# 3.0 AFFECTED ENVIRONMENT

This chapter describes the existing condition of the physical, biological, cultural, and socioeconomic resources of the HDEPA. The resources addressed herein were identified during the internal and public scoping processes as having the potential to be affected by project-related activities. Critical elements of the human environment (BLM 1988a), their status in the HDEPA, and their potential to be affected by the proposed project are listed in Table 3.1. Five critical elements (areas of critical environmental concern [ACEC], environmental justice [minority and/or low-income populations], prime or unique farmlands, wild and scenic rivers, and wilderness) are not present in the HDEPA; therefore, these five elements are not addressed further in this EA. In addition to the nine remaining critical elements, this EA also discusses topography and physiography; geology and geological hazards; mineral resources; paleontological resources; soils; noise and odor; vegetation; wildlife and fisheries; socioeconomics; land use (including livestock/grazing management and recreation); and aesthetic and visual resources. Wild horses do not occur on the HDEPA and are not discussed in this document.

## 3.1 PHYSICAL RESOURCES

### 3.1.1 Climate and Air Quality

The HDEPA is located in a semiarid, steppe (dry and cold), midcontinental climate regime typified by dry windy conditions, limited rainfall, and long cold winters. The average annual temperature is approximately 42°F (Western Regional Climate Center [WRCC] 2000a, 2000b), and monthly mean temperatures range from a low of 11°F in January to a high of 83°F in July. The average annual precipitation is approximately 10 inches, with the majority falling from April to October; 30% occurs from thunderstorms during the summer months of June through August (Martner 1986). The average annual snowfall is approximately 39 inches, with January being the month of greatest accumulation (WRCC 2000a, 2000b). Snow accumulation patterns are determined by the effects of topography and vegetation on windblown snow and have a marked effect on vegetation, wildlife, hydrology, and human activities. Annual pan evaporation rate is an estimated 60 inches, while reservoir evaporation, representing anticipated conditions is approximately 42 inches (see Appendix B).

Table 3.1 Critical Elements of the Human Environment.[1]

| Element | Status on the HDEPA | Addressed in Text of EA |
|---|---|---|
| Air Quality | Potentially affected | Yes |
| Areas of critical environmental concern | None present | No |
| Cultural resources | Potentially affected | Yes |
| Environmental justice | None present | No |
| Farmlands, prime or unique | None present | No |
| Floodplains | Potentially affected | Yes |
| Native American religious concerns | Potentially affected | Yes |
| Nonnative invasive species | Potentially affected | Yes |
| Threatened and endangered species | Potentially affected | Yes |
| Wastes, hazardous or solid | Potentially affected | Yes |
| Water quality (surface and ground water) | Potentially affected | Yes |
| Wetlands/riparian zones | Potentially affected | Yes |
| Wild and scenic rivers | None present | No |
| Wilderness | None present | No |

[1] As listed in BLM *National Environmental Policy Act Handbook H-1790-1* (BLM 1988a) and subsequent Executive Orders.

The HDEPA is located in a region of Wyoming known as the wind corridor, where cold wind from the west and southwest is channeled eastward across the Continental Divide (Martner 1981). Annual wind speeds average 4.5-21.5 mph and are greater during the afternoon and in the winter. The wind corridor has some of the strongest and most persistent winds in the U.S. (Martner 1986). There would be no impacts to climate from the proposed project, and it is not discussed further in this EA.

Air quality in the region is generally good (BLM 1995a, 1995b). Management for air quality includes the prevention of deterioration of air quality beyond applicable local, state, or federal standards; the enhancement of air resources of high quality where practicable; and the preservation of scenic values that may be impaired by the release of total suspended particulates (TSP) or other contaminants into the air that would adversely affect visibility (BLM 1988b:60).

The HDEPA is in the Hanna Basin and is part of the Laramie Air Basin (BLM 1987:167-168), which includes much of south-central Wyoming. The basin is bordered by the Wyoming-Colorado state line to the south, the Laramie Mountains to the east, the Granite Mountains to the North, and the Great Divide Basin to the west. Air transport from the west and southwest dominates in level terrain areas, and dispersion results from unstable conditions induced by surface heating during the day. Stable conditions may be expected at night as the earth cools. In areas with significant terrain features such as the Medicine Bow, Shirley, and Green Mountains, transport is more complex. Typical mountain-valley coupling effects are evident in these areas, along with significant diurnal variations in local winds (BLM 1987:167).

The HDEPA is in an area designated a Prevention of Significant Deterioration (PSD) Class II area under the WDEQ/AQD Implementation Plan (BLM 1987:154-169). PSD Class II areas are those that may be developed, and the release of limited concentrations of certain pollutants over Class II PSD increments is permitted so long as NAAQS are maintained and emissions are within the PSD Class II increment (WDEQ 2000). The nearest PSD Class I area (an area where little air quality deterioration is allowed) is the Savage Run Wilderness, approximately 50 mi south-southeast of the HDEPA. Although the Savage Run Wilderness has not been designated Class I by Congress and thus legally does not have to be managed as a Class I area, it has the legal requirement to be managed as a Class I area under the *Wyoming Air Quality Standards and Regulations* Chapter 6, Section 4(c) (personal communication, May 2001, with Darla Potter, WDEQ). Other Class I areas in the region include the Bridger Wilderness in Wyoming and the Mount Zirkel Wilderness in Colorado.

The *Clean Air Act* mandates that NAAQS, established by the EPA, must be maintained nationwide. NAAQS include standards for six "criteria" pollutants: ozone ($O_3$), nitrogen dioxide ($NO_2$), carbon monoxide (CO), respirable particulates ($PM_{10}$), sulfur dioxide ($SO_2$), and lead (Pb). Carbon County, Wyoming, is in an attainment area for all NAAQS "criteria" pollutants.

Visibility in the region is very good (generally greater than 70 mi), and particulates--fine particles carried by the wind from natural or manmade sources--are considered to be the main source of visibility degradation (BLM 1998a). Climatic factors such as prevailing winds, atmospheric stability, and mixing heights affect air quality by influencing the ability of air to disperse or dilute particulates and other pollutants. Unstable conditions caused by vertical movement of air heated near the ground during the day combined with moderate to high wind speeds provide conditions conducive to dispersing and diluting particulates and other pollutants and maintaining air quality (BLM 1987). These conditions occur more than 70% of the time throughout most of the region in which the HDEPA occurs.

