful.

Water Rights

Fort Belknap is the site where the 1908 U.S. Supreme Court decision in *Winters v. United States* (207 US 564) was originally contested regarding Indian water rights. As noted previously, the waters are a federally reserved trust asset.

Mineral Rights

The BIA Realty Office has stated that the Assiniboine and Gros Ventre have mineral right assets totaling about 54,351 subsurface acres and another 369,044 allotted mineral acres.

Air Quality

The Fort Belknap Reservation is classified as a PSD Class II area.

Cultural Resources

The Assiniboine and Gros Ventre also consider cultural and prehistoric resources located within their reservation to be ITAs. At present, an unknown number of archaeological resources are on the reservation. Sites are known to exist on the reservation, but the tribe reserves the information. These sites can consist of burials, trails, rock features, lithic scatters, house pits/rings, rock-shelters, caves, bison kills, and petroglyphs.

The Turtle Mountain Public Domain Allotments

There are approximately 61,520 acres (Madison 2001) of federal trust lands allotted to the members of the North Dakota Turtle Mountain Tribe scattered throughout 2,000 square miles of Montana.

In 1906, the Burke Act provided that individual tribe members could receive allotments of reservation land. At that time, parcels of 160 acres each were allotted to individuals of the Turtle Mountain Tribe in Montana. These allotments, although not grouped as a reservation, are considered existing environmental lands within the planning area. These lands are Trust lands and will follow the same leasing and development procedures as for the reservations.

Lands and Realty

A variety of land uses exist throughout the planning area, including agricultural (crops and grazing); roads and highways; railroads; utility rights-of-way (ROW) for electrical power lines and telephone; communication sites; oil and gas production and pipelines; residential; commercial and light industrial uses; mining; municipalities; and recreation.

Table 3-11, *Land Ownership*, shows surface ownership in acres by county for federal, state, tribal, and private lands. It also shows that approximately 65 percent of the land is private land. The majority of the private land is agriculturally based (grazing and crops). The next largest ownership is federal lands at 20 percent. Federal lands include lands managed by the BLM, U.S. Forest Service (USFS), National Park Service, U.S. Bureau of Reclamation (USBR), and U.S. Fish and Wildlife Service (FWS). BLM and USFS lands are used for grazing, timber production, mineral production (except for the Custer National forest, which is excluded from surface coal mining by Section 522 of the SMCA of 1977), and year-round recreation activities; USBR lands are used for water storage and recreation; National Park Service lands are used for recreation; and FWS lands are used for wildlife refuges and human recreation.

Tribal lands comprise 10 percent of the land in the planning area. They are used for cattle production, mining, logging and lumber production, residential, and recreation on the Northern Cheyenne Reservation. The Crow Reservation's major land uses include agriculture, mining, and recreation (Madison 2001).

State lands comprise the least amount of land in the planning area at 5 percent. This land is used for grazing, mining, timber production, oil and gas production, state parks, and recreation activities. State lands are composed of school trust land administered by DNRC Trust Land Management Division, land owned by DNRC Water Resources Division, and land owned by other state agencies. Uses vary by agency. School trust land uses include agriculture, grazing, mineral exploration and mining, aggregate production, recreational activities, oil and gas exploration and production, timber production, and special uses, for example, wind turbines for energy production. School trust lands also have pipelines, power lines, telephone lines, roads and highways, home site leases, and cabin site leases, depending on the situation.

Roads and highways include interstate, United States, state, and off-system roads open to the public—county, local, and private roads open to public use. Table 3-12 lists the number of miles of each type within the planning area.

Railroad rights-of-way crisscross the counties in the planning area. Railroads in the planning area transport goods such as grains, intermodal containers, and coal. Table 3-13 indicates the approximate miles of railroad ROW within the planning area for each county, by railroad.

There are existing gas pipelines in all the counties being studied. Some existing roads, utilities, and gas lines could be used as part of the network for new CBM installations.

TABLE 3-11
LAND OWNERSHIP

		Federal					Managed by State			Managed by Tribal			
County	Total Acres	BLM	Forest Service	National Park Service	Bureau of Reclamation	U.S. Fish & Wildlife Service	Lands	Water	State Park	Federal Government Holdings	Tribal Land	Private	Unknown
Big Horn	3,208,115	61,617	12	762			97,483	16,535	3,733	1,996	1,565,898	1,459,556	523
Blaine	2,711,111	465,021		204		2,700	173,811	12,138		19	498,968	1,558,250	
Carbon	1,319,367	222,309	323,729		6		42,463	9,099	382		121	700,233	21,025
Carter	2,132,128	505,614	90,246				141,754	5,736	372			1,388,406	
Custer	1,556,352	188,226	46,332				89,787	3,245				1,228,762	
Gallatin	1,682,769	9,026	607,719	62,927			52,793	16,549	7,825			925,930	
Golden Valley	752,094	8,182	23,570			303	48,898	1,523				669,618	
Musselshell	1,196,032	102,932				13,586	75,742	3,642				1,000,130	
Park	1,799,785	13,459	752,830	93,555		1,113	33,172	6,587				899,069	
Powder River	2,109,880	258,817	340,424				141,034	560				1,369,045	
Rosebud	1,502,305	83,857	95,575				64,807	3,031			242,132	1,012,903	
Stillwater	1,154,243	5,986	191,973		12	3,800	45,600	11,531				895,341	
Sweetgrass	1,190,833	16,116	281,586				47,836	4,502	135			840,658	
Treasure	629,224	12,252	1,323				36,955	3,635			1,600	573,459	
Wheatland	913,079	1,415	65,397				74,379	3,446	1,329			767,113	
Yellowstone	1,693,991	86,924			1,487	284	80,042	9,034	41		134,010	1,382,169	
Total:	25,551,308	2,041,753	2,820,716	157,448	1,505	21,786	1,246,556	110,793	13,817	2,015	2,442,729	16,670,642	21,548

Data Sources: Land Ownership, Highways and Railroad ROW, Montana State Library/NRIS, Helena, Montana. Created from GIS intersection of 1:100,000 scale county boundaries with 1:100,000 scale Land Ownership, Highways and Railroad ROW.

TABLE 3-12
MILES OF ROAD/HIGHWAY

County	Interstate	US	State	Off-System
Big Horn	81.8	38.7	21.7	925.0
Blaine		54.5	39.3	1,359.0
Carbon		107.6	46.0	833.0
Carter		38.3	12.1	694.0
Custer	42.8	25.5	51.8	824.0
Gallatin	43.6	115.0	67.2	1,441.0
Golden Valley		29.2	12.4	483.0
Musselshell		99.5	1.6	554.0
Park	32.4	104.0	6.7	781.0
Powder River		64.6	55.1	718.0
Rosebud	41.9	26.2	51.3	1,052.0
Stillwater	38.1		23.0	858.0
Sweetgrass	37.1	31.8		516.0
Treasure	26.2			244.0
Wheatland		79.8		449.0
Yellowstone	95.2	29.8	41.7	1,826.0
Total	**439.1**	**844.4**	**430.0**	**13,557.0**

Data Sources: Land Ownership, Highways and Railroad ROW, Montana State Library/NRIS, Helena, Montana. Created from GIS intersection of 1:100,000 scale county boundaries with 1:100,000 scale Land Ownership, Highways and Railroad ROW.

TABLE 3-13
MILES OF RAILROAD ROW

	Railroad		
County	**BNSF[1]**	**Montana Rail Link**	**Tongue River Railroad (Proposed)**
Big Horn	119		19
Blaine	62		
Carbon	61		
Custer	32		44
Gallatin		72	
Golden Valley	70		
Musselshell Park		34	
Rosebud	39		64
Sweetgrass		32	
Treasure	36		
Yellowstone	32	50	
Totals	419	188	127 (proposed)

Data Sources: Land Ownership, Highways and Railroad ROW, Montana State Library/NRIS, Helena, Montana. Created from GIS intersection of 1:100,000 scale county boundaries with 1:100,000 scale Land Ownership, Highways and Railroad ROW.
[1]BNSF—Burlington, Northern, and Santa Fe Railroad.

Livestock Grazing

Most allotments involve only one permittee; however, there are several multi-permittee allotments. There are no other rights or control of public lands granted by issuance of a grazing permit. The length of grazing periods varies from seasonal to yearlong use. Most ranch operators using the allotments are cow-calf operations with sheep operations coming in second. Most allotments are predominantly private lands with scattered 40 to 80 acre tracts of federal lands. Occasionally a few larger blocks of 640 acres or more of federal lands are encountered. Most allotments have several range improvements such as fences, stock ponds, pipelines, springs, windmills, seedings, wells, and access roads for better control of livestock for management purposes (BLM 1992).

In the planning area, approximately 1,205 allotments cover 1.6 million acres of federal lands (Tribby 2001, Padden 2001, Haas 2001). These allotments are used to graze cattle, sheep, and horses. The main class of livestock using public lands is cattle (93 percent). Authorized livestock use on the grazing allotments totals about 288,000 animal unit months which include active-use, non-use, and exchange-of-use options (Tribby 2001, Padden 2001, Haas 2001). An animal unit month is the amount of forage necessary to support one cow and her calf, or five sheep, for one month.

The TLMD regulates the grazing rights for the trust land resources in the State. For the RMP areas and three additional counties, there is a total of 1,207,400 acres of classified grazing and forested lands, and 323,941 animal unit months. Grazing use of trust lands for the entire state includes approximately 8,500 agreements during the year 2000. The 4.3 million acres of classified grazing and forested lands have an estimated carrying capacity of 1,090,000 animal unit months (Chappell 2001).

Native Americans

There are eight federally recognized Indian tribal organizations in Montana. They are the Assiniboine and Sioux Tribes of Fort Peck (Sioux Division of Sisseton/Wahpetons, the Yantonias, the Teton Hunkpapa, and the Assiniboine bands of Canoe Paddler and Red Bottoms), the Blackfeet Tribe, the Metis, the Chippewa Cree Tribe, the Confederated Salish and Kootenai, the Crow Tribe of Montana, the Fort Belknap Indian Community (the Assiniboine and the Gros Ventre), and the Northern Cheyenne Tribe. A non-federally recognized tribe also resides in Montana: the Little Shell Band of Chippewas of Montana.

Tribal enrollment within these organizations is recorded as 61,203 individuals or nearly 6.6 percent of the states population. Within this population there is an average unemployment rate of 61 percent and a high level of poverty (BIA 1999).

The majority of these native people reside on seven Indian reservations throughout Montana. The reservations are the Crow, Northern Cheyenne, Fort Peck, Fort Belknap, Rocky Boys, Blackfeet, and the Flathead. Three reservations are within the planning areas of the State of Montana and the BLM: the Crow, Northern Cheyenne, and Fort Belknap. See Table 3-14 and Map 1-1 for the general location and boundaries of the reservations. Of particular interest are the Crow and Northern Cheyenne reservations that are located within the CBM emphasis area of the Powder River Basin.

Crow Reservation

The Crow Reservation is located in south-central Montana, and comprises nearly 2,296,000 acres. Access is via Interstate 90 or U.S. Highway 87. The reservation is bordered on the south by the State of Wyoming, on the east by the Northern Cheyenne Reservation, and on the northwest by the city of Billings, which is Montana's largest metropolitan area. The reservation encompasses the Little Big Horn Battlefield and approximately 3,600 square miles of rolling prairie and rugged foothills drained by the Bighorn River. The BIA Realty Office indicated that the tribe has some 455,719 surface acres and 405,888 acres of mineral rights. There are another 1,035,850 acres that have been individually allotted, and 824,427 acres of allotted mineral rights.

Mountains, residual uplands, and alluvial bottoms make up the topography of the Crow Reservation. The three principle mountain areas are the Wolf Mountains to the east and the Big Horn and Pryor Mountains to the south. Sloping downward to the north from the mountains are rolling upland plains. The plains constitute the bulk of the reservation and

TABLE 3-14
INDIAN TRUST ASSETS

Tribe	Acreage of Reservation	Trust Acres	Tribal Surface Acres	Individually Allotted Surface Acres	Tribal Mineral Acres	Individually Allotted Mineral Acres	Fee Acreage
The Northern Cheyenne	445,000	442,193	444,000	138,211	444,000	138,211	2,087
The Crow	2,296,000	1,491,569	455,719	1,035,850	405,888	824,427	804,431
Fort Belknap Community Council	623,000	618,228	232,799	385,429	54,351	369,044	4,772
Turtle Mountain Public Domain Allotments	N/A	61,520	N/A	61,520	N/A	61,520	N/A

Source: Madison 2001

vary in altitude from 3,000 to 4,500 feet. The alluvial bottomlands are located along the Big Horn River, Little Big Horn River, and Pryor Creek drainage systems.

Tribal Government

The United States signed treaties in 1825, 1851, and 1868 with the Crow Tribe. These legal documents define the tribes' relationship with the United States, recognized their rights as a sovereign government, and established reservation boundaries. The Treaty of 1851 established the Crow Reservation. The Tribal government has authority within the boundaries of the reservation for all rights-of-way, waterways, watercourses and streams, running through any part of the reservation.

The tribal government functions under a constitution ratified on June 24, 1948 by the tribal membership. Under this constitution, the Crow Tribe has a council form of government that is made up of all members of the Crow Tribe over 18 years old. One hundred or more adults comprise a quorum of the general council. The Council has the authority to represent, act and speak for the tribe and its members. The Council meets four times a year to debate tribal matters and pass motions. Headquarters are at Crow Agency, Montana, just south of Hardin, Montana. The daily operations of the tribal government are the responsibility of four elected administrators: the Chairman, Vice Chairman, Secretary and Vice Secretary. In addition, there are several committees that oversee and operate specific programs. Each committee derives it's authority from the Council through approval of a plan of operation. In the past there has been committees formed to address the technical aspects of energy development and its environmental effects.

Population and Employment

There are about 10,000 Crow tribal members, the majority of which live on the reservation (75 percent). The Crow language is spoken by more than 80 percent of the tribe. The total workforce is 3,902 with 1,531 members employed. Of the employed 582 (38 percent) are considered to be employed but below the poverty guidelines. The unemployment rate is 61 percent and the average per capita income is $4,243 (BIA 1999). Members of the tribe are employed in various occupations including ranching, farming, government services, coal mining, and tourism. The United States government is the largest single employer of Crow people. The BIA, with offices at Crow Agency, the Indian Health Service, and the National Park Service are the providers.

Economy

The tribe's economy is based on income from the reservations land that is used to directly support livestock operations. The tribe owns immense amounts of renewable and non-renewable resources on the reservation that include water, land, timber, sand and gravel, coal, oil and gas. These resources, largely under lease agreements, serve as the primary source of most of the tribal income. Less significant sources of income include timber, fisheries, and hunting. The tribe has discussed opportunities to create alternative sources of income from increased agriculture, expanded energy development, further tourism and recreation and commercial institutions. Agriculture remains the most important commercial activity on the reservation and with the quality of water and land available increased agricultural production would be complimentary.

Education

The reservation has eight elementary schools, three high schools and the Little Big Horn Community College. The three high schools are located in Lodge Grass, Pryor, and Hardin. From coal mining revenues, the schools at Hardin and Lodge Grass have become two of the wealthiest in the state. Public schools are also available in both Billings and Hardin. Approximately 70 percent of members have a high school diploma and over 6 percent have a Bachelor's Degree or higher.

Air Quality

The air quality and climate of the Crow Reservation is similar to that of the regions described earlier in Chapter 3. The Crow Reservation is classified as a PSD Class II area.

The reservation is located in a part of Montana that has a moderate climate relative to its latitude. Snow rarely accrues for long periods of time because of the warm Chinook winds, which originate from the mountains in the West. This portion of Montana is also known for its "Indian Summers" which frequently extend into November. The mean annual temperature is 45.5^{o}F with a summer high of 110°F and a winter low of -48°F. The bulk of the

reservation varies from 12 to 18 inches annual precipitation, depending on the elevation.

Culture and History

The Crow Tribe's native name is the Apsalooke, literally translated, "children of the large beaked bird." Early explorers mistook the signing for Apsalooke, the flapping of one's hands like the wings of a bird in flight, and called them the Crow. The Crow people are generally recognized as a matrilateral society, meaning they lived with the wife's relatives. The tribes' structure was based on the clan system with marriage between clans. The clans of the Crow Tribe are the Acirari o (new lodges), Acitsi te (thick lodge), Aci oce (sore lip lodge), U watace (greasy mouths), U sawats ia (without shooting they bring game), Xu xkaraxtse (tied in a knot), Acpe nuce (filth eaters), E rarapio (kicked in the bellies), Ackya pkawia (bad war honors), Birikyo oce (whistling water), Acxatse (streaked lodge), and the Ackya mne (piegan lodge).

The Crow people were originally part of the Hidatsa. It is believed they came from eastern Kansas in a series of migrations in the 17th century. It is probable that the Mountain Crow made the first westward migration and the River Crow followed them much later. The Crows first moved to the area west of the Black Hills but were pushed further west by the Cheyenne and Sioux. The Mountain Crows settled in the upper reaches of the Yellowstone in what is now southern Montana and northern Wyoming. The River Crow continued to make a yearly visit to the Hidatsa and Mandan villages on the Missouri while the Mountain Crow traded across the Rockies with the Flatheads and Nez Perce. This trade route enabled them to became important middlemen in the regional transfer of goods amid east and west and resulted in the Crow becoming rich in horses.

Powerful enemies surrounded the relatively small tribe: the Lakota in the West and the Northern Cheyenne/Arapaho in the Southwest, the Blackfeet/ Gros Ventre in the North, and the Assiniboine in the northeast. These powerful tribes constantly warred on the Crow creating a struggle that honed their skills and produced confident and strong warriors. The first westerners to encounter the Crow reported a hospitable environment and one in which fur traders often wintered over in their camps. As the fur trade grew, many Crow bands found opportunities to trade for other western supplies and technology.

As the 19th century progressed, western migration pushed other tribes further West, creating conflicts between the Crow and the Sioux/Cheyenne alliance. During the Powder River War, the Crow were invited to join the Sioux, Cheyenne, and Arapaho but due to their earlier trading alliance with the white-man they remained loyal to the American Army and sent back the Sioux pipe. As the war progressed, the Crow fought with merit and honor alongside the U.S. Army at the Rosebud and supplied scouts for the Little Big Horn campaign. A Crow scout named Curly brought the news of Custer's defeat to the U.S. Army command headquarters on the Yellowstone (Free Indian News Web Page 2001).

Today the Reservation encompasses a portion of the original hunting grounds in southern Montana. Within this area there are many revered sites, hunting camps, vision quest locations and other sites of religious significance. Many similar sites are also located off the reservation and are discussed in general in the Cultural Resources section.