### 3.1.2 Topography and Physiography

Situated along a series of low rises trending north-northeast by south-southwest, the exploration area lies roughly 7 mi north-northeast of the town of Hanna, southeast of Seminoe Reservoir, south of the Shirley Mountains, and southwest of the Freezeout Mountains. Elevation ranges from approximately 6,800 to 7,000 ft above sea level. The proposed pipeline corridor traverses the western flanks of Ridge No. 5 and Simpson Ridge at elevations ranging from 6,700 to 7,300 ft.

### 3.1.3 Geology and Geological Hazards

#### 3.1.3.1 Geology

Coals in the Tertiary Hanna Formation are the source for CBM in the exploration area. The Hanna Formation crops out throughout the exploration are and may be greater than 11,000 ft thick (personal communication, December 29, 1992, with Jason Lillegraven, Professor, University of Wyoming [UW]) (Figure 3.1). It is composed of lenticular, discontinuous

Figure 3.1 Surface Geology.

alternating beds of variously colored shales, massive to cross-bedded calcareous sandstones, thin lenses of conglomerate (Knight 1961; Richter 1981), and at least 32 coal seams greater than 5 ft thick (Glass and Roberts 1980). The structural axis of the asymmetrical syncline that formed the Hanna Basin crosses the HDEPA.

Quaternary alluvium and colluvium crop out along the Medicine Bow River in the northern portion of the HDEPA (Love and Christensen 1985). No other formations occur in the exploration area. The pipeline corridor crosses the Ferris, Medicine Bow, and Mesaverde Formations and the Lewis Shale.

The Hanna Basin and neighboring basins and mountains were formed during the Laramide orogeny, a complex period of deposition and intense deformation (i.e., folding, faulting, or mountain-building) that formed the Rocky Mountains (Knight 1961; Richter 1981). The sedimentary rocks that make up the Hanna Formation within the Hanna Basin are moderately folded with minor faults having vertical displacements of up to 200 ft (Glass and Roberts 1980). The majority of the faults in the HDEPA have displacements of less than 50 ft (personal communications, March 25, 1992, with Rod Bernasek, Consulting Geologist, and with Clark Ditzler, Vice President, Exploration, MetFuel) (Richter 1981); however, fault displacement (along one or more splays of the Shirley Thrust) of several thousand feet along the northern boundary of the HDEPA have been noted (personal communication, December 29, 1992, with Jason Lillegraven, Professor, UW). Hanson and Schug (1979) showed that some geologic units of the Hanna Formation may be correlated across small areas.

#### 3.1.3.2 Mineral/Oil and Gas Resources

Coal and CBM gas are the principal fossil fuel resources in the HDEPA. Chapter 2.0 describes the resource recovery potential for CBM in the HDEPA.

Coal. Coals in the Hanna Formation occur throughout the Hanna Basin. These coals are nonmarine strata and were deposited during the Laramide orogeny between 66 million and 58 million years ago and are generally ranked subbituminous C to high-volatile C bituminous.

The Hanna Basin Coalfield in-place coal resources are estimated at 23.3 billion tons and are valued at approximately $6.7 billion; however, no currently economically producible coals occur within the exploration area, and the subject is not discussed further in this EA.

Underground and surface coal mining has occurred in the Hanna Basin since the 1860s (Figure 3.2). Prior to 1979, 189.6 million tons of coal were mined from the Hanna coalfield (Glass and Roberts 1980)--109.9 million tons from underground mining and 79.7 million tons from surface mining. In 1980, six companies were mining coal in the Hanna field at a rate of 15 million tons per year. Currently, there are six active surface coal mines in the Hanna Basin, four of which are undergoing final reclamation. The underground Shoshone coal mine ceased mining in December 2000 and is currently reclaiming surface disturbances.

Additionally, two historical underground coal mines in the HDEPA produced minor quantities of coal prior to abandonment (personal communication, March 6, 1992, with Richard Jones, Wyoming Geological Survey). The Rock Crossing Mine, located in Section 33, T24N, R81W, probably mined Hanna Coal Number 88 and was abandoned in 1906. The Coulter Mine, in Section 35, T24N, R81W, mined Hanna Coal Number 89. No coal was produced from two state leases in the HDEPA (lease numbers 0-21609, Section 36, T24N, R81W; and 0-30571; Section 36, T24N, R82W) (personal communications, March 6, 1992, with Donna Glissman, Secretary, WDEQ-LQD, and March 10, 1992, with Deborah Johnson, Audit Technician, Wyoming Public Lands).

Gas and Oil. Previous attempts at gas development in the Hanna Basin have been unsuccessful. Several holes (Sections 4 and 10, T23N, R81W, and Section 27, T24N, R81W), presumed to be exploration gas wells, have been drilled, but no gas was produced (personal communication, February 28, 1992, with Cheryl Volk, Clerical Specialist, WOGCC). In the early 1990s, MetFuel Wyoming Inc. proposed full field development in largely the same location as the Hanna Draw Federal Unit (BLM 1993), but the project was never developed. Nine CBM wells are currently completed in the exploratory area, all of which occur on private land. No oil exploration or development has occurred in the HDEPA.

Figure 3.2 Location of Local Surface and Underground Coal Mines.

Locatable Minerals. Federal minerals, except those specifically available through lease or sale, are available by location under the *General Mining Law of 1872*. No locatable minerals (e.g., iron, copper, gold, asbestos, jade) are known to occur within the HDEPA (BLM 1987:126); therefore, locatable minerals are not discussed further in this EA.

Saleable Minerals. The *Materials Act of 1947*, as amended (30 *United States Code* [U.S.C.] 601 et seq.), and promulgating regulations found in Title 43 C.F.R., Part 3610, govern federal minerals such as sand, stone, gravel, and rock and authorized the BLM to sell federal mineral materials at fair market value. Sand and gravel deposits, consisting of alluvium and colluvium, may be found along the Medicine Bow River or in alluvial fans or terraces in the HDEPA (BLM 1987:127). The Hanna Formation is a known source of scoria deposits that have been mined at adjacent coal mines, but no scoria is presently being mined in the HDEPA. No saleable mineral permits have been issued within the HDEPA, and there are no other known local occurrences of mineral resources in the vicinity, so saleable minerals are not discussed further in this EA.

3.1.3.3 Geological Hazards

No known or suspected active faults occur in the area (Case 1990; Case et al. 1990). Potential for seismicity is as follows: a hypothetical earthquake which could 1) cause negligible damage to "well-designed structures and well-built structures, slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built structures" or 2) cause slight damage in “specially designed structures, considerable damage in ordinary buildings with partial collapse, and great damage in poorly built structures" (Case 1994).

Earthquake damage is caused primarily by ground motion from seismic waves traveling through the earth. The earthquake damage described would likely result from ground acceleration values (a measure of potential ground motion) of 10 to 30 (expressed as percent of gravity). In the HDEPA, there is a 2% chance that in 1 in 50 years an earthquake would cause ground acceleration to exceed 16 to 20 and thus cause damage equal to or greater than that described above. This type of earthquake has a probability of occurring once in 2,500 years. About once every 500 years, an earthquake may occur which would do more than crack plaster or cause it to fall and cause damage to chimneys.

An earthquake with an epicenter in the Como area (approximately 5 mi to the east-southeast) occurred in 1973 (Case 1986), and two earthquakes with intensities of III and IV on the modified Mercali scale occurred near Medicine Bow (approximately 20 mi to the east) in 1938 and 1952. (Intensity, as measured on the modified Mercali scale, is a qualitative estimate of the perceived amount of ground-shaking.) Earthquakes with intensities of III and IV are noticeable indoors but only barely, if at all, noticeable outdoors. The Seminoe Reservoir area in the northern part of the Hanna Basin experienced five earthquakes with magnitudes of 2.9-3.1 on the Richter scale between 1989 and 1993 (Case 1990, 1994). (The Richter scale is a quantitative measure of the magnitude of an earthquake--the relative amplitude of ground motion caused by seismic waves. Magnitudes of 2.9-3.1 are relatively small.)

Subsidence of abandoned underground coal mines (i.e., Rock Crossing Mine, Coulter Mine) is a very minor potential hazard in the HDEPA. No subsidence has been observed at these mines, and the potential for subsidence is low due to small mine size (personal communication, March 6, 1992, with Richard Jones, Wyoming Geological Survey). At small mines, minor subsidence is most frequently observed at or adjacent to the mine mouth. The large Shoshone underground mine partially underlies the Hanna Draw Federal Unit (Figure 3.2). It does not underlie any area proposed for exploration or pipeline construction, but a portion of the Hanna Draw Road used to access the HDEPA intersects the Shoshone Mine permit area.

Windblown deposits occur in Sections 11 and 12, T23N, R81W, in the exploration area and in isolated patches along the proposed pipeline corridor (personal communication, June 2001, with Jim Case, Wyoming State Geological Survey). Windblown deposits in the exploration area are associated with playas. Along the pipeline, they occur in mixed deposits with alluvium and rock.

The only known landslides in the HDEPA occur along the western flank of Simpson Ridge adjacent to the proposed pipeline corridor (personal communication, June 2001, with Jim Case, Wyoming State Geological Survey). These are classified as slump/flow complexes.

Flood Insurance Rate Maps or Flood Hazard Boundary Maps have not been developed for the HDEPA, so the HDEPA is classified as Zone D (areas of undetermined but possible flood hazard). There is potential for flooding along the dry washes and the ephemeral and perennial streams in the HDEPA. The largest floodplain occurs along the Medicine Bow River in the northern portion of the HDEPA. Smaller floodplains occur along some of the creeks and washes throughout the HDEPA. Flooding in ephemeral drainages is generally in response to high-intensity (large quantity per unit of time) localized storms. Such storms cause most of the floodwater damage, surface erosion, arroyo formation, and sediment deposition in arid and semi-arid environments (Branson et al. 1981). Martner (1986) indicated an average of 40 thunderstorms per year in the vicinity.

No other known geologic hazards occur within the project area.

### 3.1.4 Paleontological Resources

Geologic mapping documents four sedimentary deposits exposed at the surface in the HDEPA (Love and Christensen 1985; Love et al. 1993; Lillegraven and Snoke 1996). These include, from youngest to oldest: 1) unnamed deposits of late Holocene age, including unconsolidated aeolian sands, stream gravels, alluvium, and colluvium; 2) Hanna Formation of Paleocene and possibly earliest Eocene age; 3) Ferris Formation of late Cretaceous and Paleocene age; and 4) Medicine Bow Formation of Late Cretaceous age.

With the exception of the Holocene deposits that are probably too young to contain fossils, these sedimentary rock units have produced scientifically significant fossils vertebrate resources in areas immediately adjacent to the Hanna Draw area and for that reason are classified as satisfying BLM Paleontology Condition 2 (H8270-1 General Guidance for Paleontological Resource Management) (Table 3.2) (Winterfeld 2001). Condition 2 may trigger formal analysis of existing data prior to authorizing land use actions involving surface disturbance.

Fossil vertebrates in areas surrounding the HDEPA document the history of animal and plant life in Wyoming during the latest part of the Mesozoic and earliest part of the Cenozoic Era. Most

Table 3.2 Summary of Surface Geologic Deposits and Paleontologic Resources Hanna Draw CBM Area.

| Geologic Deposit | Geologic Age | Type of Deposit/ Environment of Deposition | Fossil Resources | BLM Paleontologic Condition[1] | Area Present |
|---|---|---|---|---|---|
| Alluvial sediments (alluvium and colluvium) | Holocene | Unconsolidated silts, sands of valleys and plains; terrestrial-fluvial | None | 3 | Widespread |
| Terrace deposits | Pleistocene | Gravels, silts and sands that predate current erosional cycle; terrestrial-fluvial | None | 3 | Scattered along modern river and stream drainages |
| Hanna Formation | Paleocene | Sands, silts, coals, shales, conglomerate; terrestrial-fluvial, lacustrine, swamp | Vertebrates, invertebrates, plants | 2 | Exploration area, pipeline corridor |
| Ferris Formation | Latest Cretaceous to Paleocene | Sands, silts, shales, rare coals, conglomerates; terrestrial-fluvial, alluvial fan | Vertebrates, invertebrates, plants | 2 | Pipeline corridor, south of Highway 287/30 |
| Medicine Bow Formation | Latest Cretaceous | Sands, silts, coals, shales; marine-estuarine, brackish, deltaic, terrestrial-fluvial | Vertebrates, invertebrates, plants | 2 | Pipeline corridor, south of Highway 287/30 |
| Lewis Shale | Latest Cretaceous | Sands, silts, shales; marine shoreline, nearshore, offshore | Vertebrates, invertebrates, trace fossils | 2 | Pipeline corridor, along Highway 72 |

[1] See text for explanation.

importantly, these deposits preserve strata containing the Cretaceous-Tertiary boundary, which dates to the time of the extinction of the dinosaurs and adaptive radiation of mammals, and the Paleocene-Eocene boundary, which dates to the transition from archaic to modern orders of mammals (Winterfeld 2001).

BLM paleontology conditions are the basis for establishing the paleontologic potential of surface geologic formations and in determining the need for additional consideration. These categories, include the following.

Condition 1. Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources will be necessary if the

BLM field office review of available information indicates that such fossils are present in the area.