Geology and Minerals

The reservation contains a varied geology, as does the State of Montana (see earlier Geology and Minerals description). Of particular interest to this EIS are the deposits of sub-bituminous coal within the reservation. The known coal occurrences in the Powder River Basin are generally located in the Paleocene Fort Union Formation. The coals on the reservation are known to be on the eastside, beneath a 12 to 15 mile wide swathe extending from the Wyoming border to the northern border of the reservation. These deposits have been estimated to contain 17.1 billion tons of coal of which 16.1 billion tons may be prospective for CBM development. These coals may be as thick as 100 feet in places (Admin Report BIA-7, 1975). Geology and stratigraphy of the planning area are discussed at length in the *Minerals Appendix*.

The Absaloka coal mine produces coal from a strip of land the Crow Tribe ceded in 1904 to the United States for settlement by non-Indians. The United States holds rights to minerals underlying the ceded strip in trust for the tribe. In 1972, with the approval of the Department of the Interior and pursuant to the Indian Mineral Leasing Act of 1938, Westmoreland Resources, Inc., a non-Indian company, entered into a mining lease with the tribe for coal underlying the ceded strip (Supreme Court, May 1998). Today the Absaloka mine annually

produces an average of 5,500,000 short tons of coal from its 5,400 acre permitted facility.

The reservation also includes the Soap Creek, Lodge Grass, Gray Blanket, and Ash Creek oil and gas fields. There have been 172 conventional wells drilled to date on the reservation. Production occurs from the Shannon, Tensleep, Amsden and Madison formations within the reservation.

Protecting the Indian lessors from loss of royalty as a result of conventional oil and gas drainage is a prime responsibility of the BLM. Under the terms of both federal and Indian leases, the lessee has the obligation to protect the leased land from drainage by drilling and producing any well(s) that are necessary to protect the lease from drainage, or in lieu thereof and with the consent of the authorized officer, by paying compensatory royalty. Drainage analysis, on the basis of a production screen or other criteria, is required by BLM document H-3160-2, Drainage Protection Guidelines Instruction Memorandum. Under this memorandum, federal or Indian mineral interests determined to be in danger of drainage will be subject to geologic, engineering, and economic analyses in order to define the presence and magnitude of resource drainage.

Hydrology

Hydrological resources on the reservation consists of surface water flow from several rivers and their associated tributaries, and the production of groundwater from a variety of geological formations. A detailed explanation of the regional hydrology including that of the reservations' is included in an earlier section of this chapter under *Hydrology*.

According to the 1996 303d list, several watersheds and impaired waterbodies are adjacent to the Crow Reservation. These include the Rosebud watershed which crosses a part of the Crow Reservation; The Lower Bighorn watershed includes a large part of the Crow Reservation, which contacts both impaired portions of the Bighorn River; and the Little Bighorn watershed that includes a large part of the Crow Reservation but no waterbodies are determined to be impaired on the 1996 303d list.

The groundwater resources for the reservation are similar to those described for the Powder River Basin in the previous hydrology section of this chapter.

Land Use and Realty

The Crow Reservation comprises approximately 9 percent of the land in the planning area. The Crow Reservation's major land uses include agriculture, mining, and recreation (Madison 2001). The Crow maintain almost 1.2 million acres of leased grazing lands, 150,000 acres leased dry-farming land, and the nearly 30,000 acres leased irrigated farming land. Most lands are leased to large non-Indian interests by Allottees (U.S. Department of Commerce 1996).

The principal communities located on the Crow Reservation are as follows:

- Crow Agency—The Crow Tribal Government administration, the BIA, and the Crow Hospital are located in the town of Crow Agency. There are approximately 3,245 Indian people residing in Crow Agency. A 16-bed hospital is located in Hardin, Montana, approximately 12 miles from Crow Agency. Two larger hospitals (250+ bed facilities) are located in Billings, Montana 65 miles from Crow Agency. Billings is recognized as the major medical referral center for east-central Montana and northern Wyoming.
- Lodge Grass—The Lodge Grass is located approximately 22 miles south of Crow Agency and houses the Lodge Grass Health Center. Approximately 2,125 Indian people live in Lodge Grass.
- Pryor—The Pryor Health Station is located here, approximately 69 miles northwest of Crow Agency. The Indian population of Pryor is estimated at 1,018.
- Wyola—This community is located approximately 13 miles from Lodge Grass and approximately 35 miles from Crow Agency. There are nearly 450 Indian people residing in Wyola.

Recreation

The Crow Indian Reservation is a large contiguous tract of land that provides dispersed outdoor recreation for tribal members. This includes hunting, fishing, picnicking, camping, hiking, horseback riding, snowmobiling, and off-road vehicle use. Yellowtail Dam at Big Horn Canyon provides some of the finest fishing, water sports and camping in the state of Montana. Non-tribal members are not allowed to hunt on the

Reservation except for spouses of tribal members. Crow Agency recreational facilities are provided at three city parks, the school gymnasium, at playground areas, and at the Crow Tribal Fairgrounds. Within the town of Lodge Grass on the Reservation, there is a city park with landscaped open space and picnic facilities. Outdoor sports and playground equipment are available on the school grounds in Lodge Grass.

The Crow Tribe hosts one of the largest powwows held in the United States, The Crow Fair, it takes place at the Crow Agency every August. There is spirited competition dancing, drumming and singing, as well as food and craft concessions. Crow Agency is also near the Battle of the Little Big Horn National Monument a popular tourist site. Once each year the tribe does a brilliant re-enactment of the battle.

Soils

Soils in the reservation, just like soils in the rest of the RMP area, are derived mainly from sedimentary bedrock and alluvium. The soils generally range from loams to clays, but are principally loams to silty clay loams. For more information on soil types, see the Soils Appendix.

Vegetation

The same types of vegetative communities as described in this chapter are anticipated to be found on the reservation. It is understood that the Crow Tribe considers certain plants to be sacred for their therapeutic and/or traditional values.

Wildlife

The reservation environment supports a variety of wildlife including large game animals, small mammals migratory birds, raptors, waterfowl, amphibians, and reptiles. The aquatic resources are just as diverse including some 32 different fish species. See Chapter 3 discussion for details regarding species and habitat.

Northern Cheyenne Reservation

The Northern Cheyenne Indian Reservation occupies about 445,000 acres in eastern Big Horn and southern Rosebud Counties, Montana. U.S. Highway 212 provides access. The reservation covers nearly 695 square miles and is bordered on the east by the Tongue River and on the west by the Crow Reservation. According to the BIA Realty Office, the tribe has 442,193 trust acres and 444,000 of surface and mineral estate lands. There are 138,211 individual allotted acres on the reservation.

President Arthur issued an Executive Order establishing the reservation in November of 1884 with a land trust of about 271,000 acres. In 1900, President McKinley issued a second Executive Order on behalf of the Northern Cheyenne that shifted the eastern boundary to the Tongue River, expanding the reservation to its current size. The topography deviates from low, grass-covered hills to high, steep outcroppings and narrow valleys. Elevations range from approximately 3,000 to 5,000 feet.

Tribal Government

The tribe ratified a constitution and bylaws in 1936 according to Indian Reorganization Act rules. The constitution was amended in 1960 and is the document on which the Tribal Council structure is based. The tribe elects the Tribal Council, which serves as the governing body. The Tribal Council consisting of the president and 24 council members elected in the proportion of one member per 200 tribal members. The president serves a 4-year term while the council members are elected every 2 years (on a staggered basis) from five separate districts. The tribal administrative headquarters are housed in Lame Deer.

Population and Employment

The tribal enrollment is approximately 7,500 with nearly 56 percent (4,210) Northern Cheyenne living on or near the reservation. The labor force of the reservation is estimated at 2,435 with 718 members employed. Of the employed 190 (26 percent) are considered to be employed but below the poverty guidelines (BIA 1999). The unemployment rate is 71 percent and the average per capita income is $4,479. Members of the tribe are employed in various occupations including ranching, farming, government services, construction, small businesses and light manufacturing. The tribe employs a total of about 300 of its members in various capacities, including social services, health care, forestry, and casino operations.

Economy

The current economy is primarily based on livestock; individual tribal members own an

estimated 12 to 15 thousand head of cattle, which are presently worth about $12 million on the open market. The tribe has approximately 27,000 acres of reservation lands presently under cultivation, the vast majority of which is dryland farming. This primarily entails hay, wheat, barley, and small grains. Annual revenues generated by farming are estimated at about $2.5 million (U.S. Department of Commerce 1996).

In addition to this agricultural based income the tribe has developed several secondary routes of income including construction, timber sales, small business, light manufacturing and casino gaming.

There are several skilled construction contractors and subcontractors amongst the tribe, one of which is reported to have a contract for construction of the new Community Center (the old one having burned down in 1989). Additionally, new tribal housing units are planned; tribally based contractors are bidding for this project. In general, the construction industry generates sizable employment and revenues for the tribe.

One third of the reservation or approximately 147,000 acres is composed of forested land, the majority of which is comprised of Ponderosa Pine forests. The commercially available portion of the these forested lands is estimated at 70 percent. The Northern Cheyenne Pine Company is the lead forest product company using reservation timber resources.

There are currently 44 small businesses on the reservation, the majority Indian-owned. These businesses include laundromats, restaurants, gas stations, grocery stores, construction contractors, drilling companies, a lumber mill, a clothing designer, and Indian arts and crafts outlets. The reservation also hosts several light manufacturing facilities, including the Northern Cheyenne Industries, which produce teepees and other traditional articles, and the Cheyano Designs, which manufactures designer clothing.

Recently the tribe opened the Northern Cheyenne Bingo facility, a moderate-sized casino operation, offering bingo, pull tabs, and video poker. Although new, it generates nearly $11,000 a week in revenues and employs a number of tribal members.

Education

Public schools are available for pre-school grades, and K-12 in Lame Deer. Ashland houses the St. Labre Indian High School or students may decide to attend public high school in Colstrip, Montana. In Colstrip are three public elementary schools, a middle school and a transportation system, which serves all grade levels. For college, students may choose to attend the Dull Knife Community College in Lame Deer. The institution offers several associate degrees and certified programs. Dull Knife Community College also offers courses on the Cheyenne language. Approximately 62 percent of the tribal members have a high school diploma and 5.6 percent have a Bachelor's Degree or higher.

Air Quality

The air quality and climate of the Northern Cheyenne Reservation is similar to that of the regions described earlier in Chapter 3. The Northern Cheyenne Reservation is classified as a PSD Class I area. Additionally, the community of Lame Deer, Montana, is classified as a moderate PM-10 nonattainment area. Furthermore, the tribe maintains and operates three Prevention of Significant Deterioration monitoring sites on the reservation. Class I areas allow for only a small degree of air quality deterioration.

The reservation is located in a part of Montana that has a moderate climate relative to its latitude. Snow rarely accrues for long periods of time because of the warm Chinook winds, which originate from the mountains in the West. This portion of Montana is also known for its "Indian Summers" which frequently extend into November. The mean annual temperature is 45.5^{o}F with a summer high of 110°F and a winter low of -48°F. The bulk of the reservation varies from 12 to 18 inches annual precipitation, depending on the elevation.

Culture and History

Cheyenne descend from the Algonquian language family. It is believed that they originated from the upper Great Lakes region, south of Hudson Bay and James Bay. During the 15th century, there was a southerly migration toward what is now northern Minnesota. This migration gave rise to a shift away from reliance on fishing and toward the practice of farming. At about the time of the first Thanksgiving, the Cheyenne (along with other Plains Indians) started moving into what is now the Dakotas. About halfway through the 18th century, the Cheyenne acquired and mastered the art of horsemanship; this provoked another extraordinary

cultural shift from farming to the sole reliance on buffalo.

The first treaty the Cheyenne participated in was in 1825 near present-day Ft. Pierre, South Dakota (the Friendship Treaty). About a decade later, the tribe separated into two groups with a large segment of the tribe moving southward and settling along the Arkansas River in Colorado. The remaining members continued to roam the plains in the region of the North Platte and Yellowstone Rivers. These bands of free roaming Cheyenne eventually formed the Northern Cheyenne and joined forces in 1876 with the Sioux in the Sitting Bull War and the Battle of Little Big Horn. Although they won the battle, the Northern Cheyenne were finally subdued and taken as prisoners of war to Ft. Reno, Oklahoma, where the Southern Cheyenne and Arapaho joined them in captivity.

A band of Northern Cheyenne lead by Dull Knife fled Oklahoma and headed for their homelands in Montana. The dangerous escape attempt resulted in fewer than 100 of the group reaching the north. After several years of wandering the north the tribe was placed on what is more or less the site of their current reservation.

Two years after the issuing of the 1934 Indian Reorganization Act, the Northern Cheyenne structured themselves into a council form of government and sought sovereign recognition. The council administered the reservation through the Second World War but found a constitution amendment necessary in 1960. In the late 1960s, development of the tribe's coal reserves had become a major issue. In 1972, an off-reservation company made a proposal to the tribe that would have placed over 70 percent of the reservation in the hands of outside energy companies. This prompted a ground swell in activism by tribal members to reassert the tribe's political, economic, and environmental sovereignty. Arguing against the BIA and a few tribal leaders, the activists prevailed when in 1978 Congress intervened and canceled the disputed coal leases. Since that time, the Northern Cheyenne have overseen their energy development with a cautious demeanor toward economic development while preserving their cultural integrity and land.

Geology and Minerals

The reservation contains a varied geology, as does the State of Montana (see earlier Geology and Minerals description). Of particular interest to this EIS are the deposits of sub-bituminous coal within the Reservation. The known coal occurrences in the Powder River Basin are generally located in the Paleocene Fort Union Formation. The coals on the reservation are known to be beneath the entire reservation and are estimated to contain 23 billion tons of coal of which 16.3 billion tons may be prospective for CBM development (Admin Report BIA-3, 1975). Geology and stratigraphy of the planning area are discussed at length in the Geology and Minerals Appendix.

The reservation does not have any known oil or gas fields. Twenty conventional wells have been drilled to date. Additionally, Atlantic Richfield (ARCO) has explored for oil and gas reserves on tribal lands, this data has not been released to state or federal agencies.

Protecting the Indian lessors from loss of royalty as a result of conventional oil and gas drainage is a prime responsibility of the BLM. Under the terms of both federal and Indian leases, the lessee has the obligation to protect the leased land from drainage by drilling and producing any well(s) that is necessary to protect the lease from drainage, or in lieu thereof and with the consent of the authorized officer, by paying compensatory royalty. Drainage analysis, on the basis of a production screen or other criteria, is required by BLM document H-3160-2, Drainage Protection Guidelines Instruction Memorandum. Under this memorandum, federal or Indian mineral interests determined to be in danger of drainage will be subject to geologic, engineering, and economic analyses in order to define the presence and magnitude of resource drainage.

Hydrology

Hydrological resources on the reservation consist of surface water flow from several rivers and their associated tributaries, and the production of groundwater from a variety of geological formations. A detailed explanation of the regional hydrology including that of the reservations' is included in an earlier section of this chapter under *Hydrology*.

According to the 1996 State of Montana 303d, list several watersheds and impaired waterbodies are adjacent to the Northern Cheyenne Reservation. The probable cause of the impairment is nutrients and the probable source is dam construction and hydro-modification. The Lower Tongue Watershed intersects with the Northern Cheyenne Reservation, which extends up to the Tongue River itself although the Reservation does not touch the

impaired Tongue River segment. The Rosebud watershed includes most of the Northern Cheyenne Reservation and a part of the Crow Reservation; the Northern Cheyenne Reservation contacts the impaired portion of the Rosebud Creek.

The groundwater resources for the Reservation are similar to those described for the Powder River Basin in the previous hydrology section of this chapter.

Land Use and Realty

The Northern Cheyenne Reservation comprises approximately 2 percent of the land in the planning area. The Northern Cheyenne lands are used for cattle production, mining, logging and lumber production, residential, and recreation (Madison 2001). About 27,000 acres of reservation lands are presently under cultivation; the vast majority of this is dry-land farming, an additional 105,000 acres is composed of forested land that is considered commercially harvestable (U.S. Dept. of Commerce 1996).

The principal communities located on the Northern Cheyenne Reservation are as follows:

- Lame Deer—Lame Deer is located in Rosebud County approximately 21 miles West of Ashland between Busby and Custer National Forest along Highway 212/39. Lame Deer is the tribal headquarters and home of the Northern Cheyenne Powwow. There are approximately 1,925 Indian people residing in Lame Deer.
- Ashland—Ashland is located in Rosebud County 70 miles South of Miles City between Birney and Brandenburg along Highway 212 on the banks of the Tongue River near the Custer National Forest. Approximately 500 Indian people live in Ashland.

Recreation

The Northern Cheyenne Indian Reservation provides dispersed outdoor recreation including hunting, fishing, hiking, horseback riding, and plant and berry gathering. Hunting by non-members is not permitted. Lame Deer has the tribal gymnasium, two baseball diamonds, and a hand game building. Developed recreation sites include Crazy Head Springs and Lost Leg Lake (fishing, camping, picnicking); Green Leaf, Red Nose, Parker, and LaFerre ponds (fishing); and Morning Star Lookout. Undeveloped sites include Buffalo Jump and Badger Peak.

Camping facilities exist at the Northern Cheyenne Craft Center in Lame Deer and at the Morning Star View Campgrounds. Tribal elk and buffalo herds are pastured near Lame Deer Ice Well Campgrounds. A museum/curio shop is under development; this will serve, in part, as an outlet for the work of numerous tribal artists and craftspeople. The tribe holds a 4th of July powwow each year, which is widely attended. Finally, many visitors on their way to Glacier and Yellowstone parks, the Little Big Horn Battlefield, and other regional attractions find it convenient to stop by the reservation.

Soils

Soils in the reservation, just like soils in the rest of the RMP area, are derived mainly from sedimentary bedrock and alluvium. The soils generally range from loams to clays, but are principally loams to silty clay loams. For more information on soil types, see the Soils Appendix.

Vegetation

The same types of vegetative communities as described in this chapter are anticipated to be found on the reservation. It is understood that the Northern Cheyenne Tribe considers certain plants to be sacred for their medicinal or traditional values.

Wildlife

The reservation environment supports a variety of wildlife including large game animals, small mammals migratory birds, raptors, waterfowl, amphibians, and reptiles. The aquatic resources are just as diverse including some 32 different fish species. See Chapter 3 discussion for details regarding species and habitat.