Condition 2. Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these same units where they are exposed in the area of consideration.

Condition 3. Areas that are unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils based on their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or aeolian deposits or the presence of deep soils. However, if possible, it should be noted at what depth bedrock may be expected in order to determine if fossiliferous deposits may be uncovered during surface-disturbing activities.

Search of the locality records of the paleontologic collections housed at the Department of Geology and Geophysics at UW revealed no designated fossil localities within the HDEPA (personal communication, June 2001, with Jason Lillegraven, UW). No other museums were contacted because field parties from UW have been the only group to conduct paleontologic research in the Hanna Basin in recent times.

The Hanna, Ferris, and Medicine Bow Formations and Lewis Shale, however, are known to produce vertebrate fossils of scientific significance in areas adjacent to the HDEPA. For that reason, these formations satisfy BLM Paleontologic Condition 2.

The Hanna Formation produces the remains of terrestrial and aquatic vertebrates, invertebrates, and plants of Paleocene to possibly earliest Eocene age (Gill et al. 1970; Ryan 1977; Lillegraven 1995; Eberle and Lillegraven 1998a). Plants from the formation include microfossil (pollen) and megafossil (leaf and stem imprints and petrified and carbonized wood) remains. Prior to the 1970s, the only vertebrate fossils reported from the Hanna Formation were those mentioned by Bowen (1918), who reported on the sparse occurrence of fish scales, turtle fragments, and the fragmentary jaw of the condylarth genus Claenodon. During the late 1970s, Lillegraven and

Eaton discovered a lower jaw of the phenacodont condylarth genus Tetraclaenodon. More recent work completed in the 1990s by UW field parties documented fossil vertebrates including a wide variety of mammals, reptiles, and fish of Paleocene age. In addition, a specimen of early horse, Hyracotherium, was discovered from near the top of the unit that suggests the top of the Hanna Formation is earliest Eocene in age (Eberle and Lillegraven 1998a, 1998b).

In the Carbon Basin (approximately 16 mi southeast of the exploration area), the Hanna Formation has produced the remains of 33 mammalian species comprising seven orders and 16 families that are middle to late Paleocene in age (Secord 1998). Although fish fossils are known from the Hanna Formation within the boundaries of the Hanna Draw Federal Unit, they are of no special importance scientifically (personal communication, June 2001, with Jason Lillegraven, UW). In addition, no terrestrial vertebrates have been found in the exploration area. The pipeline corridor, however, crosses several fossil-bearing formations and is known to have produced fragmentary fossils.

The Ferris Formation has produced fossils ranging in age from Latest Cretaceous to Early Paleocene age. The Ferris Formation has produced scientifically significant fossil vertebrates, including the remains of 59 species of early Paleocene (Puercan) mammals (Eberle and Lillegraven 1998a, 1998b; Eberle 1996). The vertebrate fauna of the Ferris is of particular importance because it spans the Cretaceous-Tertiary boundary and provides critical information on the diversification of mammals at the beginning of the Cenozoic Era. In addition, the formation preserves fossil leaves and shells of freshwater invertebrates and trace fossils.

The Medicine Bow Formation has produced the remains of terrestrial vertebrates and plants and marine and freshwater invertebrates. Plants known from the formation include microfossil (pollen) and megafossil (leaf and stem imprints, and petrified and carbonized wood) remains. Well-preserved fossil leaf floras have been described from the formation by Dorf (1942). Invertebrate fossils include marine foraminifera and brackish water gastropods and bivalves, represented by at least 21 species (Gill et al. 1970; Fox 1971). Dinosaur bone fragments from the ceratopsian Triceratops have long been known from the lower part of the formation (Bowen 1918; Lull 1933; Breithaupt 1985, 1994), and the formation has also produced the remains of a small number of mammals of Lancian (Latest Cretaceous) age (Lillegraven 1993, 1995; Secord 1998). The lower part of the Medicine Bow Formation has little potential for vertebrate fossils because of its marine nature (personal communication, June 2001, with Jason Lillegraven, UW).

The Lewis Shale is known to preserve a variety of marine invertebrate fossils, including many genera of bivalves, baculites, scaphites, and ammonites. Isurid shark teeth have also been recovered from the formation at localities in Carbon County (Breithaupt 1985). The Fox Hills Sandstone, which is often lumped with the Lewis because it is too thin to map separately on smaller scale maps, is known to preserve shallow-water marine invertebrate fossils, including a large variety of clams and snails, three distinctive types of ammonites, a species of bryozoan, and trace fossil Ophiomorpha burrows. The remains of marine fish--sharks, rays, and bony fish--and marine crocodiles and lizards (mosasaurs) have been reported from localities in the Fox Hills Sandstone in Sweetwater and Converse Counties in Wyoming (Winterfeld 1978; Breithaupt 1985).

### 3.1.5 Soils

Soils within the HDEPA have been preliminarily mapped by the Natural Resources Conservation Service (NRCS). Available maps show 19 major soil mapping units in the HDEPA (Table 3.3). Soils are extremely variable and may be clayey, sandy, or loamy; deep or very shallow; saline or neutral; and poorly drained or well drained. The 19 soil units can be grouped into four major types based on topographic positions: upland soils (i.e., soils on uplands, pediments, high alluvial fans, or high river terraces); bottomland and stream terrace soils (i.e., soils on streambanks or low alluvial fans); dissected upland soils (i.e., soils on dissected uplands or at rock outcrops); and playa soils (NRCS 2001).

Soil depths in the upland soils ranges from 0 to more than 87 inches. Slopes are typically 0 to 6%. Water erosion hazard is slight or moderate, and wind erosion is moderate to severe. Shallow depths, low permeability, and alkalinity are other limitations to development and/or productivity on these soils.

Table 3.3 Soil Characteristics.

Table 3.3 Soil Characteristics.[1]

| Mapping Unit | Depth to Bedrock (inches) | Slope (%) | Permeability | Water Erosion Hazard | Soil Blowing Hazard | Limitations | Limitations for Road Construction |
|---|---|---|---|---|---|---|---|
| **Uplands, Pediments, High Alluvial Fans, High River Terraces** | | | | | | | |
| 253 - Blazon-Cushool Association [2, 3] | 14-35 | 0-6 | Moderate | Slight to moderate | Moderate to severe | Shallow | Moderate to severe: depth to rock |
| 254 - Abston-Seaverson complex[2] | 14-32 | 0-6 | Low | Slight | Severe | Severe wind erosion hazard, alkalinity, shallow | Severe: excess sodium, depth to rock |
| **Streambanks, Floodplains, Low Alluvial Fans** | | | | | | | |
| 210 - Absher Variant very fine sandy loam [2, 3] | $\geq$ 87 | -- | Low | Moderate | Severe | Severe wind erosion hazard, alkalinity, clay | Severe: excess sodium |
| 257 - Havre Variant - Glendive Variant complex [2] | $\geq$ 63 | 0-3 | Moderate to moderately rapid | Moderate | Moderate to severe | Moderate to severe wind erosion hazard, flooding | Slight |
| **Dissected Uplands, Cuestas, Rock Outcrops** | | | | | | | |
| 235 - Blaxon complex [2, 3] | 13 | 6-40 | Moderate | Severe | Moderate | Severe water erosion hazard | Severe: slope |
| 252 - Blazon-Rentsac complex [2, 3] | 10-14 | 10-50 | Moderate | Severe | Moderate | Moderate wind erosion hazard, severe water erosion hazard, shallow | Severe: slope, depth to rock |
| 401 - Torriorthents/Rock Outcrop [2, 3] | 0-n.a. | 30-60 | -- | -- | -- | -- | Severe: depth to rock |
| 1203 - Rentsac-Shinbara/ Rock Outcrop [3] | 0-20 | -- | Moderate to rapid | Severe | Moderate | Moderate wind erosion hazard, severe water erosion hazard, shallow | -- |

Table 3.3 (Continued)

| Mapping Unit | Depth to Bedrock (inches) | Slope (%) | Permeability | Water Erosion Hazard | Soil Blowing Hazard | Limitations | Limitations for Road Construction |
|---|---|---|---|---|---|---|---|
| **Playas** | | | | | | | |
| 255 - Playa [2] | -- | 0 | -- | -- | -- | Salinity, severe wind erosion hazard | -- |
| 258 - Rock River-Cushool Complex [3] | 20->60 | 0-12 | Moderate | Slight | Severe | Shallow, severe wind erosion hazard | -- |
| 38A - Rock River sandy loam [3] | >60 | 2-6 | Moderate | Slight | Severe | Severe wind erosion hazard | -- |
| 236 - Cushool-Worfman-Blackhall Complex | 6-40 | 2-20 | Moderate to moderately rapid | Slight to severe | Severe | Shallow, severe wind erosion hazard | -- |
| 931-Forelle [3] | >60 | 0-6 | Moderate | Slight to moderate | Severe | Severe wind erosion hazard | -- |
| 245 - n/a [4] | -- | -- | -- | -- | -- | -- | -- |
| 13B - Rhoamett silty clay [3] | >60 | 0-2 | Low | Slight | Slight | Shrink-swell, low strength, alkalinity | -- |
| 264 - Rentsac channery loam [3] | 10-20 | 5-50 | Moderately rapid | Moderate | Slight | Shallow, slope | Severe: depth to rock, slope |
| 208 - Pinelli-Forelle Complex [3] | >60 | 3-15 | Moderately slow to moderate | Slight to moderate | Moderate | Shrink-swell, low strength, wind and water erosion hazard | -- |
| 261 - Luhon - Rock River Association [3] | >60 | 0-10 | Moderate | Slight to moderate | Moderate to severe | Severe wind erosion hazard | -- |
| 51WA - Patent Variant very fine sandy loam[3] | >60 | 0-3 | Moderate | Moderate | Moderate | None | -- |

[1] Source: NRCS (unpublished data).
[2] Occurs in proposed drilling area.
[3] Occurs along proposed pipeline corridor.
[4] No information available from the NRCS.

Bottomland and stream terrace soils occur along stream channels, floodplains, and low alluvial fans adjacent to stream channels. Slopes are typically 0 to 3%. The potential for water erosion is slight to moderate except along stream channels where active channel cutting may be occurring. The soil blowing hazard is moderate to severe. Other factors that may potentially limit development or productivity include alkalinity, high clay content, low permeability, and flooding (NRCS 2001).

Soils on dissected uplands are very shallow (typically less than 20 inches deep if soil is even present at all) and often are actively eroding. Bedrock frequently crops out, and soil development may be limited. Water erosion and soil blowing hazards are slight to severe (Table 3.3) (NRCS 2001).

Two playas occur in Section 12 in the exploration area. Slopes are near 0%. Productivity may be limited by high salinity (BLM 1993).

Most soils in the HDEPA are used for livestock grazing and wildlife habitat. Productivity varies depending on numerous factors, such as soil depth, texture, topographic slope, slope aspect, and permeability. Bottomland and stream terrace soils are most productive with an average of 500 to 3,000 lbs air-dried vegetation per acre per year. Upland soil productivity ranges from 400 to 1,600 lbs per acre of air-dried vegetation on lands in excellent condition. Dissected upland soil productivity is unknown but is probably relatively low. Playa productivity may be relatively high if salinity is not a limiting factor, but if salinity is a factor, the productivity would be low (NRCS 2001).

### 3.1.6 Water Resources

#### 3.1.6.1 Surface Water

The exploration area and the proposed pipeline corridor lie within the North Platte River drainage basin (BLM 1987). Surface drainage in the vicinity is generally toward the Medicine Bow River, a perennial river that may experience periods of very low flow, especially during fall and winter uses (Figure 3.3) (U.S. Geological Survey [USGS] 1994). The Medicine Bow River derives most of its flow from snowmelt and, to a lesser extent, from ground water inflow and occasional thunderstorms. For the 54-year period between 1940 and 1993, mean daily flow in the Medicine Bow River near Hanna was typically less than 20 cfs but ranged from 12 to 3,059 cfs. Flows were highest during May-June and lowest in September and January (USGS 1994). Several springs occur along the pipeline corridor, but none occur in the exploration area.

Surface water quality in the area is fair. The Medicine Bow River is a Class 2 water (WDEQ 1990), which are waters other than Class 1 waters that presently support or have the potential to support game fish or include nursery areas or food sources to support game fish. The Medicine Bow River supports a cold-water fishery as well (BLM 1990c). The pH is neutral to slightly alkaline, sulfates average approximately 500 mg/l, and chlorides range from 12 to 42 mg/l (Table 3.4). Total dissolved solids (TDS) may exceed 1,000 mg/l. Radium levels are low, averaging 0.25 picocuries/l. Water quality in the Medicine Bow River for all major surface water (i.e., livestock and wildlife watering, industry, primary contact recreation [swimming], irrigation, and human health value criteria [Gumtow 1994]) uses is unassessed (WDEQ 1998). All other streams within the HDEPA are Class 4 waters (WDEQ 1990), which do not have the hydrologic or natural water quality potential to support fish. Class 4 waters are protected for agriculture and wildlife watering uses. Levels of sulfates (1,242 mg/l) and TDS (2,023 mg/l) in Hanna Draw are high (Table 3.4), while pH is neutral to alkaline, and chloride levels average 28 mg/l. Radium-226 levels have not been measured.