Paleontological Resources

Paleontologic resources consist of fossil-bearing rock formations containing information that can be interpreted to provide a further understanding about Montana's past. Fossil-bearing rock units underlie the entire planning area. While fossils are relatively rare in most rock layers, there are seven geologic rock units within the planning area that do contain significant fossil material. Rock units that are known to contain fossils are the Tullock and Ludlow Members of the Fort Union Formation, the Judith River, Hell Creek, Morrison, and Cloverly Formations, the Lakota Sandstone Formation, and the White River Group. Figure 3-1 is a stratigraphic section showing the age and relative position of each of these fossil-bearing units.

The Morrison, Hell Creek, Cloverly, and Lakota Sandstone formations are noted for the occurrence of dinosaur fossils. The Bridger Fossil ACEC, a 575-acre site located in Carbon county within the Billings RMP area, contains outcrops of both the Cretaceous Period Cloverly Formation and the Jurassic Period Morrison Formation. Outcrops of the Morrison Formation within the Bridger Fossil area have yielded the fossil remains of numerous juvenile and subadult sauropods. The Bridger Fossil Area is one of two listed National Natural Landmarks within the Billings RMP area, the other is the Cloverly Formation site in Bighorn County (Federal Register 48(41):8693, 1983). There are other areas within the EIS study areas that have been nominated for National Natural Landmarks for paleontological resources.

The Judith River Formation preserves the fossil record from ancient environments including shallow oceans, deltas, rivers, freshwater swamps, and lakes. The Judith River Formation contains the fossil remains of plants as well as many animal species including mollusks, fish, amphibians, lizards, small mammals, dinosaurs, and other reptiles.

The Cretaceous Period Hell Creek Formation preserves the fossil record of a subtropical to tropical environment that was characterized by low plains interrupted by broad swampy bottoms and deltaic areas. Fossil remains from the Hell Creek Formation include a wide variety of plants, mollusks, fish, amphibians, reptiles, birds, small mammals, and dinosaurs. Fossil dinosaur remains include *Triceratops, Anatosaurus,* and *Tyrannosaurus*. The fossil record of plant and animal communities found within the Hell Creek Formation varies between low moist areas and the drier, upland plains environments that were present in the past. The Castle Butte ACEC, located in Yellowstone County within the Billings RMP area, contains outcrops of the Hell Creek Formation, which are noted for their paleontologic resources.

The contact between the Cretaceous Period Hell Creek Formation and the Paleocene Tullock/ Ludlow Member of the Fort Union Formation marks an important event in time. This contact represents a time of worldwide extinction for many animals, most notably the dinosaurs, and the beginning of the rapid evolution of mammals. The fossil record from the Fort Union Formation contains evidence of ancient environments that include streamside swamps, bottomlands, and well-established river courses. Fill within ancient river channels contains fossils of fresh water clams and snails. The Tullock/Ludlow Member is the primary fossil bearing unit of the Fort Union Formation and contains fossils of turtles, fish, reptiles, and mammals.

The Tertiary Period White River Group is considered an important source of fossil mammals. Although the White River Group outcrops in the planning areas, the majority of the fossil bearing areas are in the Dakotas.

Recreation

Montana's natural features, coupled with the large amount of state and federal lands, offer residents and vacationers a variety of year-round recreational opportunities. Montana has thousands of miles of streams, hundreds of lakes, reservoirs, mountainous areas, rolling hills, and grassland prairies—many of which are available for recreational purposes.

The planning area, which includes the Billings and Powder River RMP areas and the counties of Blaine, Gallatin, and Park, are replete with recreational opportunities that vary with seasonal changes. Spring and summer provide opportunities for fishing, hiking, photography, wildlife viewing, spring turkey hunting, water sports (powered and non-powered), off-road vehicle activities, camping, picnicking, touring (vehicle and bicycle), and caving. Early to late fall is hunting season. Winter brings the winter sports of skiing, snowshoeing, and snowmobiling. The planning area provides vast areas for people to enjoy.

Federal

There are three national forests in the planning area: Custer, Gallatin, and Lewis and Clark. These forests provide a variety of year-long, outdoor recreation. The Absaroka Beartooth Wilderness and the Lee Metcalf Wilderness (Spanish Peak Unit) in the Gallatin National Forest provide unique wilderness opportunities for hiking, horseback riding, camping, fishing, hunting, wildlife viewing, and photography. The Bridger Mountains National Recreational Trail (also in the Gallatin Forest), the Lewis and Clark Historic Trail, and the Nez Perce National Historic Trail provide opportunities for hiking, photography, wildlife viewing, and historic touring.

The Upper Missouri National Wild and Scenic River (North Side–Blaine County) provides fishing, hiking, non-powered water sports, camping, picnicking, wildlife viewing, and photography opportunities.

The Bighorn Canyon National Recreation Area is a popular area for camping, fishing, boating, hiking, wildlife viewing, and photography. West of and adjacent to the Bighorn Canyon National Recreation Area is the Pryor Mountain Wild Horse Range where off-road vehicles are not allowed, and skiing, caving, hiking, and wildlife viewing occur.

The BLM has land holdings throughout the state. The majority of this land is not contiguous; it is fragmented and many times isolated by private holdings. Most of this land is managed for multiple use. Recreational opportunities include hiking, horseback riding, off-road vehicle travel, fishing, hunting, wildlife viewing, camping, picnicking, caving, skiing, and showshoeing. The off-road vehicle plan is currently under protest. If approved, off-road vehicle use would be limited. Included in this land is the Pryor Mountain Wild Horse Range and the Pompey's Pillar National Monument.

There are nine National Wildlife Refuges in the planning area—two in Blaine County, one in Golden Valley County, four in Musselshell County, and two in Stillwater County. They provide opportunities for wildlife viewing, hiking, and photography.

According to 33 CFR Part 329, navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity. A determination whether a waterbody in the project area is a navigable water of the United States is made by the U.S. Army Corps of Engineers Omaha District's Division Engineer, and is based on a report of findings prepared at the district level in accordance with the criteria set out in regulations. Tabulated lists of final determinations of navigability are maintained in the District office, and are updated as necessitated by court decisions, jurisdictional inquiries, or other changed conditions.

State

There are 12 state parks within the emphasis area that offer outdoor activities, Native American history and geological sites, wildlife preserves, water sports, photography, hiking, camping, and fishing. These parks are Chief Plenty Coups, Cooney Reservoir, Greycliff Prairie Dog Town, Lake Elmo, Madison Buffalo Jump, Medicine Rocks, Missouri Headwaters, Natural Bridge, Pictograph Cave, Rosebud Battlefield, and Tongue River Reservoir.

In addition, state-owned lands checkerboard the planning areas. Much of this land is surrounded by private or federal land. Recreational opportunities

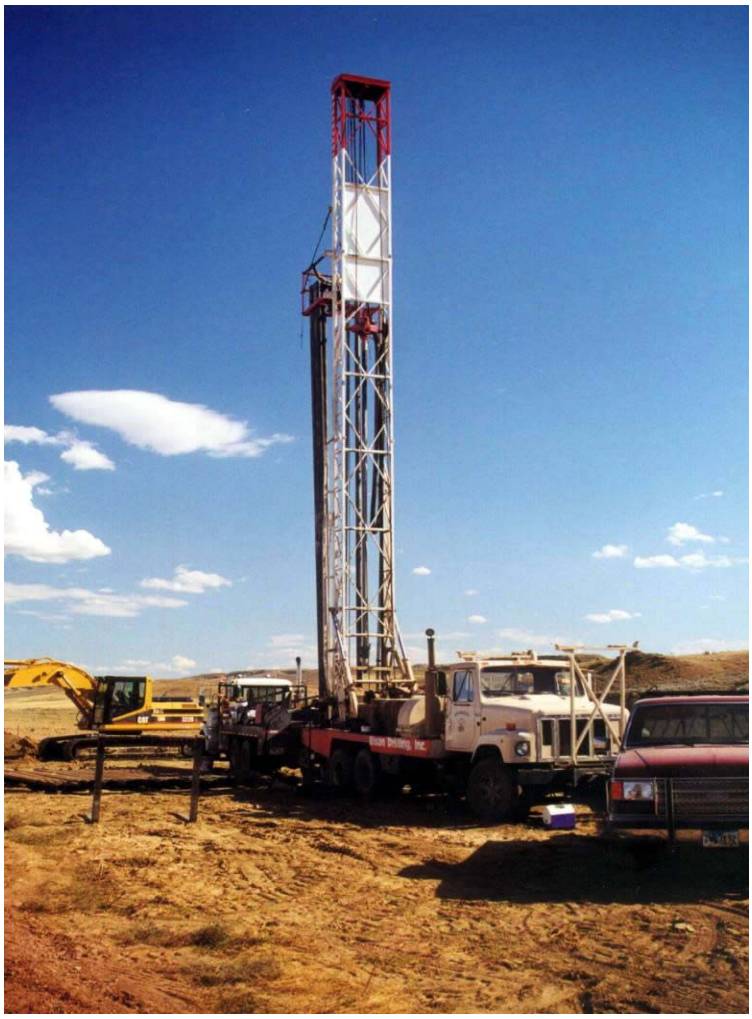
include hunting, fishing, wildlife viewing, hiking, snowmobiling, and skiing. Navigable waterways and islands owned by the state also provide additional recreational opportunities.

Local/City Recreation

The larger municipalities of Billings, Bozeman, Laurel, Miles City, Livingston, and Three Forks offer museums, parks, baseball fields, rodeo grounds/fairgrounds, walking/hiking/bike trails, water sports, and other opportunities. The other municipalities in the planning area offer a city park, outdoor sports activities at the schools, and, depending on the municipality, possibly a museum or rodeo grounds.

Private Lands

In addition to public lands, recreational opportunities also exist on privately owned lands, including private campgrounds, resorts, and dude ranches. Activities such as hunting and back-country trips also may be permitted on privately owned land with landowner consent. Recreational opportunities also arise on private lands as a result of MFWP actions, such as hunting opportunities through the block management program and conservation easements.



Typical rig used to drill a CBM well.

Socio-Economics

Demographics

Population data for Montana and the 16-county CBM emphasis area is presented in Table 3-15. Between 1990 and 2000, the population in Montana increased at an average annual rate of 1.2 percent to 902,195 persons. The 16-county planning area grew at a slightly greater rate of 1.5 percent over the same period. Three counties—Gallatin, Stillwater, and Carbon—grew faster than the average for the planning area, with average annual rates of 3.0 percent, 2.3 percent and 1.7 percent, respectively. Four counties—Carter, Powder River, Rosebud, and Treasure—had negative growth rates and lost population.

The forecasted population for the year 2020 is also shown in Table 3-15. For both the state and the CBM emphasis area, the forecasts show faster growth over the next 20 years compared to the last

TABLE 3-15
HISTORICAL POPULATION AND POPULATION FORECASTS

	1990 (Census)	2000 (Census)	Percent Annual Average Growth 1990-2000	2020 (Forecast)	Percent Average Annual Growth 2000-2020
Big Horn County	11,337	12,671	1.1%	14,880	1.6%
Blaine County	6,728	7,009	0.4%	7,310	0.4%
Carbon County	8,080	9,552	1.7%	11,390	1.8%
Carter County	1,503	1,360	-1.0%	1,470	0.8%
Custer County	11,697	11,696	0.0%	13,060	1.1%
Gallatin County	50,463	67,831	3.0%	82,460	2.0%
Golden Valley County	912	1,042	1.3%	1,180	1.3%
Musselshell County	4,106	4,497	0.9%	5,390	1.8%
Park County	14,484	15,694	0.8%	20,170	2.5%
Powder River County	2,090	1,858	-1.2%	1,770	-0.5%
Rosebud County	10,505	9,383	-1.1%	13,720	3.9%
Stillwater County	6,536	8,195	2.3%	10,590	2.6%
Sweetgrass County	3,154	3,609	1.4%	3,870	0.7%
Treasure County	874	861	-0.1%	800	-0.7%
Wheatland County	2,246	2,259	0.1%	2,330	0.3%
Yellowstone County	113,419	129,352	1.3%	158,310	2.0%
Total Emphasis Area	**248,134**	**286,869**	**1.5%**	**348,700**	**2.0%**
State of Montana	**799,065**	**902,195**	**1.2%**	**1,082,260**	**1.8%**

Source: Montana Department of Commerce, Census and Economic Information Center. Projections by NPA Data Services, Inc.

10 years. State population is forecast to grow by 1.8 percent and the planning area is forecast to grow by 2.0 percent. Four counties—Gallatin, Park, Rosebud, and Stillwater—are projected to grow at equal or greater rates than the average for the emphasis area, with rates of 2.0 percent, 2.5 percent, 3.9 percent and 2.6 percent, respectively. Population in Treasure County is forecast to fall, with a rate of –0.7 percent. However, personal communication with the Montana Department of Labor and Industry indicates that the projected population of 13,720 for Rosebud County in the year 2020 is an overestimate and that a more likely future population is 12,200 or 12,500 (Montana Department of Labor and Industry 2001b). These numbers correspond to annual growth rates of 1.3 percent and 1.4 percent, respectively, which are more consistent with the average for the emphasis area and the state.

Data on race and ethnicity from the 2000 U.S. Census are shown in Table 3-16. The data indicate that the Montana population is 90.6 percent white, similar to the 16-county planning area, which is 90.1 percent white. Statewide and in the planning area, Native Americans make up the largest non-white group, totaling 6.2 percent and 6.6 percent, respectively. Persons identified as Hispanic or Latino (of any race) comprise 2.0 percent of the State population and 2.6 percent of the 16-county area population.

TABLE 3-16
RACE/ETHNICITY AS PERCENT OF TOTAL POPULATION

Geographic Area	Total Population	Percent White	Percent Black or African American	Percent American Indian and Alaska Native	Percent Asian	Percent Native Hawaiian and Other Pacific Islander	Percent Some Other Race	Two or More Races	Percent Hispanic or Latino (of any race)[i]
Big Horn County	12,671	36.6%	0.0%	59.7%	0.2%	0.0%	0.7%	2.8%	3.7%
Blaine County	7,009	52.6%	0.2%	45.4%	0.1%	0.0%	0.2%	1.5%	1.0%
Carbon County	9,552	97.1%	0.3%	0.7%	0.4%	0.0%	0.6%	1.0%	1.8%
Carter County	1,360	98.6%	0.1%	0.4%	0.1%	0.0%	0.3%	0.5%	0.6%
Custer County	11,696	97.0%	0.1%	1.3%	0.3%	0.1%	0.3%	1.0%	1.5%
Gallatin County	67,831	96.2%	0.2%	0.9%	0.9%	0.1%	0.5%	1.2%	1.5%
Golden Valley County	1,042	99.1%	0.0%	0.6%	0.1%	0.0%	0.0%	0.2%	1.2%
Musselshell County	4,497	96.9%	0.1%	1.3%	0.2%	0.0%	0.4%	1.2%	1.6%
Park County	15,694	96.6%	0.4%	0.9%	0.4%	0.0%	0.5%	1.2%	1.8%
Powder River County	1,858	97.4%	0.0%	1.8%	0.1%	0.0%	0.2%	0.5%	0.6%

TABLE 3-16
RACE/ETHNICITY AS PERCENT OF TOTAL POPULATION

Geographic Area	Total Population	Percent White	Percent Black or African American	Percent American Indian and Alaska Native	Percent Asian	Percent Native Hawaiian and Other Pacific Islander	Percent Some Other Race	Two or More Races	Percent Hispanic or Latino (of any race)[1]
Rosebud County	9,383	64.4%	0.2%	32.4%	0.3%	0.0%	0.7%	2.0%	2.3%
Stillwater County	8,195	96.8%	0.1%	0.7%	0.2%	0.0%	0.9%	1.2%	2.0%
Sweet Grass County	3,609	97.0%	0.1%	0.6%	0.3%	0.0%	0.7%	1.3%	1.5%
Treasure County	861	96.4%	0.1%	1.6%	0.3%	0.0%	0.9%	0.6%	1.5%
Wheatland County	2,259	97.0%	0.1%	0.6%	0.2%	0.2%	0.3%	1.6%	1.1%
Yellowstone County	129,352	92.8%	0.4%	3.1%	0.5%	0.0%	1.3%	1.9%	3.7%
Planning Area Total	286,869	90.1%	0.3%	6.6%	0.5%	0.0%	0.9%	1.6%	2.6%
MONTANA	902,195	90.6%	0.3%	6.2%	0.5%	0.1%	0.6%	1.7%	2.0%

Source: U.S. Census Bureau, Census 2000 Redistricting Data (Public Law 94-171) Summary File, Matrices PL1 and PL2.
[1]Percent numbers in this column are a subset of one or more of the other race/ethnicity designation percentages.

While 13 of the 16 counties are between 92.8 percent and 99.1 percent white, three of the counties—Big Horn, Blaine, and Rosebud—include Indian Reservations with substantial Native American populations. Big Horn County, which includes most of the Crow Reservation and part of the Northern Cheyenne Reservation, has a population that is 59.7 percent Native American. Rosebud County also includes part of the Northern Cheyenne Reservation and is 32.4 percent Native American. Blaine County includes most of the Fort Belknap Reservation and is 45.4 percent Native American.

Table 3-17 shows the percentage of people below the poverty level (as defined by the U.S. Census Bureau) for Montana and each of the 16 study-area counties (1997 data). The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is poor. Compared to the state as a whole, the 16-county planning area has a somewhat greater percentage of people below the poverty level; some counties within the planning area have poverty rates that are much higher than average for the state.

TABLE 3-17
POVERTY STATUS BY COUNTY (AS DEFINED BY U.S. CENSUS BUREAU)
(1997)

	Number of Persons Below Poverty Level	Percent of Population Below Poverty
Big Horn County	3,768	29.6%
Blaine County	1,904	26.8%
Carbon County	1,230	12.9%
Carter County	294	19.3%
Custer County	2,022	17.0%
Gallatin County	7,059	11.6%
Golden Valley County	216	21.2%
Musselshell County	893	19.4%
Park County	2,196	13.8%
Powder River County	277	15.3%
Rosebud County	1,999	19.9%
Stillwater County	860	10.6%
Sweetgrass County	418	12.3%
Treasure County	141	15.8%
Wheatland County	453	19.8%
Yellowstone County	15,363	12.1%
Planning Area Total	**39,093**	**17.3%**
Montana	**135,691**	**15.5%**

Source: U.S. Census Bureau Small Area Income and Poverty Estimates Program 2001.

In 1997, the percentage of the population of Montana below the U.S. Census Bureau poverty threshold was 15.5 percent; the average in the 16-county emphasis area was 17.3 percent. Nine of the 16 counties in the planning area have poverty rates greater than the state average. The two counties with the highest rate are Big Horn and Blaine, where more than one quarter of the population had an income below the poverty level in 1997. The total number of persons in the planning area below the poverty level was about 39,093. This represents about 28.8 percent of the state's total population below the poverty level.