Human health value criteria are a suite of water quality standards, and waters that meet or exceed these standards are classified as supporting human health value criteria and suitable for human use.

The exploration area is internally drained or drains to the northwest via an unnamed draw into Hanna Draw. The pipeline route would cross an estimated 13 ephemeral channels. The southern end of the pipeline drains to the west, generally into small basins with no outlet. At the northern

Figure 3.3 Surface Water Drainage.

Table 3.4 Surface Water Quality, Medicine Bow River and the Hanna Draw.[1]

| | Medicine Bow River[3] | | | Hanna Draw[2] | | |
|---|---|---|---|---|---|---|
| Water Quality Parameter[2] | Average | Standard Deviation | n[4] | Average | Standard Deviation | n[4] |
| Calcium (mg/l) | 114.80 | 46.13 | 13 | 223.70 | 86.09 | 13 |
| Chloride (mg/l) | 26.92 | 14.67 | 13 | 29.38 | 38.70 | 13 |
| Magnesium (mg/l) | 50.30 | 22.80 | 13 | 159.60 | 74.13 | 13 |
| pH (s.u.) | 8.20 | 0.16 | 7 | 7.97 | 0.54 | 13 |
| Potassium (mg/l) | 4.73 | 2.86 | 13 | 8.50 | 1.79 | 13 |
| Radium-226 (pCi/l) | 0.25 | 0.04 | 4 | -- | -- | -- |
| Sodium (mg/l) | 89.50 | 38.73 | 13 | 188.60 | 91.99 | 13 |
| Sodium absorption ratio | 1.73 | 0.42 | 13 | 2.23 | 0.76 | 13 |
| Sulfate (mg/l) | 495.30 | 231.40 | 13 | 1242.00 | 590.60 | 13 |
| Total alkalinity (mg/l) | 133.00 | 23.25 | 10 | 232.00 | 73.04 | 5 |
| TDS (mg/l) | 877.30 | 361.90 | 13 | 2023.00 | 901.50 | 13 |
| Total hardness (mg/l) | 496.10 | 210.90 | 13 | 1208.00 | 510.30 | 13 |

1 Source: Wyoming Water Research Center (1992).
2 µg = micrograms; mg = milligrams; pCi = picocuries, l = liters; µmhos = micromhos; s.u.= standard units.
3 Gauging station locations:
Medicine Bow River: SE¼ NW¼, Section 34, T24N, R81W
Hanna Draw: SW¼ NE¼, Section 34, T24N, R81W
4 Number of samples.

end of the pipeline route, drainage is northeast into Pine Draw, which is a tributary of the Medicine Bow River. The central pipeline corridor flows into Carbon Creek, which drains into Allen Lake and has no outlet.

3.1.6.2 Ground Water

Ground water within the HDEPA occurs in confined (artesian), semi-confined, and unconfined (water table) aquifers (Daddow 1986). Ground water is contained primarily in the sandstone and coal aquifers of the Hanna Formation in a complex array of rocks and geologic structures. The Hanna Formation is the uppermost member of the hydrologic unit, defined by Lowry et al.

(1983) and Richter (1981), which also includes the Ferris and Medicine Bow Formations, Fox Hills Sandstone, Lewis Shale, and the Mesaverde Group. The Hanna Formation and the minor alluvial and colluvial aquifers that occur along the HDEPA streams are on the only aquifers that would be affected by the proposed project.

Data obtained from the producing wells indicate that the radius of influence of the producing wells is small, as evidenced by the absence of observable well to well interactions (personal communication, August 2001, with Duane Zavadil, Williams).

The principal water-bearing units in the Hanna Formation are thin (5 to 60 ft) locally discontinuous sandstones, conglomerates, and coals (Richter 1981; Lowry et al. 1983; Arch Mineral Corporation 1991; Rosebud Coal Sales Company 1989). The Hanna No. 2 coal lies between strata with the lower hydraulic conductivities (personal communication, August 2001, with Duane Zavadil, Williams), so vertical water movement between the Hanna No. 2 coal and overlying aquifers would be minimal.

Quaternary alluvial deposits along the HDEPA streams may serve as small isolated surficial aquifers consisting of highly permeable unconsolidated sand and gravel. Because of their limited aerial extent, these surficial aquifers probably yield relatively small quantities of water. Alluvial deposits along the Medicine Bow River may be up to 100 ft thick (Lowry et al. 1973) and thus have the capacity to store large amounts of water, but these aquifers would not be affected by the exploration project and are therefore not discussed further in this EA.

Ground water recharge to the Hanna Formation is mainly from precipitation or snow melt near the basin margins where the aquifers crop out (Richter 1981). Recharge also occurs where streams cross the outcrops and from vertical leakage through underlying aquifers. Ground water movement in shallow aquifers is generally towards local surface drainages and ultimately to the Medicine Bow River (Richter 1981) or into basins with no outlet. Water-level data from the Seminoe I and II Coal Mines, located southwest of the proposed project area, indicate that the direction of ground water flow is to the northwest, nearly parallel to the strike of the coalbeds (Arch Mineral Corporation 1988, 1991).

While aquifer characteristics are poorly known, aquifer permeability and potential water yield tend to be related to rock characteristics and degree of fracturing (Richter 1981). Measured water yields from wells drilled in the vicinity range from very low (1 gallon per minute [gpm]) to moderate (150 gpm). Clinker deposits or alluvium may have higher yields. Well yields from coalbeds are expected to be approximately 550 bbl/day (0.36 cfs) initially, declining to 350 bbl/day (0.23 cfs) during 18 months of testing. Springs within the Hanna Basin (some of which occur along the proposed pipeline route) usually discharge between 1 and 10 gpm (Richter 1981).