Table 3-17A shows the percent of tribal members who are employed but below U.S. Health and Human Services poverty guidelines (similar to U.S. Census guidelines). These data indicate that the percent of tribal members who are employed but below the poverty guideline is greater than the total percent of persons below poverty for the respective counties where the tribes are located. It can be inferred that the total poverty rate for all tribal members (employed and unemployed) would be even greater than just for those who are employed, suggesting relatively large numbers of persons on the reservations living in poverty.

TABLE 3-17A
TRIBAL POVERTY RATES AMONG THOSE EMPLOYED (1999)

Tribe	County	Total Tribal Enrollment	Percent Employed but Below Poverty Guideline
Crow Tribe of Montana	Big Horn County, Yellowstone County	10,083	38%
Northern Cheyenne Tribe	Big Horn County, Rosebud County	7,473	26%
Fort Belknap Indian Community	Blaine County	5,223	40%
Montana (all tribes)		61,203	33%

Source: BIA 1999.

Social Organization

Housing Units and Vacancy

Housing units and vacancy rates for Montana and the 16-county planning area are shown in Table 3-18. The latest available county-specific data on housing units is from the 1990 Census.

In 1990, Montana had 361,155 housing units; 109,719 or 30 percent of these were in the 16-county planning area. A U.S. Census estimate indicates there were about 328,881 housing units in Montana in 1998, which is an increase of 6 percent since 1990.

Homeowner vacancy rates indicate the percent of total owner-occupied housing that is vacant. In Montana, the homeowner vacancy rate for 1990 was 2.9 percent, compared to 3.4 percent for the planning area. Six counties had home ownership vacancy rates higher than the planning area average, suggesting a surplus of vacant houses on the market. This is possibly because of a poor economic climate.

The rental vacancy rate in 1990 was 9.6 percent for the state and 13.3 percent for the planning area. Generally, rental vacancy rates between 5 percent and 10 percent are considered adequate. Rental vacancy rates below 5 percent can indicate potential rental shortages and above 10 percent can indicate potential surplus. The relatively high rental vacancy rate in the planning area (13.3 percent) indicates a potential surplus, which is possibly because of a poor economic climate.

Temporary Housing

Temporary housing units are typically defined to include hotels and motels, and recreational vehicle or camping sites. An inventory of temporary housing units is typically included in an environmental impacts analysis to use in determining potential impacts on the local housing supply from an influx of temporary population (such as construction workers or other employees). This data is typically gathered for a city, county, or small region. Because of the broad scope of this study, however, an inventory of accommodations by specific location was not attempted. A large number of hotels/motels and recreational vehicle and camping areas are available throughout the State and the 16-county planning area. These sites tend to be concentrated in and around the large cities, such as Billings or Bozeman, as well as major tourist or recreation areas, such as Yellowstone National Park.

TABLE 3-18
HOUSING UNITS

	1990 Housing Units	1990 Homeowner Vacancy Rate (%)	1990 Rental Vacancy Rate (%)
Big Horn County	4,304	3.7	10.4
Blaine County	2,930	2.5	8.9
Carbon County	4,828	4.1	13.7
Carter County	816	3.6	20.8
Custer County	5,405	4.0	14.3
Gallatin County	21,350	1.5	4.5
Golden Valley County	432	3.3	14.8
Musselshell County	2,183	5.7	20.0
Park County	6,926	2.5	9.8
Powder River County	1,096	2.2	20.4
Rosebud County	4,251	2.7	13.3
Stillwater County	3,201	2.6	9.5
Sweetgrass County	1,639	2.7	12.9
Treasure County	448	8.0	12.4
Wheatland County	1,129	2.1	17.3
Yellowstone County	48,781	2.9	10.2
Planning Area Total	**109,719**	**3.4%**	**13.3%**
Montana	**361,155**	**2.9%**	**9.6%**

Source: US Census Bureau (1990)

Public Services and Utilities

Public services, typically provided by local governments (cities, counties and special service districts), include police and fire protection, emergency medical services, schools, public housing, parks and recreation facilities, water supply, sewage and solid waste disposal, libraries, and roads and other transportation infrastructure. Other important community services include electric and communications utilities. The provision of public services and the ability of service providers to adapt to change over time, or resulting from specific development activities, depend on a number of factors, including financial ability and community leadership.

Attitudes, Beliefs, Lifestyles, and Values

Information on general attitudes, beliefs, lifestyles, and values in Montana and the general planning area as they relate to CBM development has been gathered from public comment letters received during the scoping process for this project and also from past summaries in several related documents. While the generalized characterizations are not likely to apply to all individuals, the intention is to provide an idea of the range of the attitudes and lifestyles of the population subgroups present in the study area. See the Socioeconomics Appendix for detailed information.

The study area population is largely rural, with strong ties to the land and to the many small towns. Residents generally value the rural character of their lifestyle. Specific aspects of this lifestyle might include appreciation of wide-open spaces, natural landscape, fresh air and solitude. The lifestyle of rural communities often offers the desirable qualities of neighbors knowing each other, lack of urban problems, relaxed pace, personal freedom, and being a good place to raise children. Longtime residents often want to see continued control of the land at the local level without interference from outside agencies or groups.

A portion of the population in the study area are Native Americans, who generally desire to preserve many elements of their heritage, express strong connections with the natural environment, and often do not wish to become homogenized into the non-Indian culture. At the same time, some tribal members or subgroups are pursuing the development of energy resources for the long-term social and economic betterment of tribal members.

The vast majority of public comments received during the scoping process in early 2001 relayed concerns about potential impacts on water quality and quantity. Those who commented were most concerned with the discharge of water of poor quality (e.g., saline) and the drawdown of groundwater aquifers.

The comments reflect a difference in attitudes toward CBM development among those individuals and organizations that might profit directly from CBM and those that would not. The comments reflect a tension between the desire for new development to support the often stagnant rural economies and the concern that such development could harm the environment and the lifestyle qualities for which Montana is known, including natural beauty, wide-open spaces, and solitude. Concerns were also expressed about potential adverse affects on the lifestyles of Native Americans, particularly those on the reservations. The comments reflect the traditional high value placed on natural resources by these groups, the importance of existing water and other natural resources in tribal economies and cultures, and the opinion that tribal members will be unduly burdened with the costs of development while not receiving many or any benefits.

Economics

Employment

Table 3-19 displays state employment by sector for the years 1990 and 1998. In 1998, an estimated 543,333 people were employed in Montana, with 184,525 in the 16-county planning area. In 1998, employment in the planning area represented about 34 percent of the jobs in the state. Between 1990 and 1998, total employment in the state grew by 106,759, an increase of 24.5 percent. Employment in the 16 study-area counties grew by a total of 39,008, or 26.8 percent, during the same period.

Montana's largest employment sectors in 1998 were services, retail trade, and government; the smallest sector was mining. By far the fastest-growing sector between 1990 and 1998 was construction, which increased by 74.3 percent during the period. Other fast-growing sectors were agriculture, forestry and fishing services, and retail trade.

Some sectors of state employment decreased between 1990 and 1998. Mining jobs decreased by 14 percent in the state, from 7,824 to 6,730. Overall, government jobs increased by only 3.4 percent; within that sector, military jobs decreased by 19.4 percent and federal civilian jobs decreased by 8.2 percent.

Tables 3-20 and 3-21 present state and planning area employment by sector. Table 3-20 shows that the economic base of the planning area by sector is very similar to the state as a whole. However, as indicated in Table 3-21, there is substantial variation among the sizes and strengths of the various economic sectors in the 16 study-area counties.

TABLE 3-19
MONTANA EMPLOYMENT TRENDS BY SECTOR

	1990	1998	Change, 1990-1998	Percentage Point Change, 1990-1998
Farm Employment	30,576	32,071	1,495	4.9%
Non-Farm Employment				
Agriculture, Forestry, Fishing, and other	6,154	8,739	2,585	42.0%
Mining	7,824	6,730	-1,094	-14.0%
Construction	19,070	33,245	14,175	74.3%
Manufacturing	26,342	29,504	3,162	12.0%
Transportation and Public Utilities	23,858	26,759	2,901	12.2%
Wholesale Trade	17,449	20,693	3,244	18.6%
Retail Trade	78,715	106,202	27,487	34.9%
Finance, Insurance, and Real Estate	27,693	34,673	6,980	25.2%
Services	118,623	161,740	43,117	36.3%
Government				
Federal, civilian	13,771	12,647	-1,124	-8.2%
Military	10,516	8,474	-2,042	-19.4%
State	21,561	22,972	1,411	6.5%
Local	34,422	38,884	4,462	13.0%
Montana Total	**436,574**	**543,333**	**106,759**	**24.5%**

Source: U.S. Department of Commerce, BEA, 2001.

TABLE 3-20
STATE EMPLOYMENT VERSUS PLANNING AREA EMPLOYMENT BY SECTOR (1998)

	Planning Area Employment by Sector	% of Planning Area Total by Sector	State Employment by Sector	% of State Total by Sector
Farm Employment	9,459	5.2%	32,071	5.9%
Non-Farm Employment				
Agriculture, Forestry, Fishing, and other	2,347	1.3%	8,739	1.6%
Mining	2,193	1.2%	6,730	1.2%
Construction	11,590	6.3%	33,245	6.1%
Manufacturing	8,583	4.7%	29,504	5.4%
Transportation and Public Utilities	8,450	4.6%	26,759	4.9%
Wholesale Trade	9,287	5.1%	20,693	3.8%
Retail Trade	36,475	20.0%	106,202	19.5%
Finance, Insurance, and Real Estate	11,789	6.5%	34,673	6.4%
Services	54,915	30.1%	161,740	29.8%
Government				
Federal, civilian	3,730	2.0%	12,647	2.3%
Military	1,596	0.9%	8,474	1.6%
State	7,390	4.0%	22,972	4.2%
Local	12,137	6.6%	38,884	7.2%
Undisclosed or under 10 jobs	2,586	1.4%	N/A	N/A
Montana Total	182,527	100.0%	543,333	100.0%

Source: U.S. Department of Commerce, BEA, 2001.

TABLE 3-21
PLANNING AREA EMPLOYMENT BY COUNTY AND SECTOR (1998)

Industry	Big Horn	Blaine	Carbon	Carter	Custer	Gallatin	Golden Valley	Mussel -shell	Park	Powder River	Rosebud	Stillwater	Sweet Grass	Treasure	Wheatland	Yellowstone
Farm Employment	13.2%	21.8%	17.9%	44.4%	6.9%	2.5%	41.7%	15.8%	6.8%	33.8%	9.7%	14.3%	22.4%	40.6%	22.1%	1.6%
Non-Farm Employment																
Ag. Services, forestry, fishing, and other	3.0%	a	3.1%	a	1.5%	1.6%	a	a	1.7%	a	1.4%	2.5%	a	a	a	0.9%
Mining	8.7%	a	1.2%	a	b	0.4%	0.0%	3.6%	0.4%	1.7%	9.2%	a	b	0.0%	b	0.9%
Construction	3.3%	3.6%	6.8%	a	a	8.6%	a	6.5%	7.3%	a	1.5%	5.1%	9.0%	a	a	6.4%
Manufacturing	1.2%	1.2%	3.4%	1.9%	2.6%	6.4%	a	5.8%	6.3%	a	2.5%	8.9%	4.2%	0.0%	3.3%	4.3%
Transportation and public utilities	1.8%	2.2%	2.2%	3.6%	a	3.3%	b	4.3%	4.2%	5.0%	12.0%	a	a	5.7%	2.7%	6.1%
Wholesale trade	1.5%	3.6%	2.0%	0.0%	3.0%	4.0%	a	a	1.8%	1.0%	0.1%	1.6%	2.1%	a	a	7.6%
Retail trade	12.6%	14.6%	18.6%	8.0%	22.6%	21.0%	a	17.6%	21.4%	13.1%	12.3%	14.5%	20.5%	12.2%	20.5%	21.1%
Finance, insurance, and real estate	3.7%	4.7%	5.9%	2.2%	5.9%	6.3%	0.0%	4.4%	5.8%	1.7%	3.3%	3.8%	5.4%	a	3.9%	7.5%
Services	30.3%	20.0%	27.0%	a	29.5%	28.5%	a	23.9%	34.7%	15.4%	34.0%	17.8%	16.3%	11.7%	22.5%	32.8%
Government																
Federal, civilian	7.3%	6.4%	1.4%	2.0%	4.7%	1.1%	b	0.8%	0.9%	1.4%	3.2%	0.8%	1.5%	1.1%	3.6%	2.0%
Military	1.2%	1.3%	1.1%	1.0%	1.0%	0.8%	b	1.3%	1.0%	0.8%	1.0%	1.0%	0.9%	0.9%	1.1%	0.8%
State	0.8%	0.8%	0.5%	0.3%	4.1%	11.0%	b	0.8%	0.6%	1.7%	0.6%	0.5%	0.8%	1.4%	0.7%	1.9%
Local	11.4%	15.2%	8.9%	12.6%	7.7%	4.6%	16.3%	10.8%	7.0%	16.5%	9.3%	8.4%	12.2%	17.0%	12.7%	6.0%
Undisclosed or under 10 jobs	0	4.4%	0	24.0%	10.4%	0	41.9%	4.2%	0	7.8%	0	20.9%	4.6%	9.4%	6.8%	0
Total	100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %	100.0%	100.0%	100.0%

Source: U.S. Department of Commerce, BEA, 2001.
a = Not shown to avoid disclosure of confidential information but the estimates for these items are included in the totals.
b = Less than 10 jobs but the estimates for these items are included in the totals.

Unemployment

Table 3-22 presents the unemployment rate for Montana and each of the planning area counties in 1995 and 2000. In 1995, the average unemployment rates in Montana and in the planning area were essentially the same; 5.9 percent for the state and 5.8 percent for the planning area. In 2000, the average State unemployment rate had dropped to 4.9 percent while the average rate in the planning area remained at 5.8 percent.

In 2000, unemployment rates in four of the planning area counties were higher than the 16-county average: Big Horn (14.4 percent); Blaine (6.7 percent); Musselshell (7.4 percent); and Rosebud (7.5 percent). Unemployment rates in each of the counties but Musselshell are explained in part by the high unemployment rates on the Indian Reservations contained wholly or partly within these counties. As indicated in Table 3-23, unemployment on the Crow, Northern Cheyenne, and Fort Belknap Indian reservations in 1999 ranged between 14.9 percent and 22.9 percent. Consistent with trends in the rest of the state, the unemployment rate on each reservation fell between 1996 and 1999.

TABLE 3-22
AVERAGE ANNUAL UNEMPLOYMENT RATES BY COUNTY

	1995 Rate (%)	2000 Rate (%)	Percentage Point Change, 1995-2000
Big Horn County	12.7	14.4	1.7
Blaine County	9.8	6.7	-3.1
Carbon County	6.0	5.1	-0.9
Carter County	1.8	2.1	0.3
Custer County	4.6	4.3	-0.3
Gallatin County	2.7	2.7	0.0
Golden Valley County	7.6	5.7	-1.9
Musselshell County	8.6	7.4	-1.2
Park County	4.7	5.3	0.6
Powder River County	2.4	3.0	0.6
Rosebud County	9.2	7.5	-1.7
Stillwater County	5.0	4.9	-0.1
Sweetgrass County	3.7	2.5	-1.2
Treasure County	3.5	5.0	1.5
Wheatland County	5.1	4.6	-0.5
Yellowstone County	4.8	3.8	-1.0
Planning Area Total	**5.8**	**5.8**	**0.0**
Montana	**5.9**	**4.9**	**-1.0**

Source: Montana Department of Labor & Industry, Research & Analysis Bureau, Local Area Unemployment Statistics (2001a).

TABLE 3-23
AVERAGE ANNUAL UNEMPLOYMENT RATES BY RESERVATION

	1996 Rate (%)	1999 Rate (%)	Change 1996-1999
Crow Reservation	15.5	14.9	0.6
Northern Cheyenne Reservation	26.0	18.7	7.3
Fort Belknap Reservation	27.2	22.9	4.3

Source: Montana Department of Labor & Industry, Research & Analysis Bureau, Local Area Unemployment Statistics (2001a)

Unemployment rates on the reservations as measured by the Bureau of Indian Affairs are reported in Table 3-23A. These rates are based on self-reported information from tribal leaders; 1999 is the latest year available. The rates calculated in this manner are substantially greater than those reported by the Montana Department of Labor and Industry (Table 3-23). They indicate unemployment at 61 percent for the Crow tribe, 71 percent for the Northern Cheyenne tribe, and 76 percent for the Fort Belknap tribe. For all tribal members in Montana, the unemployment rate was 61 percent.

TABLE 3-23A
TRIBAL WORKFORCE AND UNEMPLOYMENT (1999)

Tribe	County	Total Tribal Enrollment	Available for Work of Total Work Force	Unemployed as % of Labor Force	Percent Employed but Below Poverty Guideline
Crow Tribe of Montana	Big Horn County	10,083	3,902	61%	38%
Northern Cheyenne Tribe	Big Horn County, Rosebud County	7,473	2,437	71%	26%
Fort Belknap Indian Community	Blaine County	5,223	2,780	76%	40%
Montana (all tribes)		61,203	26,348	61%	33%

Source: BIA 1999

Per Capita Income

Per capita income for the State of Montana and the counties in the planning area is shown in Table 3-24. In 1998, the average U.S. per capita income was $27,203, and the State average was $21,229. The average per capita income in the planning area was $17,715, only 83.4 percent of the state average. In 1998, per capita income in Gallatin and Yellowstone counties was higher than the State average, and incomes in Carbon, Custer, and Stillwater Counties were more than 90 percent of the state average. On the other hand, per capita income in three counties was substantially lower: Big Horn County (62.4 percent); Carter County (61.9 percent), and Musselshell County (67.6 percent).

TABLE 3-24
PER CAPITA INCOME, 1996-1998

	Dollars per Year			% Average Annual Increase (1996-1998)	% of State Average (1998)
	1996	1997	1998		
Big Horn County	11,987	12,418	13,239	5.1%	62.4%
Blaine County	13,357	13,764	15,358	7.2%	72.3%
Carbon County	17,798	18,901	19,745	5.3%	93.0%
Carter County	11,793	12,480	13,139	5.6%	61.9%
Custer County	18,879	19,792	20,487	4.2%	96.5%
Gallatin County	21,019	21,889	22,820	4.2%	107.5%
Golden Valley County	14,471	15,115	16,095	5.5%	75.8%
Musselshell County	13,087	14,047	14,351	4.7%	67.6%
Park County	17,578	17,756	18,708	3.2%	88.1%
Powder River County	13,593	15,061	16,314	9.6%	76.8%
Rosebud County	16,395	17,423	18,066	5.0%	85.1%
Stillwater County	18,114	18,726	19,736	4.4%	93.0%
Sweet Grass County	16,871	18,591	19,032	6.2%	89.7%
Treasure County	15,208	14,744	15,707	1.6%	74.0%
Wheatland County	14,784	16,695	16,217	4.7%	76.4%
Yellowstone County	22,173	23,168	24,425	5.0%	115.1%
Planning Area	**16,069**	**16,911**	**17,715**	**5.0%**	**83.4%**
Montana	**19,383**	**20,130**	**21,229**	**4.7%**	**100.0%**
United States	**24,651**	**25,924**	**27,203**	**5.0%**	

Source: Bureau of Economic Analysis

Between 1996 and 1998, per capita income in the planning area increased by an average of 5 percent annually, slightly greater than in the State as a whole, in which per capita income increased by 4.7 percent. Per capita income increased in all of the planning area counties between 1996 and 1998.

Government Revenue Sources

Government revenues include taxes, royalties, fees, and several other income sources. Please see the Socioeconomics Appendix for more information.

Taxes

Public finance mechanisms include taxes, royalties, and other fees paid to local, state, and federal governments. Taxes in Montana consist of property taxes, income taxes, natural resource taxes (coal, oil, and natural gas), and selective sales taxes (cigarette and alcoholic beverages). There is no general sales tax in Montana. Table 3-25 shows total taxes collected in Montana. In 2000, more than $789 million was collected in property taxes, accounting for 51.2 percent of the total state tax revenues collected. Income taxes were the second largest portion at 37.3 percent, followed by natural resources (6.5 percent) and sales taxes (5 percent).

TABLE 3-25
TOTAL TAXES COLLECTED IN MONTANA (2000)

	2000 Tax Revenues Collected in Montana	Percent of Total
Property Taxes	$789,786,040	51.2%
Income Taxes	$575,094,186	37.3%
Natural Resource Taxes	$100,063,319	6.5%
Selected Sales Taxes	$77,860,652	5.0%
Montana Total	**$1,542,804,197**	**100.0%**

Source: Montana Department of Revenue (2000)

The taxes and royalties assessed on oil and gas development and production are an important source of revenue for local governments and the State of Montana. The oil and gas industry pays rents, royalties, and bonuses on federal leases; production taxes on working and non-working interests in the State of Montana; and local property taxes on drilling and production equipment. See the Socioeconomics Appendix for more information on taxes.

State Oil and Gas Lease Income

DNRC leases oil and gas, metalliferous and non-metalliferous, coal, sand, and gravel mineral rights agreements on 6.3 million acres of school trust lands, and more than 100,000 acres of other state-owned land throughout Montana. School trust lands are lands historically granted to the State of Montana to be used to support common schools and other educational and state institutions.

State mineral lease royalties are collected from production facilities located on state lands. Royalty payments are based on the volume of oil and gas produced and the price of the commodity. Rental and royalty revenues are either deposited into the appropriate permanent or distributable school trust or the state general fund. Table 3-26 presents the revenues received by the state in fiscal year (FY) 2000 from minerals management, including leases (rents) and mineral production royalties on state trust lands. Oil and gas revenues in FY 2000 were $6.6 million, or 57.2 percent of total state mineral management revenues. Oil and gas revenues comprised the largest share, with coal revenues the second largest, at 40.3 percent of the total.

TABLE 3-26
REVENUES RECEIVED FROM MINERALS MANAGEMENT ON STATE LANDS IN FY 2000

	FY 2000 Revenue (Dollars)
Oil and Gas	
Rentals/Bonuses/Penalties	2,966,285
Royalties	3,684,595
Seismic Exploration	11,075
Subtotal	6,661,955
Percent	57.2%

TABLE 3-26
REVENUES RECEIVED FROM MINERALS MANAGEMENT ON STATE LANDS IN FY 2000

	FY 2000 Revenue (Dollars)
Aggregate Minerals	
Rentals	250
Royalties	245,693
Subtotal	245,943
Percent	2.1%
Coal	
Rentals	44,371
Royalties	4,649,634
Subtotal	4,694,005
Percent	40.3%
Other Minerals	
Subtotal	41,124
Percent	0.4%
Rentals/Penalties	32,246
Royalties	8,878
TOTAL	11,643,027

Source: MDNRC 2000 (www.dnrc.state.mt.us/trust/mmb.htm)

The state mineral leasing program includes 2,433 oil and gas leases, 534 of which are currently productive. From FY 1999 and FY 2000, the number of oil and gas leases increased by 8.1 percent and the number of productive leases increased by 14.3 percent. In FY 2000, state lands yielded 923,777 barrels of oil, 5,050,552 million cubic feet of gas, and 375,113 gallons of condensate. Oil production declined 6.5 percent from FY 1999. However, the increase in average price from $10.50 per barrel in FY 1999 to $20.21 per barrel in FY 2000 accounted for the large increase in oil royalty revenue. Gas production in FY 2000 increased 19.6 percent, while price increased 36.0 percent compared to FY 1999, also resulting in a substantial increase in royalty revenue.

Federal Mineral Revenues

Oil and gas royalties are earned from production facilities on federal leases, units, or communication agreements. Federal mineral lease royalties are collected on oil and gas produced based on the volume of product. Table 3-27 presents federal mineral revenue disbursements by county of origin for the 16 planning area counties and the state as a whole. Coal, gas, and oil are the main mineral products. The totals reported do not include royalties and rents from leases on Native American tribal and allotted lands.

TABLE 3-27
ONSHORE FEDERAL MINERAL REVENUE DISBURSEMENTS IDENTIFIED BY COUNTY OF ORIGIN, FISCAL YEAR 2000, MONTANA[1]

	Product	Sales Volume ($)	Royalty Value ($)	Disbursed to State ($)
Big Horn	Bonus		185,076	92,538
	Coal	20,416,210	20,912,616	10,456,308
	Gas	44,411	4,028	2,014
	Other Revenues		16,562	8,281
	Rent		335,127	167,564
	Subtotal		21,453,409	10,726,705
Blaine	Bonus		251,411	125,705
	Gas	1,559,733	460,736	230,368
	Oil	35,238	69,797	34,898
	Other Revenues		64,995	32,497
	Rent		105,524	52,762
	Subtotal		952,462	476,231
Carbon	Gas	166,547	45,722	22,861
	Gas Plant Products	2,789,164	89,617	44,809
	Oil	386,161	1,042,440	521,220
	Other Revenues		2,616,601	1,308,301
	Rent		76,892	38,446
	Sulfur	1,023	524	262
	Subtotal		3,871,797	1,935,899
Carter	Bonus		47,366	23,683
	Oil	865	1,888	944
	Other Revenues		22,294	11,147
	Rent		90,429	45,214
	Subtotal		161,976	80,988
Custer	Bonus		51,904	25,952
	Gas	56,563	11,875	5,938
	Other Revenues		1,135	568
	Rent		44,205	22,103
	Subtotal		109,119	54,560

TABLE 3-27
ONSHORE FEDERAL MINERAL REVENUE DISBURSEMENTS IDENTIFIED BY COUNTY OF ORIGIN, FISCAL YEAR 2000, MONTANA[1]

	Product	Sales Volume ($)	Royalty Value ($)	Disbursed to State ($)
Gallatin	Rent		5,127	2,564
	Subtotal		5,127	2,564
Golden Valley			0	0
Musselshell	Bonus		594	297
	Oil	5,378	2,394	1,197
	Other Revenues		1,077	539
	Rent		19,030	9,515
	Subtotal		23,095	11,547
Park			0	0
Powder River	Bonus		39,028	19,514
	Gas	14,352	4,076	2,038
	Oil	74,079	172,508	86,254
	Other Revenues		6,796	3,398
	Rent		482,732	241,366
	Subtotal		705,139	352,569
Rosebud	Bonus		517,040	258,520
	Coal	1,612,516	1,852,468	926,234
	Oil	21,613	42,355	21,178
	Other Revenues		690,601	345,301
	Rent		220,533	110,266
	Subtotal		3,322,997	1,661,499
Stillwater	Bonus		6,766	3,383
	Oil	3,499	5,222	2,611
	Rent		26,077	13,039
	Subtotal		38,066	19,033
Sweet Grass	Bonus		8,928	4,464
	Rent		25,854	12,927
	Subtotal		34,782	17,391

TABLE 3-27
ONSHORE FEDERAL MINERAL REVENUE DISBURSEMENTS IDENTIFIED BY COUNTY OF ORIGIN, FISCAL YEAR 2000, MONTANA[1]

	Product	Sales Volume ($)	Royalty Value ($)	Disbursed to State ($)
Treasure	Coal	97,143	118,745	59,372
	Rent		2,760	1,380
	Subtotal		121,505	60,752
Wheatland	Other Revenues		480	240
	Subtotal		480	240
Yellowstone	Oil	1,648	2,494	1,247
	Other Revenues		516	258
	Rent		131	65
	Subtotal		3,140	1,570
Planning Area Total			30,768,312	15,384,156
% of State Total			71.8%	75.4%
Montana Total[2]			42,881,292	20,401,472

Source: U.S Department of Interior, Minerals Management Service 2001.
[1]Does not include revenues collected from American Indian lands or offshore operations.
[2]Adjusted for net receipts sharing (less $1,039,174 disbursed to state).

Mineral royalties from the 16 planning area counties totaled $30.7 million—approximately 71.8 percent of the $42.8 million collected in the state. Big Horn County accounted for a large share of the planning area revenues, with total royalties of $21.4 million, which were mostly from coal. Coal and oil revenues are far greater than gas revenues.

Formulas for disbursement of revenues from federal mineral leases are governed by legislation and regulations. Nationally, in fiscal year 2000, federal mineral lease revenues were disbursed as follows: 66.0 percent to the U.S. Treasury; 20.2 percent to special purpose funds, such as historic preservation, land and water conservation, and reclamation; 10.8 percent to states; and 3.0 percent to Native American tribes. This corresponds to $5.1 billion to the U.S. Treasury, $1.6 billion to special purpose funds, $843 million to states, and $235 million to tribes.

The percentage of royalties disbursed in Montana is much greater than the national average. Of the $42.8 million in royalties collected on federal lands in Montana counties in 2000, nearly half, or $20.4 million, was disbursed to the state.

Private Landowner Revenue

Some landowners in Montana own the mineral rights to their land and lease those rights for natural gas development and other uses. Landowners who do not own mineral rights may be subject to the development of natural gas or other energy or mineral resources on their land. Both of these categories of landowners receive income for use of their land, in the form of natural gas royalties or one-time compensation for land disturbance and use, respectively. This income is included in the total per capita incomes presented in Table 3-24.

Water Resource Values

Water plays an important role in the state and local economies of Montana. Water is a scarce resource in Montana—particularly in eastern Montana. Many of the state's surface water basins are over-appropriated and have been closed to future appropriations. In

these locations, water users are turning more and more to groundwater to meet their water needs.

Most of the water in the planning area originates as groundwater. Livestock watering and domestic water wells are the primary uses of groundwater in the area. Surface water and ground water are also used for agricultural irrigation and surface water is used for recreation in some areas. Continued availability of adequate quantity and quality for these major uses is essential to maintaining the health of these sectors of the local and state economies.

The economic value of water resources for human uses varies greatly by location and by use and user. As an example, it has been estimated that the value of irrigation water to agricultural producers, based on the increase in production attributable to the use of the water for irrigation, is between $25 and $50 per acre-foot in eastern Montana (Schaefer 2001). Costs for domestic water would generally be more. The values are inherent components of the values of the various sectors of the economy, such as income from grazing and agriculture or costs of providing public water service. Changes in the supply or cost of water would contribute to changes in the costs and revenues for these activities.

Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations" (1994) requires the non-discriminatory treatment of minority populations and low-income populations for projects that occur on federal lands, require federal permits, use federal funds, or are otherwise under the jurisdiction of a federal agency. Disproportionately high or adverse health or environmental effects on such populations must be identified and addressed as appropriate.

Low-Income and Minority Populations

This section describes locations of concentrations of minority populations and low-income populations at the county level, in accordance with the scope of this study. Potential sub-county concentrations of minority populations and low-income populations are also possible but could only be identified on a project-specific basis. The occurrences of minority populations and low-income populations are discussed in detail in the *Demographics* section of this report, and are presented in Tables 3-16 and 3-17, respectively.

The Montana population is 92.2 percent white, similar to the 16-county study area, which is 91.5 percent white. While thirteen of the 16 study-area counties are between 94.5 percent and 99.1 percent white, three of the counties—Big Horn, Blaine, and Rosebud—include Indian Reservations with substantial Native American populations. Big Horn County, where the population is 59.7 percent Native American, includes most of the Crow Reservation and part of the Northern Cheyenne Reservation. Rosebud County also includes part of the Northern Cheyenne Reservation and is 32.4 percent Native American. Blaine County includes most of the Fort Belknap Reservation and is 45.4 percent Native American.

The percentage of the Montana population living in poverty is 15.5 percent; the average in the 16-county study area is 17.3 percent. The study area contains 39,093 persons below the poverty level, or about 28.8 percent of the State's total below the poverty level. Nine of the 16 study-area counties have poverty rates greater than the State average. The two counties with the highest rate are Big Horn and Blaine, where more than one quarter of the population had an income below the poverty level in 1997.

Soils

Montana, with its wide mix of geologic parent material, has a vast array of different soil types. Differences in climate, parent material, topography, and erosional conditions result in soils with diverse physical and chemical properties. The distribution and occurrence of soils can be highly variable and is dependent on a number of factors including slope, geology, vegetation, climate, and age. For more information on soil types, see the Soils Appendix.

The five major soil forming factors are as follows (Brady 1990):

1. Climate—particularly temperature and precipitation.
2. Living Organisms—especially native vegetation, microbes, soil animals, and human beings.
3. Nature of parent material.
4. Topography of the site.
5. Time that parent materials are subject to soil formation.

Soils in the RMP areas are derived mainly from sedimentary bedrock and alluvium. The soils generally range from loams to clays, but are principally loams to silty clay loams.

Soil salinity affects the suitability of a soil for crop production and the stability of the soil. The SAR is the measure of sodium relative to calcium and magnesium, and affects the soil structure and infiltration rate of water. The *Soils Technical Report* presents a more detailed discussion pertaining to the salinity and SAR of the soils in the Billings RMP and Powder River RMP areas. A summary of this report is presented in the Soils Appendix.

Solid and Hazardous Wastes

The hazardous materials program priorities are to protect the public health and safety; protect natural and environmental resources; comply with applicable federal and state laws and regulations; and minimize future hazardous substance risks, costs, and liabilities on public lands. BLM is responsible for all releases of hazardous materials on public lands and requires notification of all hazardous materials to be used or transported on public land.

Solid and hazardous wastes can be generated during oil and gas and CBM activity. These wastes are under the jurisdiction of the MDEQ for Resource Conservation and Recovery Act (RCRA) wastes; the MBOGC for RCRA-exempt wastes such as drilling wastes; and the EPA on tribal lands. At the present time, wastes generated from the wellhead through the production stream to and through the gas plant are exempt from regulation as a hazardous waste under RCRA's exploration and production exemption, but are covered by mineral leasing regulations. The exemption does not apply to natural gas as it leaves the gas plant for transportation to market. Releases must be reported in a timely manner to the National Response Center the same as any release covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Prior to a gas plant, releases are reported to the BLM via a Report of Undesirable Event (NTL-3A; 43 CFR 3162.5-1(c)). The BLM requires immediate reporting of all Class I events, which involve the release of more than 100 barrels of fluid/500 MCF of gas, or fatalities. The MDEQ's Solid and Hazardous Waste Bureau is responsible for administering both the Montana Solid Waste Management Act (75-10-201 *et. seq.*, Montana Code Annotated [MCA]) and the Montana Hazardous Waste Act (75-10-401 *et seq.* MCA).

It has been established by CERCLA that the owner of the land is ultimately responsible for hazardous materials or substances placed or released on their lands. Under CERCLA, the term "hazardous substance" is typically any toxic, corrosive, ignitable, explosive, or chemically reactive substance, but does not include petroleum, crude oil, natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel, or mixtures of natural gas and synthetic gas. The oil and gas industry transports hazardous materials on the highways, stores and uses the materials at the sites, and produces some hazardous wastes, such as paint waste from the painting of facilities, and unused acid or chemicals that were not used in well treatments. This presents a potential for spills, leaks, and illegal disposal. Reserve pits may be required to be lined, which reduces but does not eliminate leaks. Produced water is the predominant fluid, but some hazardous substances also are released. The content of the releases or spills will be varied and unpredictable.

The transportation of hazardous materials is regulated by Montana's Department of Transportation (MDT) under CFR Parts 171-180. These regulations pertain to packing, container handling, labeling, vehicle placarding, and other safety aspects. The transportation of all hazardous waste materials in Montana must comply with the Federal Motor Carrier Safety Regulations, part 390 through part 397.

The EPA requires manufacturers to report releases of more than 600 designated toxic chemicals into the environment. EPA compiles this data in an annual Toxics Release Inventory. Toxics Release Inventory facilities are required to report on releases of toxic chemicals into the air, water, and land. In addition, they report on off-site, pollution prevention activities and chemical recycling. The Toxics Release Inventory also provides information about potentially hazardous chemicals and their use; however, the law does not cover toxic chemicals that reach the environment from non-industrial sources, such as dry cleaners or auto service stations. In 1998, EPA added seven new industries to the Toxics Release Inventory: metal mining, coal mining, electrical utilities that combust coal or oil, RCRA Subtitle C hazardous waste treatment and disposal facilities, chemicals and allied products wholesale distributors, petroleum bulk plants and terminals, and solvent recovery services. There are currently 19 facilities in the RMP areas that report Toxics Release Inventory information to the EPA, with most of them being related to the energy and mining industries. The Solid and Hazardous Waste Appendix contains *the Toxics Release Inventory for Montana*.

Vegetation

The land classification system developed by the University of Montana for the Montana Gap Analysis (MT-GAP) is used for this discussion because it has a large amount of detailed information about vegetation and wildlife distribution. All classification descriptions are from the MT-GAP project, and acreage estimates and calculations are based on their data results (Fisher et al. 1998).