Ground water levels in the area depend on the aquifer in which the well is completed and well depth. Thirty-four water well permits have been issued in the exploration area, 33 of which were recently permitted by the WSEO for development by Williams (see Appendix F). Nine of these 33 have been drilled for the purposes of CBM exploration, all on private land. The other well was developed by Arch Mineral Corporation. Completion depths of 3,576-4,260 ft below ground level were reported for five of Williams's wells. The Arch Mineral Corporation well was completed at 300 ft below ground surface. An additional 38 wells occur in the Hanna Draw Federal unit, most of which are associated with coal mine ground water dewatering or monitoring or with ranching. None of these wells are completed any deeper than 706 ft. Numerous abandoned wells/cancelled water rights were held by MetFuel, Inc., and these wells were completed at depths of 4,450-6,015 ft. Pipeline construction would not affect water wells. Existing data are limited and, therefore, the shape of the potentiometric surface within each water-bearing unit cannot be determined. Most of the coalbed and sandstone aquifers of the Hanna Formation dip into the basin. The lower aquifers usually crop out at higher elevations than the upper aquifers, and, therefore, the lower aquifers have a higher potentiometric surface in the center of the basin than the upper aquifers. Ground water elevations measured from wells in the vicinity range from 6,400 to 7,000 ft above sea level (BLM 1993). Static water levels range from 1 ft aboveground to 189 ft below ground.

A composite sample of six producing wells on private land in the exploration are and several other samples were collected and analyzed. The data show that the water is suitable for livestock and wildlife watering and aquatic life (Tables 3.5 and 3.6), the only uses proposed for the stored water.

### 3.1.7 Noise and Odor

Ambient noise levels throughout the HDEPA are generally rural in nature, with the only appreciable noise being wind, the existing CBM development, traffic, recreational off-road vehicles (ORVs), an occasional aircraft, and animals. The predominant noise source in the area is the wind, and ambient noise levels are strongly correlated with wind speed (BLM 1995a, 1995b). Average hourly wind speeds increase throughout the morning, peak in early afternoon, and decrease in late afternoon. Ambient noise levels follow a similar pattern, increasing from 30 to 40 A-weighted decibels (dBA) in the morning, increasing to 50 to 60 dBA during the afternoon, and then decreasing to 30 to 40 dBA in the evening. These levels correspond to the noise levels of a soft whisper (30 dBA), a quiet office (50 dBA), and a normal conversation (60 dBA). Traffic traveling to and from the existing CBM wells cause infrequent noise increases. Noise-sensitive areas in the HDEPA include greater sage-grouse leks and nesting areas during the breeding and nesting season, occupied raptor nests, and crucial winter range for big game species during severe winter.

No specific data are available for odors in the HDEPA; however, other than the natural odors created by vegetation, wildlife, and livestock, HDEPA odors are likely associated with existing CBM wells, roads, and coal mines. Occasional vehicular emissions from cars, trucks, and ORVs may also contribute to odors experienced on the HDEPA. Most odors are likely to be quickly dispersed by the wind.

Table 3.5 Produce Water Quality from Existing CBM Wells in the Exploration Area

Table 3.5 Produced Water Quality from Existing CBM Wells in the Exploration Area .[1]

| Parameter | Produced Water Quality | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Composite (6 wells) | NPDES Application[2] | Hanna Draw No. 1(a)[3] | Hanna Draw No. 18(a)[3] | Hanna Draw No. 18(b)[3] | Hanna Draw No. 1(b)[3] | Hanna Draw No. 10 | Hanna Draw No. 19 | Hanna Draw No. 6 |
| **MAJOR IONS** | | | | | | | | | |
| Bicarbonate as $HCO_3$ (mg/l) | 658 | 956 | 801 | 1,311 | 422 | 678 | 791 | 566 | 695 |
| Carbonate as $CO_3$ (mg/l) | <1 | na | 111 | 47 | 7.0 | 25.0 | 13 | 10.6 | 13.6 |
| Chloride (mg/l) | 16 | 484 | 843 | 24.3 | 10.5 | 35.0 | 32 | 11 | 15 |
| Fluoride (mg/l) | 3.0 | 2.6 | na | 2.62 | | | | | |
| Sulfate (mg/l) | 290 | 14.1 | <1.0 | 14.1 | 434 | 1,030 | 99 | 329 | 219 |
| Calcium (mg/l) | 6 | na | 22.8 | 12.7 | 10.8 | 7.0 | 12 | 5 | 6 |
| Magnesium (mg/l) | 3 | 0.32[2] | 13.1 | 3.9 | 2.5 | 2.6 | 3.5 | 1.3 | 1.5 |
| Potassium (mg/l) | 3 | na | na | 6.2 | 7.8 | 9.0 | 3.7 | 2.8 | 2.9 |
| Sodium (mg/l) | 380 | 22.3[2] | 587 | 440 | 366 | 386 | 339 | 354 | 349 |
| **METALS[3]** | | | | | | | | | |
| Aluminum (µg/l) | <50 | <50 | na | na | -- | -- | -- | -- | -- |
| Antimony, total (µg/l) | <5 | <5 | <5.0 | <5.0 | -- | -- | -- | -- | -- |
| Arsenic, total (µg/l) | 0.3 | 1.1 | 1.10 | <1.0 | -- | -- | -- | -- | -- |
| Barium, total (µg/l) | 200 | 1,191 | 2,300 | 181 | -- | -- | -- | -- | -- |
| Beryllium, total (µg/l) | <0.03 | <1 | <0.10 | <1.0 | -- | -- | -- | -- | -- |
| Boron, dissolved (mg/l) | <100 | na | na | 170 | -- | -- | -- | -- | -- |
| Cadmium (µg/l) | <0.1 | <0.1 | na | na | -- | -- | -- | -- | -- |
| Chromium (µg/l) | 4 | <1 | na | na | -- | -- | -- | -- | -- |
| Copper (µg/l) | 3 | 7 | na | na | -- | -- | -- | -- | -- |
| Iron, dissolved (µg/l) | 40 | 5,595 | 2,370 | 1,110 | 930 | 2,850 | 5,880 | 560 | 550 |
| Lead (µg/l) | <2 | na | na | na | -- | -- | -- | -- | -- |
| Manganese, dissolved (µg/l) | 75 | 115 | 80 | 140 | -- | -- | -- | -- | -- |
| Manganese, total (µg/l) | 80 | 145 | 100 | 140 | -- | -- | -- | -- | -- |