The planning area includes six general land classes or vegetative communities: Agriculture/Urban Areas, Grassland, Shrubland, Forests, Riparian Areas, and Barren Lands. The five general land classification descriptions and their subdivisions will be explained in more detail below. All of these habitats are important to a wide variety of wildlife species.

Plant Communities

Grasslands

Grasslands are among the most biologically productive of all vegetative communities because of soil nutrient retention and fast biological recycling. They are also very valuable because the vegetation is nutritious and used by livestock and by a large constituent of wildlife (Williams and Diebel 1996; Estes et al. 1982). Grassland sites are dominated by herbaceous canopy cover at greater than 15 percent, shrub cover at less than 15 percent, and forest cover at less than 10 percent (Fisher et al. 1998).

Grasslands cover an estimated 10.4 million acres of the 16 counties that make up the CBM emphasis area. This is almost twice as much land as any other vegetation type in the planning area. Those grasslands with underlying subbituminous or bituminous coal deposits cover 1.5 million acres of the Powder River RMP area and 1 million acres of the Billings RMP area. Together, the counties of Park, Blaine, and Gallatin have almost a million acres of grasslands underlain by coal within their boundaries. For grassland types, see the Biological Appendix.

Shrublands

Shrublands are characterized by shrub covers greater than 15 percent and forest cover less than 10 percent (Fisher et al. 1998). This vegetation type is dominant on approximately 5 million acres of the CBM emphasis area. Of this, 1.8 million acres are underlain by bituminous coal deposits. Important shrubs include several species of sagebrush (*Artemisia nova*, *A. tridentata*, *A. vaseyana*, and *A. wyomingensis*). Other important shrub species in this category are bitterbrush (*Purshia tridentata*), creeping juniper (*Juniperus horizontalis*), greasewood (*Sarcobatus* spp.), mountain mahogany (*Cercocarpus* spp.), rabbitbrush (*Chrysothamnus* spp.), and shadscale (*Atriplex canescens*). These shrublands are often associated with a complex of understory grasses such as bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*), needle and thread (*Stipa comata*), and western wheatgrass (*Agropyron smithii*).

Forests

Land is classified as forest if it has more than 10 percent tree cover. Montana has 19 categories of forests under this classification. Within the emphasis area, 4.5 million acres are classified as forest. Of that, almost 1.4 million acres are underlain by subbituminous or bituminous coal deposits. Two forest types account for the majority of the forested areas within the emphasis area: Ponderosa Pine Forests and Low-Density Xeric Forests. Ponderosa Pine sites are dominated by ponderosa pine (*Pinus ponderosa*) at 20 to 80 percent cover. They are associated with big sagebrush, ninebark, snowberry, bluebunch wheatgrass, blue grama, and Idaho fescue. Low-density xeric forests have tree cover at 5 to 20 percent with a grass understory. Dominant tree species are Douglas-fir, limber pine, ponderosa pine, Rocky Mountain juniper, or Utah juniper (Fisher et al. 1998).

Riparian Areas

These are sites that are associated with intermittent and perennial water sources or with woody draws. Riparian areas are classified as Conifer, Broadleaf, Mixed Broadleaf and Conifer, Graminoid and Forb, Shrub, and Mixed (Fisher et al. 1998). All riparian types have high species richness, which reaffirms why riparian sites are considered to be some of the most biologically diverse habitats anywhere.

Barren Lands

These are sites with less than 10 percent forest cover, less than 10 percent shrub cover, and less than 10 percent herbaceous cover (Fisher et al. 1998). The category name may imply that these areas have no biological value, but this would be misleading.

Noxious Weeds

Although the word "noxious" means harmful or deleterious, in this context it is a legal term for species of plants that have been designated "noxious" by law. Noxious weeds are non-native species with the potential to spread rapidly—usually through superior reproductive capacity, competitive advantage mechanisms, and lack of natural enemies.

Fourteen species have been defined as Category 1 noxious weeds for Montana; these weeds are currently known to be established within the state. Approximately 87,365 acres within the CBM emphasis area that are underlain by subbituminous or bituminous coal beds are considered to be altered by exotic or introduced plant species (defined by 30 percent or more of vegetative cover coming from non-native species). Not all of these are in the "noxious " weed category, but this switch from native plants is an indication of the potential scope of the issue.

- **Spotted Knapweed** (*Centaurea maculosa*): Since the 1920s, this perennial has spread from western Montana to every county in Montana. It covers an estimated five million acres of Montana land. This species readily establishes itself on disturbed sites and has the competitive advantage over many native species because it starts growth early in spring.
- **Diffuse Knapweed** (*Centaurea diffusa*): This aster invades roadsides, waste areas and dry rangelands. It is highly competitive and able to exclude many native species.
- **Hoary Cress (Whitetop)** (*Cardaria chalepensis*): This invader is well adapted to moist habitats such as sub-irrigated pasture, hay fields, rangelands, and roadsides. In unshaded areas that have been disturbed, it can form dense monocultures.
- **Dyer's Woad** (*Isatis tinctoria*): This species was first reported in Montana in the 1950s. It tends to invade dry, rocky soils in rugged terrain. A chemical in the seed pods can inhibit the germination of seeds from other plants. It has been confirmed to be in two counties within the planning area: Musselshell and Park.
- **Oxeye Daisy** (*Chrysanthemum leucanthemum*): This perennial invades by both prolific seed production and by branching rhizomes and adventitious roots. It prefers upland pastures and meadows, but also grows along waste areas in western and southern Montana.
- **Dalmatian Toadflax** (*Linaria dalmatica*): This species grows in a wide range of habitats, especially if soils are well-drained and coarse-textured. Wet conditions seem to limit the success of this species.
- **St. Johns's Wort** (*Hypericum perforatum*): This perennial covers about 500,000 acres in Montana. It is particularly adapted to sandy or gravelly soils. It reproduces by both seeds and short runners.
- **Leafy Spurge** (*Euphorbia esula*): Leafy spurge began to invade eastern Montana as early as 1925 and now is known to be in every county. It is most aggressive in dry areas where competition from native plants is less robust.
- **Purple Loosestrife** (*Lythrum salicaria*): This species' fast growth and enormous reproductive ability allow it to choke native vegetation out of wetlands.
- **Saltcedar** *(Tamarix ramosissima):* Saltceder is an aggressive woody invader. It prefers waterways and ponds and can transpire up to 200 gallons of water per day. It forms dense monocultures that provide little or no habitat for wildlife. It exudes salts onto the surrounding surface rendering the inter-spaces uninhabitable to other vegetation.

See the *Biological Appendix* for a complete list of noxious weeds for Montana.

Species of Concern

Many federally listed threatened, endangered, or candidate species of special concern exist in the planning area that are given special consideration under Section 7(c) of the Endangered Species Act of 1973 (ESA). As required by the ESA, the FWS has provided a list of endangered, threatened, and proposed species that may be present in the planning area (see Table 3-28). This section reviews its habitat requirements, as well as the likelihood of this species being found in the 16 counties that may be potentially affected.

TABLE 3-28
ENDANGERED, THREATENED, AND PROPOSED PLANT SPECIES PRESENT IN THE CBM EMPHASIS AREA

Common Name	Scientific Name	Habitat in Montana	Federal Status*
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	River meander wetlands in Jefferson, Madison, Beaverhead, and Gallatin counties	T

*T=Threatened

Ute Ladies'-Tresses Orchid

This plant was listed as Threatened January 17, 1992 (57 Federal Register [FR] 2053). Ute ladies'-tresses orchid (*Spiranthes diluvialis*) is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams. It occurs primarily on sites subject to intermittent and unpredictable inundation, and the plants often emerge from shallow water (Sheviak 1984; FWS 1996).

The species occurs primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed (Coyner 1989, 1990; Jennings 1989, 1990). In Montana, it is found in meandered wetlands and swales in broad, open valleys, at margins with calcareous carbonate accumulation (Montana NRIS 2001). It is known to occur only in southwestern Montana in Beaverhead, Gallatin, Jefferson, and Madison counties.

State Species of Concern

In addition to species that are federally protected under the ESA, the State of Montana has designated additional species of concern within its jurisdictional boundaries. There are five rankings for State Species of Special Concern. This document focuses only on the highest ranking (S1). This ranking is defined as critically imperiled because of extreme rarity (five or fewer occurrences, or very few remaining individuals), or because some factor of its biology make it especially vulnerable to extinction.

State-listed species (with BLM and Forest Service rankings) that have potential distributions within the 16-county emphasis area of this EIS or that have undefined distributions in the state are listed in the *Biological Appendix* (see *Plant Species of Concern in the 16 County Planning Area*). Species that are federally listed under the ESA have been omitted from these tables because they have already been considered. The *Biological Appendix* also includes the type of habitat where they are likely to be found. (Montana NRIS 2001). Table VEG-6 links wildlife species to habitat requirements.

Plant species are listed by county where each state species of concern is known to occur (*Biological Appendix*). Sensitive species for the BLM and USFS are also listed in this appendix. Historic maps for most species of concern show much wider distributions than present distributions.

Visual Resource Management

Visual resources are visual features in the Montana landscape that include landform, water, vegetation, color, adjacent scenery, uniqueness or rarity, structures, and other man-made features. The 16 counties in the emphasis area portray a variety of landscapes and habitats, all with different visual qualities. Current visual resource management is in accordance with the two RMPs. The four classes are as follows:

- Class I—preserve the existing character of the landscape
- Class II—retain the existing character of the landscape
- Class III—partially retain the existing character of the landscape
- Class IV—provide for management activities that require major modifications to the existing character of the landscape

Non-federal land is not under any visual resource management system although there are often visual quality concerns. Federally authorized projects, however, undergo a visual assessment to comply with aesthetic requirements. Typically, sensitive areas include residential areas, recreation sites, historical sites, significant landmarks or topographic features, or any areas where existing visual quality is valued.

Three CBM well heads forming a field pod near Decker, Montana.
Each well is drilled to a different depth and into a different layer of coal.

Wilderness Study Areas

Ten wilderness study areas are within the planning area:

- Carbon County
  - Burnt Timber Canyon WSA
  - Pryor Mountain WSA
  - Big Horn Tack-On WSA
- Golden Valley County
  - Twin Coulee WSA
- Park County
  - Yellowstone River Island WSA
- Blaine County
  - Stafford WSA
  - Ervin Ridge WSA
  - Cow Creek WSA
- Rosebud County
  - Zook Creek WSA
- Powder River County
  - Buffalo Creek WSA

Monitoring reports for these WSAs list little or no activity with the exception of some minor vehicle tracks found in the Cow Creek WSA, Stafford WSA, Pryor Mountain WSA, Big Horn Tack-On WSA, and Burnt Timber Canyon WSA.

Wildlife

The EIS planning area covers very large portions of southeast, south central, and north central Montana, and includes substantial geographic and topographic variation and a wide variety of plant communities and wildlife habitat types. This combination of factors results in very diverse wildlife communities, with some species having widespread occurrence throughout the planning area and others being restricted to one or a few specialized habitats and locations.

The *Vegetation* section described the predominant native plant communities that provide habitat for wildlife in the planning area. These include a variety of grassland, shrubland, forest, and riparian habitat types. Drier grasslands and shrublands are dominant with breaks, badlands, coulees, wooded draws, open conifer forests, and riparian shrub and forest communities along perennial and intermittent drainages. Two other cover types present in the planning area include open water and a variety of agricultural land uses, both of which provide important habitat value to certain species during some seasons. Additionally, special habitat features such as cliffs, snags, springs, natural potholes, reservoirs, lakes, and islands are present in the planning area.

Mammals

The variety of locations, topography, and cover types in the planning area support many mammal species. The Montana Gap Analysis atlas of terrestrial vertebrates (MT-GAP 1998) shows the known distribution of vertebrates in Montana. It indicates that the planning area supports 10 species of bats; 8 species of shrews; 34 other species of small mammals and lagomorphs; 17 omnivores or predators ranging in size from the least weasel (*Mustela nivalis*) to the black bear (*Ursus americanus*) and mountain lion (*Felis concolor*); and 5 to perhaps 7 big game species. Several of these species have suffered substantial habitat loss and population decline and are considered to be rare or are protected by federal statutes. These species are addressed in the *Species of Concern* (SOC) section.

Some of the more common predators include the coyote (*Canis latrans*), red fox *(Vulpes vulpes*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), and striped skunk (*Mephitis mehpitis*). Local occurrence of several of these and other predators varies by habitat type present.

Big game species common within parts or all of the planning area include elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), and pronghorn (*Antilocapra americana*). The MT-GAP (1998) provides the following summary of habitat preferences for these species.

Elk habitat preference is described as including moist sites during the summer. Elk use open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland as well as coniferous forests, brushy clearcuts, and forest edges. High quality winter range is critical to long term elk survival.

Mule deer are the most widely distributed big game species in Montana and occupy a wide range of habitat types during the year. Breaks, badlands, and brushy draws are preferred in open prairie country. McCracken and Uresk (1984) reported that both hardwood and pine forests were important to mule deer in southeastern Montana, with hardwood forests preferred. The Billings RMP (BLM 1983) indicates that although mule deer occur throughout the planning area, they are more abundant in the open shrub-grassland habitats adjacent to timbered or broken terrain. Habitat such as riparian bottoms, agricultural areas, and forests are used as well, either year long or seasonally. Winter ranges are typically at lower elevation than summer ranges, and are often dominated by shrub species that provide crucial browse.

White-tailed deer also occur throughout Montana but are more restricted by habitat preference than are mule deer. Preferred habitats include forest types, agricultural fields and prairie areas adjacent to cover. Mesic areas such as riparian areas and montane forests are preferred in the drier portions of central and eastern Montana. McCracken and Uresk (1984) reported a strong preference for hardwood forests in southeastern Montana. During the winter, white-tailed deer using forested areas prefer dense canopy classes, moist habitat types, uncut areas, and low snow depths. Winter concentration areas occur almost exclusively in riparian-wetland habitats and in dense pine (Youmans and Swenson 1982). White-tailed deer tend to remain in one particular area and do not migrate in the winter (Hamlin 1978).

Pronghorn are relatively common throughout eastern and central Montana and occupy a variety of grassland and shrubland habitats on prairies, semi-desert areas, and foothills. Summer habitat preferences are reported to include mixed shrub communities, perennial grasslands, silver sagebrush stands, annual forblands, and croplands (Armstrup

1978; Wentland 1968). McCracken and Uresk (1984) reported a strong preference to sagebrush-grassland cover types in southeastern Montana. Sagebrush-grasslands with shrubs 12 to 24 inches tall are preferred in the winter when sagebrush comprises a significant portion of the pronghorn diet (Bayless 1967).

The range of moose (*Alces alces*) overlaps with coal bearing lands in Carbon County. Moose habitat generally consists of a mosaic of second-growth forest, openings, swamps, lakes, and wetlands. Water bodies are required for foraging and hardwood-conifer forests provide winter cover. Willow flats may provide year-long habitat in some areas (Stone 1971) and closed canopy stands may be important in late winter (Mattson and Despain 1985).

The other two big game species that may occur in the planning area include the mountain goat (*Oreamnos americanus*) and mountain bighorn sheep (*Ovis canadensis*). Mountain goats typically occupy alpine and subalpine habitats, steep grassy talus slopes, grassy ledges and cliffs, or alpine meadows. Both mountain goats and mountain sheep may overlap with coal-bearing lands in southwestern and southern Carbon County, respectively. The Pryor Mountain bighorn herd, which occurs south of Billings, is estimated at 100 individuals (BLM 1983). Grasses and forbs provide the major portion of their yearlong diet, which is supplemented with browse types such as curlleaf mountain mahogany and sagebrush (FWS 1978). Little information is currently available on the migratory routes of this herd.

In eastern Montana, most mule deer and elk winter range is located on relatively large areas of land with a diversity of slopes, aspects, and topographic features (MBOGC 1989). Winter range is often part of year-round habitat.

Prairie dog towns provide habitat for more than 163 vertebrate species, including several rare or endangered species such as the burrowing owl (*Athene cunicularia*), swift fox (*Vulpes velox*), mountain plover (*Charadrius montanus*), and black-footed ferret (*Mustela nigripes*)—which is an endangered species (Reading et al. 1989; Koford 1958; Tyler 1968; Campbell and Clark 1981; Clark et al. 1982; and Agnew 1983). Black-tailed prairie dogs *(Cynomys ludivicianus*) formerly occupied most of the planning area along with thousands of acres of adjacent short grass prairie lands. White-tailed prairie dogs (*C. leucurus*) are found only along the Clarks Fork of the Yellowstone River in Carbon County, which is at the northern limit of its range.

As noted above, at least 10 species of bats probably occur in the planning area. Additional species migrate through central and eastern Montana. These sites vary by species and include caves, large diameter hollow trees, old buildings, abandoned mines, rock crevices, and under the loose bark on large trees.

As noted above, at least 42 species of shrews and other small mammals and lagomorphs occur in the planning area. MFWP has expressed particular concern about the Preble's shrew (*Sorex preblei*) and Merriam's shrew (*S merriami*). Preble's shrew has a spotty distribution associated with dry sagebrush and sagebrush grasslands (Hoffman and Pattie 1968) and riparian shrubs (Allen et al. 1994; Ports and George 1990). Merriam's shrew is apparently somewhat more widely distributed in the planning area. It occupies the same general habitat types as the Preble's shrew plus grasslands and open ponderosa pine stands (MT-GAP 1998).

Birds

As noted for mammals, the variety of locations, topography, and cover types in the planning area also support many bird species. The MT-GAP (1998) indicates that more than 250 species of birds occur in the emphasis area. Some are year-long residents, a few migrate south into the emphasis area during the winter, and most breed in the emphasis area and winter to the south. Approximate numbers of species include 32 waterfowl and related species; 33 shore and wading birds; 18 diurnal and 11 nocturnal raptors; 8 species of gallinaceous birds; 8 woodpeckers; and 137 songbirds, including many neotropical migrants. Species richness and breeding bird densities are highest in riparian woodlands and wetland habitats.

Waterfowl

The Billings RMP planning area is within the Central Flyway, which has important migration corridors. Lands in the planning area also fall within the Prairie Pothole Joint Venture established through the North American Waterfowl Management Plan. The Prairie Pothole Joint Venture is thought to contain the most important duck breeding habitat in North America. Many spring runoff ponds in the planning area provide important habitat for nesting waterfowl. The major rivers and stockponds provide important habitat for resident ducks and nesting areas for migrants. A large variety of ducks, geese, and shorebirds use riparian-wetland habitats within the planning area for both nesting and migration

stopovers. Common species include the mallard (*Anas platyrhynchos*), pintail (*A. acuta*), gadwall (*A. strepera*), blue-winged teal (*A. discors*), common merganser (*Mergus merganser*), Canada goose (*Branta canadensis*), killdeer (*Charadrius vociferus*), and avocet (*Recurvirostra americana*). The Yellowstone and Clarks Fork drainages are used heavily for nesting by Canada geese and some species of ducks. Nesting occurs mostly on established islands and brushy riparian-wetland areas where abundant cover provides protection from predators.

Hansen (2001) identified several specific areas that are important to waterfowl and shorebirds. One critical habitat (for waterfowl and shorebird nesting and migration) is the Lake Mason National Wildlife Refuge (NWR), its entire watershed, and some associated shallow lakes located in Mussellshell County. Another is the Spidel Waterfowl Production Area, another FWS area for waterfowl and shorebirds located at the edge of one of the coal areas about 3 miles northeast of Broadview. A group of major waterfowl and shorebird areas located in Stillwater County between Molt and Rapelje includes Big Lake, Halfbreed NWR, and Hailstone NWR.

The Yellowstone River through Yellowstone, Big Horn, Treasure, Rosebud, and Custer counties is a major habitat for nesting, migrating, and wintering waterfowl. Also, the Howrey Island ACEC is a large island in the Yellowstone River in Treasure County that provides valuable habitat for waterfowl and many other species.

In Blaine County there are a number of large and small wetlands within the coal area that are important to waterfowl and shorebirds. These include North Chinook Reservoir and the Holm Waterfowl Production Area about 20 miles north-northwest of Chinook, and Tule Lake and BR12, about 10 miles north of Zurich. Smaller wetlands in this area are collectively extremely important. This is an important nesting area for northern pintails, a species of duck that has declined in numbers.

Raptors

Many of the raptors occurring in the Billings RMP planning area and the rest of the planning area have been identified by the State of Montana, the USFS, or BLM as sensitive species or species of special interest or concern (Flath 1991; Houtcooper et al. 1985). Those listed by the state include the ferruginous hawk (*Buteo regalis*), osprey (*Pandion haliaetus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipiter gentilis*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), prairie falcon (*Falco mexicanus*), burrowing owl, flammulated owl (*Otus flammeolus*), great gray owl (*Strix nebulosa*), and Boreal owl (*Aegolius funereus*). The endangered bald eagle (Haliaeetus leucocephalus) is discussed in the *Species of Concern* section.

Burrowing owls are of particular interest because of the rapid decline in their numbers (MT-GAP 1998). They occur in a variety of open habitat types, nesting and roosting in burrows dug by mammals (AOU 1983). They appear to be totally dependent on these mammal burrows with prairie dog towns providing prime habitat (MT-GAP 1998).

Ferruginous hawks occupy relatively undisturbed prairie and shrub steppe regions with scattered trees, rock outcrops, and wooded stream bottoms (Evans 1982; Clark et al. 1989). MFWP notes that there are a few pairs that apparently nest along tributaries in both the Powder River and Tongue River watersheds. Ferruginous hawks have declined throughout their range over the last 30 years. Merlins have also suffered substantial population declines. They occur in sparsely treed prairie, prairie parkland, along stream bottoms, and in grassland habitats. MFWP notes that merlin were present in the Powder River watershed, but that little current information is available.

Upland Game Birds

The following section from the Billings and Big Dry RMPs describes habitat preferences and important natural history information for the prairie sharp-tailed grouse *(Tympanuchus phasianellus jamesi*) and greater sage grouse (*Centrocercus urophasianus*) that applies to the entire planning area. Sharp-tails are widely distributed and are generally found in the grassland, shrub-grassland, and woodland vegetation areas. Sharp-tail habitat includes hills, benchlands, and other areas of rolling topography that have good stands of residual cover composed chiefly of grasses for roosting, feeding, and nesting. Dancing grounds, or leks, are usually flat areas on elevated knolls or benches. The dancing or mating sites are nearly bare of vegetation, although brushy cover is located nearby for feeding and escape. The breeding and nesting period from March to June is the most critical period in the life cycle. Females nest and raise their broods in the grassy uplands, usually within 1 mile of mating grounds.

Studies in southwestern North Dakota have shown that more than 90 percent of the nest sites were in residual vegetation over 6 inches high, and 70 percent

of brood locations were in vegetation over 9 inches high (Kohn 1976). Habitat preferences in this planning area are similar.

Sage grouse are discussed under *Species of Concern* later in this *Wildlife* section.

Neotropical Migrants

A wide variety of neotropical migrants pass through or breed in the planning area. Habitat types that would be expected to support the highest species richness and highest breeding densities include cottonwood and ash riparian communities (Hopkins 1984) and emergent wetland communities. Hansen (2001) indicated that large blocks of native grasslands in Blaine County are very important to several species of birds that are declining in numbers, including Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit *(Anthus spragueii*), chestnut-collared longspur (*Calcarius lapponicus*), and McCown's longspur (*Calcarius mccownii*). A number of other bird species, including the Brewer's sparrow (*Spizella breweri*), and loggerhead shrike (*Lanius ludovicianus*), are also declining throughout their range.

Reptiles and Amphibians

The MT-GAP (1998) indicates that the emphasis area supports 9 species of amphibians and 14 species of reptiles. These include 1 salamander, 4 frogs, 4 toads, 3 turtles, 2 lizards, and 9 snakes. MFWP has expressed particular concern about 5 of these species including the northern leopard frog (*Rana pipiens*), tiger salamander (*Ambystoma tigrinum*), hognose snake (*Heterdon nasicus*), milk snake (*Lampropeltis triangulum*), and the spiny softshell (*Trionyx spiniferus*).

Leopard frogs have declined substantially in western, and to a somewhat lesser extent, central Montana (MT-GAP 1998). They are locally abundant in southeastern Montana (Reichel and Flath 1995). They are associated with permanent slow moving water bodies with considerable vegetation, but may also range into moist meadows and grassy woodlands and occasionally agricultural areas (Nussbaum et al. 1983). They are most often associated with riparian habitats and on prairies near permanent water. Tiger salamanders occur throughout the planning area wherever there is terrestrial substrate suitable for burrowing and a nearby body of water for breeding (MT-GAP 1998). All amphibians are particularly susceptible to adverse effects of water quality degradation because larval stages are spent in water and they absorb water through their skin during all life stages.

The western hognose snake occurs in a variety of habitats throughout central and eastern Montana. They are especially associated with arid areas, prairie grasslands and shrublands, and floodplains with gravely or sandy soils (Reichel and Flath 1995). Milk snakes occur in suitable habitats throughout south central and southeastern Montana. Preferred habitats include sandstone bluffs, rock outcrops, grasslands, and open ponderosa pine and juniper stands (Hendricks and Reichel 1996). The spiny softshell is a riverine species that occurs primarily in the larger rivers of southeastern Montana. It is found in well-oxygenated, slower moving water with nearby mud flats and sandbars, and occasionally in back water sloughs (MT-GAP 1998).

Species of Concern

This section discusses wildlife species of concern that occur in the planning area. These include species listed or proposed for protection under the ESA, species classified as sensitive by the BLM or Forest Service, and species considered to be critically imperiled in the state of Montana. Table 3-29 and the following discussion present information about the species protected under ESA.

Birds

Sage Grouse

Sage grouse are widely distributed in suitable habitat, but because their numbers have declined significantly throughout their range over the last 20 years they are a possible candidate for listing under the ESA. Sage grouse are primarily associated with big and silver sagebrush communities in grassland-shrub and shrub vegetation types. The importance of mature sagebrush with a good under story of grasses and forbs to sage grouse is well documented.

Sage grouse males appear to form leks opportunistically at sites within or adjacent to potential nesting habitat. Although the lek may be an approximate center of annual ranges for non-migratory populations (Eng and Schladweiler 1972, Wallestad and Pyrah 1974, Wallestad and Schladweiler 1975), this may not be the case for migratory populations (Connelly et al. 1988, Wakkinen et al. 1992). Average distances between

TABLE 3-29
ENDANGERED, THREATENED, AND PROPOSED ANIMAL SPECIES PRESENT IN THE CBM EMPHASIS AREA

Common Name	Scientific Name	Habitat in Montana	Federal Status*
Birds			
mountain plover	*Charadrius montanus*	Arid, shortgrass prairieland in eastern Montana	PT
bald eagle	*Haliaeetus leucocephalus*	Forested riparian areas throughout the State	T
interior least tern	*Sterna antillarum athalassos*	Sandbars and beaches in eastern Montana and along the Yellowstone and Missouri rivers	E
Mammals			
gray wolf	*Canis lupus*	Adapted to many habitats, need large ungulate prey base and freedom from human influence	E/10(j)
black-tailed prairie dog	*Cynomys ludovicianus*	Short-grass and mixed-grass prairie in the east of the 110th Meridian; concentrations are in southern Philips County, Custer County, Blaine County, Fort Belknap Reservation, and Crow Reservation	C
Canada lynx	*Felis lynx canadensis*	Montana spruce/fir forest in western Montana	T
black-footed ferret	*Mustela nigripes*	Prairie dog complexes in Eastern Montana	E
grizzly bear	*Ursus arctos horribilis*	Alpine/subalpine coniferous forest in Western Montana	T

*T=Threatened; E=Endangered; C=Candidate; PT=Proposed Threatened;
E/10(j)= Endangered/Experimental Populations.

nests and nearest leks vary from 0.66 to 3.75 miles but documented distances from leks with which females were associated to their nests have exceeded 12 miles. (Autenrieth 1981 Wakkinen et al. 1992, Fischer 1994, Hanf et al. 1994, Lyon 2000). Nests are placed independent of lek location (Bradbury et al. 1989, Wakkinen et al. 1992). Nesting habitat is usually located under sagebrush, and with about 50 percent of nests located within 2 miles of leks (Wallestad and Pyrah 1974; Martin 1970). Sagebrush provides 80 to 100 percent of their winter diet (Wallestad and Schladweiler 1975; Martin 1970; Eng and Schladweiler 1972). For winter, sage grouse prefer an area where sagebrush shrubs are at least 12 inches high (BLM 1995). Forbs, especially dandelion and salsify, are an important dietary component for the juveniles and adults in the spring and summer and wet meadows and other riparian areas are heavily used in the summer as sagebrush areas dry out.

Mountain Plover

This species has been proposed for listing as threatened. It was once widely distributed across short-grass prairies on the western Great Plains, occupying a range extending from Montana to New Mexico and Texas. Conversion of native prairies to agriculture has significantly reduced suitable breeding habitats for this species. It prefers level sites with very short grass and scattered cactus. Intensive grazing is beneficial for mountain plovers, and they also regularly occupy prairie dog towns. High, arid

plains and shortgrass prairie with blue grama-buffalo grass communities are the primary habitat. The mountain plover does not winter in Montana, but may breed within the planning area, particularly in black-tailed prairie dog towns. It currently breeds in central, north-central, and southwest Montana and is transitory in other parts of Montana, such as the Greater Yellowstone Ecosystem. Blaine and Phillips counties currently support the bulk of mountain plovers that nest in Montana.

Bald Eagle

This species was reclassified from endangered to threatened, because of recovery status, on July 12, 1995. Bald eagles concentrate in and around areas of open water where waterfowl and fish are available. They prefer solitude, late-successional forests, shorelines adjacent to open water, a large prey base for successful brood rearing, and large, mature trees for nesting and resting.

Bald eagle recovery zones include the Powder and Missouri rivers. Bald eagles commonly nest along the Yellowstone River in Rosebud and Custer counties. The Yellowstone River is used during spring and fall migration. Peak occurrence is November through April. The Missouri, Yellowstone, Musselshell, and Powder rivers provide habitat during migration as well as during the winter months. Bald eagles currently are expanding their nesting territories down the Yellowstone River (Flath 1991).

Interior Least Tern

The historic distribution of the interior least tern is the major river systems of the plains states and midwestern United States. The occurrence of breeding least terns is localized and is highly dependent on the presence of dry, exposed sandbars and favorable river flows that support a forage fish supply and isolate the sandbars from the riverbanks. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand and gravel bars within a wide, unobstructed, water-filled river channel. In the upper Missouri River Basin, it often nests with piping plovers. During spring and fall migrations, the least tern uses stockwater reservoirs (Flath 1991).

The least tern is known to nest in the planning area. Its habitat includes graveled islands in the lower Yellowstone River and the Missouri River below Fort Peck dam.

Peregrine Falcon

The peregrine falcon was delisted on August 25, 1999, and protection from take and commerce for the peregrine falcon is no longer provided under the ESA. However, peregrine falcons are still protected by the Migratory Bird Treaty Act (MBTA). The MBTA and its implementing regulations (50 CFR parts 20 and 21) prohibit take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11). With limited exceptions, take will not be permitted under MBTA until a management plan is developed in cooperation with state wildlife agencies, undergoes public review, is approved, finalized, and published in the FR.

Peregrine falcons migrate through the planning area during spring and fall, especially along rivers and other water bodies that support waterfowl and shorebirds. Peregrines are believed to nest northeast of Great Falls, possibly within the planning area.

Mammals

Gray Wolf

This species was listed as endangered on March 11, 1967. On November 18, 1994, the FWS announced that experimental populations of this species would be reintroduced in central Idaho and southwestern Montana. Populations classified as experimental are exempt from full endangered status. Historically, the gray wolf ranged throughout Montana. It appears to have been common throughout the State, inhabiting both short and tall grass prairie as well as forested regions. It has no particular habitat preference, but requires areas with low human population, low road density, and high prey density, which are ideally large, wild ungulates.

Most confirmed wolf sightings and pack accounts are for western Montana, along the Bitterroot divide, and in the areas around Yellowstone National Park, where it has been reintroduced (Fisher et al. 1998).

Black-tailed Prairie Dog

This species was proposed for listing as threatened on March 25, 1999. On February 3, 2000, the FWS determined that the black-tailed prairie dog warrants listing under the ESA. However, because there are other species also awaiting listing that are in greater need of protection, the FWS is not proposing to list

the species at this time, but it still remains a candidate for listing.

Although the original abundance of prairie dogs in Montana is unknown, early accounts indicate they were abundant and widely distributed east of the Continental Divide in grasslands and sagebrush-grasslands. This species is capable of colonizing a variety of shrub-grassland and grassland habitats. Generally, the most frequently used habitats in Montana are dominated by western wheatgrass, blue grama, and big sagebrush and located in relatively level areas in wide valley bottoms, rolling prairies, and the tops of broad ridges. The black-footed ferret is an obligate predator of prairie dogs. Other species with close associations to prairie dogs are burrowing owls, mountain plovers, and ferruginous hawks. These are all species of concern.

Canada Lynx

This species was listed as threatened on March 24, 2000. It is dependent on snowshoe hares and found in the same habitats, which include dense, mature old-growth lodgepole pine, Douglas-fir, Engelmann spruce, and subalpine fir forest. Distribution and primary potential habitats for Montana are in the western portion of the State in mature coniferous forests with a well-developed understory. Dens are primarily located in mature lodgepole pine and spruce-fir forests.

Black-footed Ferret

This species was listed as endangered on March 11, 1967. Black-footed ferrets depend almost exclusively on prairie dogs for food and shelter. They primarily prey on prairie dogs and use their burrows for shelter and dens. Ferret range is coincident with that of prairie dogs. There is no documentation of black-footed ferrets breeding outside of prairie dog colonies. There are specimen records of black-footed ferrets from ranges of three species of prairie dogs: the black-tailed prairie dog (*Cynomys ludovicianus*), white-tailed prairie dog (*Cynomys leucurus*), and Gunnison's prairie dog (*Cynomys gunnisoni*).

The Montana Black-footed Ferret Working Group has studied prairie dog towns capable of supporting black-footed ferrets. They are assessing the possibility of black-footed ferret reintroduction, and have released a paper suggesting eight possible reintroduction sites in Montana (Clark et al. 1982). One of these sites is located in Custer and Prairie counties.

Grizzly Bear

This species was listed as threatened on March 11,1967. On November 11, 2000, the FWS listed some populations in Montana and Idaho as experimental in order to facilitate restoration to designated recovery areas. The grizzly (or brown) bear was once found in a wide variety of habitats including open prairie, brushlands, riparian woodlands, and semidesert scrub. Its distribution in Montana is now limited to the Northern Continental Divide Ecosystem and the Yellowstone Ecosystem with a few in the Cabinet-Yaak Ecosystem. Scattered individuals may occur in the mountainous areas of western Montana. It no longer exists in the wild in eastern Montana. Most populations require vast areas of suitable habitat to prosper. This species is common only in habitats where food is abundant and concentrated, including white-bark pine, berries, and salmon or cutthroat runs, and where conflicts with humans are minimal.

State Species of Special Concern

In addition to species that are federally protected under the ESA, the State of Montana has designated additional species of concern within its jurisdictional boundaries. There are five rankings for State Species of Special Concern. This document focuses only on the highest ranking (S1). This ranking is defined as critically imperiled because of extreme rarity (five or fewer occurrences, or very few remaining individuals), or because some factor of its biology makes it especially vulnerable to extinction.

State-listed species (with BLM and USFS rankings) that have potential distributions within the 16-county emphasis area of this EIS or that have undefined distributions in the state are listed in the Wildlife Appendix, *Wildlife Species of Concern* (see Table WIL-1 for Special Status Species of State of Montana, BLM and USFS). Species that are federally listed under the ESA have been omitted from these tables because they have been considered. Table WIL-1 also lists vertebrate species that are species of concern for the state, BLM, or the USFS.

Aquatic Resources

Aquatic habitat in the CBM emphasis area that supports, or could potentially support, fisheries and other aquatic resources briefly described in the following paragraph includes rivers, streams, lakes, and stock ponds. Extensive information on aquatic habitat and fisheries resources in the Billings and Powder River RMP areas and in Gallatin, Park, and

Blaine counties is contained in the Montana NRIS on the Internet at http://nris.state.mt.us/wis/mris1.html (Montana NRIS 2001). Tables WIL-2 through WIL-5 in the *Biological Appendix* summarize representative planning area information from the Montana NRIS (2001) Internet database. Table WIL-2 summarizes aquatic resources characteristics of major drainages and representative tributaries within the boundaries of each RMP area and county. These characteristics include drainage length, aesthetics, fisheries management, fisheries resource value, number of fish species present, and whether a dewatering problem has been identified. The relative abundances of fish species present in major drainages and representative tributaries are summarized in Table WIL-3 (Billings RMP area), Table WIL-4 (Powder River RMP area), and Table WIL-5 (Park, Gallatin, and Blaine counties). The scientific names of fish species discussed in the following text are given in Tables WIL-3, WIL-4, and WIL-5.

Numerous other aquatic resources besides fish are present in emphasis area water bodies. These resources often are important in the diet of various species of fish, or they comprise part of the food web that fish ultimately depend on in their diet. Examples of other aquatic resources include benthic macroinvertebrates and microinvertebrates, zooplankton, phytoplankton, periphyton (attached algae), snails, clams, and worms. Numerous taxa of aquatic insects whose distribution and abundance vary with geographic location, habitat type, and habitat condition occur in planning area drainages. Immature and adult forms of Plecoptera (stoneflies), Ephemeroptera (mayflies), Trichoptera (caddisflies), and Diptera (true flies) are particularly important in the diets of juvenile and adult trout, whitefish, and other native fish species.

Fish and other aquatic species that have been listed, proposed, or are candidates for listing as federally endangered or threatened species, or have otherwise been designated as federal or state sensitive species or species of concern, are discussed under *Special Status Species* in this Aquatic Resources section.

Billings RMP Area

Major rivers and streams in the Billings RMP area are the Yellowstone River and its tributaries in the southern two-thirds of the area, and the Musselshell River and its tributaries in the northern one-third of the area. Both of these rivers eventually drain to the Missouri River outside of the RMP area. Major tributaries to the Yellowstone River are the Boulder, Stillwater, Clarks Fork of the Yellowstone, and Bighorn rivers. Careless Creek is a major tributary to the Musselshell River. Each of the referenced drainages is characterized by a dendritic pattern of tributaries, with flows ranging from perennial to ephemeral (MBOGC 1989). Examples of other water bodies that provide important habitat for aquatic resources in this resource area are Bighorn Lake, Cooney Reservoir, Big Lake, Lebo Lake, numerous mountain lakes at higher elevations, and miscellaneous water bodies such as storage reservoirs and stock ponds.

The Billings RMP area drainages listed in Table WIL-2 have been characterized as ranging from "national renown" in the more upstream reaches to "stream and area fair" in some of the downstream reaches (Montana NRIS 2001). Designated fisheries management in these drainages is for trout, except in the Yellowstone River east of Billings (managed for warm/cool water and non-trout species) and in the downstream section of the Clarks Fork of the Yellowstone (managed for non-trout species) (see Table WIL-2). The fisheries resource value in these drainages is either outstanding, high, or substantial, except in the Little Bighorn River (moderate value) and Careless Creek (moderate or limited value in some reaches). The greatest numbers of fish species are generally found in the more downstream reaches of larger drainages, with comparatively fewer species present in the more upstream, or upstream reaches of, tributaries. Numbers of fish species present vary from 32 in the Musselshell River, 28 in the Yellowstone River east of Billings, 20 in the Yellowstone River west of Billings, 9 in the Boulder and Stillwater rivers, and 8 in the Little Bighorn River (see Table WIL-2).

Table WIL-3 provides detail about the relative abundance of fish species collected from each of the Billings RMP area drainages listed in Table WIL-2. Many of the same fish species are abundant or common in many of these drainages, although there is a pattern, proceeding downstream, of increased species diversity and the replacement of predominantly cold water species by cool and warm water species. Examples of abundant or commonly occurring game fish in the Yellowstone River west of Billings are rainbow trout, brown trout, mountain whitefish, and burbot (ling); abundant or common non-game fish species in this reach of the Yellowstone River include, among others, goldeye, longnose sucker, white sucker, mountain sucker, shorthead redhorse, and mottled sculpin (see Table WIL-3). The same species of trout and whitefish, as well as Yellowstone cutthroat trout and brook trout, also are abundant or common in the Boulder and

Stillwater rivers. By comparison, these same species of salmonids are either uncommon in occurrence or absent from the mainstem Yellowstone River east of Billings. Instead, game fish typically associated with cool or warm water regimes—such as channel catfish, northern pike, smallmouth and largemouth bass, yellow perch, sauger, and walleye—first appear in river collections or are more abundant than farther upstream (see Table WIL-3).

Fish species present in the Clarks Fork of the Yellowstone and in the Bighorn River generally represent a subset of fish species present in nearby reaches of the Yellowstone River. There are more fish species present in the downstream sections of the Clarks Fork (19 species) and the Bighorn (30 species) than in their upstream sections (12 species in the Clarks Fork and 17 species in the Bighorn) (see Table WIL-2). Rainbow trout, brown trout, and mountain whitefish are present in both sections of the Clarks Fork and Bighorn rivers, but these species are more abundant in the upstream than downstream sections (see Table WIL-3). Yellowstone cutthroat trout also are present in the Clarks Fork, and Arctic grayling are present in the upstream section of the Clarks Fork. Other game species present in these two drainages include channel catfish, burbot, and sauger in the downstream section of the Clarks Fork, and channel catfish, northern pike, burbot, smallmouth bass, sauger, and walleye in both sections of the Bighorn River. The Little Bighorn River, which is tributary to the downstream section of the Bighorn River, supports five commonly occurring game fish species, including rainbow trout, brown trout, mountain whitefish, channel catfish, and smallmouth bass (see Table WIL-3).

A variety of 32 fish species are present in the Musselshell River within the Billings RMP area (Table WIL-2). More than half of these species have been rated as abundant or common in occurrence in various fisheries studies conducted on this drainage (see Table WIL-3) (Montana NRIS 2001). Examples of game species present in the Musselshell, which is managed as a trout fishery within the RMP area, include brown trout, mountain whitefish, channel catfish, black bullhead, northern pike, smallmouth bass, sauger, and walleye. Examples of dominant non-game species present in the Musselshell are goldeye, common carp, sand shiner, flathead chub, longnose dace, longnose sucker, white sucker, mountain sucker, shorthead redhorse, and mottled sculpin. The ten species of fish present in Careless Creek, a tributary to the Musselshell, are dominated by non-game fish, such as lake chub, flathead chub, longnose dace, and white sucker. The only game fish reported from Careless Creek is brook trout, which is common in occurrence (see Table WIL-3).

Some of the storage reservoirs and stockponds in the Billings RMP area, and in other planning area reservoirs and stockponds, have been stocked with various game fish species. Examples include northern pike, largemouth bass, yellow perch, walleye, bluegill, crappie, and rainbow trout (MBOGC 1989, BLM 1995). Rainbow trout must be restocked regularly because they will not reproduce in ponds, but other species such as bass, perch, bluegill, and crappie may establish self-sustaining populations in ponds.

Water quality in perennial rivers and streams within the Billings RMP area is generally good. Water quality in the Yellowstone River has been rated as good for wildlife uses, while water quality in the Musselshell River has been rated as satisfactory for wildlife uses (BLM 1995). The BLM (1995) also reported that the area's semiarid climate is not conducive to maintaining fish habitat and populations in most intermittent streams. However, Regele and Stark (2000), citing the Montana Fish, Wildlife, and Parks (MFWP), stated that perennial as well as intermittent prairie streams in southeastern Montana are important in the life histories of native fish species and often provide spawning and rearing habitat for mainstem fish species.

Powder River RMP Area

Major rivers and streams that comprise important aquatic habitat in the Powder River RMP area are the Yellowstone River and its tributaries in the western two-thirds of the area, and the Little Missouri River and its tributaries in the eastern one-third of the area. All of these rivers eventually drain to the Missouri River outside of the RMP area. Major tributaries to the Yellowstone River are the Tongue (and Tongue River Reservoir), Little Powder, and Powder rivers, and Rosebud, Pumpkin, Otter, Armells, Hanging Woman, and Mizpah creeks. Box Elder Creek is a tributary to the Little Missouri River. The referenced drainages are characterized by a dendritic pattern of perennial and ephemeral tributaries (MBOGC 1989). Examples of other water bodies that provide habitat for aquatic resources in this RMP area are lakes, storage reservoirs, and stock ponds.

The Powder River RMP area drainages listed in Table WIL-2 have been characterized as typically ranging from "clean stream and natural setting" to "stream and area fair," although the Powder River varies from "natural and pristine beauty" in the upstream section to "low" in the downstream section

(Montana NRIS 2001). Fisheries management in these drainages is for non-trout species, warm/cool water species, or has not been designated, except in the upstream section of the Tongue River where designated fisheries management is for trout. The fisheries resource value in most of these drainages is either high, substantial, or moderate, except in some reaches of Pumpkin and Mizpah Creeks that have limited fisheries resource value. The greatest numbers of fish species are generally found in the more downstream or downstream reaches of larger drainages, with fewer species present in the more upstream or upstream reaches of smaller tributaries. Numbers of fish species present vary from 40 in the Yellowstone River and 33 in the downstream section of the Tongue River to 13 in the Little Powder River and 18 in the Little Missouri River (see Table WIL-2).

Table WIL-4 provides detail on the relative abundance of fish species collected from many of the Powder River RMP area drainages listed in Table WIL-2. The number of fish species in this reach of the Yellowstone River (40 species) is considerably greater than in the Yellowstone within the Billings RMP area east of Billings (28 species) and west of Billings (20 species). The most abundant game fish in the Yellowstone River in the Powder River RMP area are shovelnose sturgeon, paddlefish, channel catfish, burbot, sauger, and walleye. Lesser numbers of a wide variety of other game species also are present, such as northern pike, various sunfishes, smallmouth and largemouth bass, white and black crappie, and rainbow and brown trout. Examples of some of the more abundant non-game species in the Yellowstone are goldeye, common carp, emerald shiner, flathead chub, river carpsucker, white sucker, shorthead redhorse, and stonecat. The federally-listed endangered pallid sturgeon occurs rarely in the Yellowstone River within this RMP area (see Table WIL-4).

Species present in tributaries to the Yellowstone River within the Powder River RMP area generally overlap with those species present in the mainstem Yellowstone. However, species composition in the tributaries is less diverse overall, particularly in the smaller drainages and in the upstream sections of drainages (see Table WIL-4). Some of the fish species dominant in the Yellowstone also are prominent in sections of the Tongue and Powder rivers. Examples include shovelnose sturgeon, channel catfish, sauger, goldeye, common carp, flathead chub, white sucker, and shorthead redhorse. Other game species present in the Tongue and Powder rivers include northern pike, walleye, several species each of bullheads, sunfishes, and crappies in the Tongue River; burbot, green sunfish, and walleye in the Powder River; and rainbow and brown trout, which are uncommon in occurrence, in the upstream sections of the Tongue and Powder rivers (see Table WIL-4).

Considerably fewer game species are present in the smaller Powder River RMP area tributaries listed in Table WIL-2. For the following tributaries, the only game species reported as common in occurrence are channel catfish, northern pike, burbot, and sauger in Rosebud Creek, which drains directly to the Yellowstone; channel catfish in Pumpkin Creek, which is tributary to the downstream section of the Tongue River; and channel catfish in the Little Powder River, which is tributary to the downstream section of the Powder River (Montana NRIS 2001) (see Table WIL-4). The Little Missouri River, which empties into the Missouri River and contains 18 fish species, supports four game species, including channel catfish, black bullhead, green sunfish, and sauger (see Table WIL-4).

Water quality conditions and concerns in perennial, intermittent, and ephemeral drainages in the Powder River RMP area are generally similar to those described for drainages in the Billings RMP area. Water quality in the Yellowstone and Powder rivers has been rated as good for wildlife uses (MBOGC 1989).

Elser et al. (1980) reported the results of extensive fisheries investigations conducted on numerous large and small drainages in southeastern Montana. The authors found that the lower Yellowstone River in this part of the State supports a diverse, productive fishery that is dependent on adequate flows and good water quality. Elser et al. (1980) reported that in the Tongue River, fish populations range from a cold water-mixed population downstream of the dam at Tongue River Reservoir to an assemblage of slow-water species downstream near the river's mouth. They added that migrant fish species from the Yellowstone River depend on high spring flows to allow good passage into the Tongue River. Elser et al. (1980) noted that fish populations in the Powder River are limited in diversity and abundance because of water quality and water quantity conditions. Fish populations are probably limited for similar reasons in the Little Missouri River, which Elser et al. (1980) described as having highly erratic flows, fair to poor water quality, very hard water, and moderate to high turbidities.

Park, Gallatin, and Blaine Counties

Various water bodies provide important aquatic habitat and sustain valuable fisheries in Park, Gallatin, and Blaine counties. Important habitat in Park County includes the Yellowstone River as it flows north from Yellowstone National Park, tributaries to the Yellowstone such as Shields River, and numerous mountain lakes. The Yellowstone River in Park County is of "national renown," is managed for its trout fishery, and has an outstanding fisheries resource value (see Table WIL-2). Shields River has been characterized as a "clean stream in a natural setting," is managed for its trout fishery, has a high to substantial fisheries resource value, but also is periodically dewatered (Montana NRIS 2001).

The Yellowstone River in Park County supports 12 species of fish. Yellowstone cutthroat trout, rainbow trout, brown trout, and mountain whitefish are the dominant game species, with longnose sucker, white sucker, longnose dace, and mottled sculpin among the dominant non-game species (see Table WIL-5). Shields River, with 10 fish species, generally supports the same assemblage of dominant cold water game and non-game fish as the Yellowstone River. Water quality in the referenced Park County drainages, and in drainages in Gallatin and Blaine counties discussed in the following text, generally tends to be good to excellent, primarily because of the proximity to headwaters or the often undeveloped or remote nature of the surrounding areas.

Major drainages in Gallatin County include the Gallatin, Madison, and Jefferson rivers and their tributaries, which combine to form the Missouri River. These rivers and streams are managed for, and support, nationally renowned trout fisheries that have either an outstanding, high, or substantial fisheries resource value (see Table WIL-2). The Gallatin County drainages vary from "national renown" to "clean stream and natural setting." However, periodic dewatering problems have been identified for portions of the Missouri and Gallatin rivers, and chronic dewatering problems have been identified for portions of the Jefferson and Gallatin rivers (Montana NRIS 2001).

The relative abundance and kinds of fish species present in the referenced Gallatin County drainages are similar, varying from 13 species in the Missouri and Madison rivers to 12 species in the Jefferson and Gallatin rivers. Dominant game fish include brown trout, rainbow trout, and mountain whitefish, with dominant non-game fish consisting of longnose sucker, white sucker, longnose dace, and mottled sculpin. Other less abundant cold water game species present in some of these drainages include Yellowstone cutthroat trout, westslope cutthroat trout, brook trout, and Arctic grayling. Table WIL-5 provides further information on fish species present and their relative abundance in these drainages.

Important aquatic habitat in Blaine County includes the Missouri River and its tributaries, such as Cow Creek, in the southern half of the county, as well as the Milk River and its tributaries, such as Lodge and Peoples creeks, in the northern half of the county. The Milk River empties into the Missouri River east of Blaine Country. Examples of other water bodies that provide important aquatic habitat in Blaine County are North Chinook Reservoir and Putnam Lake. The Missouri River in Blaine County is of "national renown," is managed as a non-trout fishery, and has an outstanding fisheries resource value (see Table WIL-2). Its tributaries in Blaine County have been characterized as of "clean stream and natural setting" or "stream and area fair," and have a fisheries resource value of high, substantial, or moderate. Cow Creek and part of Peoples Creek are managed as trout fisheries, while the Milk River, Lodge Creek, and part of Peoples Creek are managed for non-trout species (Montana NRIS 2001).

The numbers of fish species present in Blaine County drainages listed in Table WIL-2 vary from 31 in the Milk River and 26 in the Missouri River to eight in Cow Creek (see Table WIL-5). Many of the same fish species are abundant or common in the Missouri and Milk rivers and are dominated by species with warm or cool water preferences. Examples include goldeye, common carp, emerald shiner, flathead chub, longnose dace, and stonecat. Examples of other commonly occurring species in these drainages include shovelnose sturgeon, western silvery/plains minnow, longnose sucker, channel catfish, and sauger in the Missouri River, and lake chub, northern redbelly/finescale dace, white sucker, burbot, yellow perch, sauger, and walleye in the Milk River. Of the eight species present in Cow Creek, which is managed as a trout fishery, only brook trout occur in abundance. Examples of commonly occurring species in Lodge and Peoples creeks include: lake chub, common carp, fathead minnow, black bullhead, northern pike, and yellow perch in Lodge Creek; longnose dace, redside shiner, brook trout, and mottled sculpin in Peoples Creek; and white sucker and western silvery/plains minnow in both creeks. The federally listed endangered pallid sturgeon occurs rarely in the Missouri River within Blaine County (see Table WIL-5).

Special Status Species

Many federally listed threatened, endangered, or candidate species of special concern exist in the planning area that are given special consideration under Section 7(c) of the ESA of 1973. As required by the ESA, the FWS has provided a list of endangered, threatened, and proposed species that may be present in the planning area. This section reviews the habitat requirements of the three special status aquatic species identified by the FWS (see Table 3-30), as well as the likelihood of them being found in the 16 counties that may be potentially affected by this project.

Montana Arctic Grayling

This species is a candidate for listing under the ESA. On October 2, 1991, a petition requested that the "fluvial Arctic grayling" be listed as an endangered species throughout its historic range in the lower 48 states. The petitioners stated that the decline of the fluvial Arctic grayling was a result of many factors, including habitat degradation as a result of the effects of domestic livestock grazing and stream diversions for irrigation, competition with nonnative trout species, and past overharvesting by anglers. Additionally, the petition stated that much of the annual recruitment is lost in irrigation ditches. Historically, this species was widely, but irregularly, distributed and locally abundant above Great Falls in the upper Missouri River drainage in Montana. (FWS 1994c).

Pallid Sturgeon

This species was listed as endangered on September 6, 1990 (55 FR 36641). They evolved in large rivers with high turbidity and a natural hydrograph consisting of spring flooding and other natural highwater events. Historically in Montana, they occupied reaches of the Missouri River from Fort Benton downstream and in the Yellowstone River from Miles City to the Missouri River (FWS 1993). There are three priority recovery management areas in Montana, two on reaches of the Missouri and one on the Yellowstone River.

Warm Spring Zaitzevian Riffle Beetle

This species is a candidate for listing. This species is only known to inhabit a single warm springs in Gallatin County near the city of Bozeman.

TABLE 3-30
SPECIAL STATUS AQUATIC SPECIES PRESENT IN THE CBM EMPHASIS AREA

Common Name	Scientific Name	Habitat in Montana	Federal Status*
Fish			
Montana Arctic grayling	*Thymallus arcticus*	Fluvial populations in the cold-water, mountain reaches of the Upper Missouri River	C
Pallid sturgeon	*Scaphirhynchus albus*	Bottom dwelling fish of the Missouri and Yellowstone rivers	E
Invertebrates			
Warm spring zaitzevian riffle beetle	*Zaitzevia thermae*	Warm springs in Gallatin County	C

*E=Endangered; C=Candidate.