Table 3.5 (Continued)

| | Produced Water Quality | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Composite (6 wells) | NPDES Application[2] | Hanna Draw No. 1(a)[3] | Hanna Draw No. 18(a)[3] | Hanna Draw No. 18(b)[3] | Hanna Draw No. 1(b)[3] | Hanna Draw No. 10 | Hanna Draw No. 19 | Hanna Draw No. 6 |
| Mercury (µg/l) | <0.06 | <0.1 | na | na | -- | -- | -- | -- | -- |
| Nickle (µg/l) | <10 | <10 | na | na | -- | -- | -- | -- | -- |
| Selenium (µg/l) | <5 | <5 | na | na | -- | -- | -- | -- | -- |
| Silver (µg/l) | <3 | <3 | na | na | -- | -- | -- | -- | -- |
| Thallium, total (µg/l) | <10 | <10 | <10.0 | <10.0 | -- | -- | -- | -- | -- |
| Zinc (µg/l) | 20 | <10 | na | na | -- | -- | -- | -- | -- |
| **NON-METALS** | | | | | | | | | |
| Alkalinity, Total as $CaCO_3$ (mg/l) | 540 | 1075 | na | na | -- | -- | -- | -- | -- |
| Conductivity @ 25°C (µmhos/cm) | 1,650 | 3,185 | 4,410 | 1,060 | 1,710 | 1,760 | 1,540 | 1,630 | 1,600 |
| Cyanide, Total automated (µg/l) | <5.00 | 9.5 | 14.0 | <5.0 | -- | -- | -- | -- | -- |
| Hardness as $CaCO_3$ (mg/l) | 23 | 75 | 111 | 47 | 38.0 | 28.0 | 45 | 18 | 21 |
| pH s.u. | 8.67 | 8.5 | 8.83 | 8.2 | 8.45 | 8.81 | 8.47 | 8.52 | 8.54 |
| Sodium adsorption ratio (mg/l) | 34.7 | 20.7 | 24.2 | 17.2 | 26.0 | 31.5 | 22 | 36.1 | 32.9 |
| Total Dissolved Solids (mg/l) | 1,020 | 1,790 | 2,420 | 1,160 | 1,080 | 1,110 | 982 | 1,050 | 1,030 |
| Total Petroleum Hydrocarbons (mg/l) | <1.0 | na | <1.0 | <1.0 | -- | -- | -- | -- | -- |
| Radium 226 (pCi/l) | na | 1.4 | 2.3 | -- | -- | -- | -- | -- | -- |

1 na = constituent not reported; µg = micrograms; mg = milligrams; pCi = picocuries, l = liters; µmhos = micromhos; s.u.= standard units.
2 Produced water quality reported in Williams' NPDES application (see Appendix C).
3 Two samples (a and b) were collected and analyzed from Hanna Draw Well Nos. 1 and 18.
4 These analyses reported in milliequivalents/liter.
5 Soluble metals unless otherwise noted.

Table 3.6 WDEQ Water Quality Standards.

| Constituent[1] | Class 3A Surface Water (Chronic Level for Aquatic Life and Wildlife) | Acute Level for Aquatic Life and Wildlife | Class III Ground Water (Standard for Livestock Consumption) |
|---|---|---|---|
| Chloride (mg/l) | 230 | 860 | 2,000 |
| Sulfate (mg/l) | -- | -- | 3,000 |
| Aluminum (µg/l) | 87 | 750 | 5,000 |
| Cadmium (µg/l) | 2.2 | 4.3 | 50 |
| Chromium (µg/l) | 74.1 (III); 11 (VI) | 569.8 (III); 16 (IV) | 50 |
| Copper (µg/l) | 9 | 13.4 | 500 |
| Lead (µg/l) | 2.5 | 64.6 | 100 |
| Mercury (µg/l) | 0.77 | 1.4 | 0.05 |
| Nickel (µg/l) | 52.0 | 468.2 | -- |
| Selenium (µg/l) | 5 | 20 | 50 |
| Silver (µg/l) | -- | 3.4 | -- |
| Zinc (µg/l) | 118.1 | 117.2 | 25,000 |
| Boron (µg/l) | -- | -- | 5000 |
| Iron (µg/l) | 1,000 | -- | -- |
| Manganese (µg/l) | 1,462 | 3110 | -- |
| Arsenic (µg/l) | 150 | 340 | 200 |
| Cyanide, Total Automated (µg/l) | 5.2 | 22 | -- |
| pH (s.u.) | 6.5 - 9.0 | 6.5 - 9.0 | 6.5 - 8.5 |
| Total Dissolved Solids (TDS) (mg/l) | -- | -- | 5,000 |

[1] µg = micrograms; mg = milligrams; pCi = picocuries, l = liters; µmhos = micromhos; s.u.= standard units.

## 3.2 BIOLOGICAL RESOURCES

### 3.2.1 Vegetation

#### 3.2.1.1 Plant Communities

The major vegetation type within the HDEPA is sagebrush steppe (TRC Mariah Associates Inc. 2001), which occurs throughout the exploration area and along the pipeline corridor. The sagebrush steppe type consists of a mosaic of about 50% sagebrush shrublands and 50% open grassland. The rolling topography produces dry upland areas that support primarily herbaceous vegetation, while Wyoming big sagebrush communities dominate draws, depressions, and snow accumulation areas.

The sagebrush shrublands are dominated by Wyoming big sagebrush, black sagebrush, bitterbrush, and rabbitbrush. Common grasses and forbs include western wheatgrass, needle-and-thread grass, blue grama, prairie Junegrass, threadleaf sedge, wild buckwheat, western yarrow, scarlet globemallow, penstemon, and paintbrush.

The upland grass patches support communities of grasses, sedges, and forbs. Common grasses typically include needle-and-thread grass, bluebunch wheatgrass, and western wheatgrass. Common forbs include penstemon, western yarrow, and scarlet globemallow; upland sedges (e.g., threadleaf sedge) may also be present.

TEP&C plant species are discussed in Section 3.2.3.

#### 3.2.1.2 Wetlands/Riparian Areas

Numerous wetlands occur along the Medicine Bow River within the exploration area--none of these would be disturbed and thus are not discussed further in this EA. Six additional potential wetland sites are known to occur in the exploration area. Three of these wetland sites are diked or impounded (Figure 3.4) (USFWS n.d.), and Section 12 contains two large playas. Wetlands and other waters of the U.S. would be identified on a site-specific basis for all proposed well pad, road, and gathering line locations during the APD process.

Figure 3.4 Potential Wetlands.

The pipeline corridor contains over 50 potential wetlands. Once the pipeline route has been established, the acreage of wetlands and other waters of the U.S. to be impacted would be assessed and mitigation would be developed in consultation with the COE.

#### 3.2.1.3 Nonnative Invasive Species

No significant infestation of nonnative invasive species was noted on federal lands in the HDEPA during site visits in May and June (TRC Mariah Associates Inc. 2001). Although some small areas of nonnative invasive species invasion likely occur on the HDEPA, they are not widespread. Designated and prohibited nonnative invasive species that may occur in the area include field bindweed, Canada thistle, leafy spurge, perennial sow thistle, quackgrass, hoary cress (white top), perennial pepperweed (giant white top), ox-eye daisy, skeletonleaf bursage, Russian knapweed, yellow toadflax, Dalmation toadflax, Scotch thistle, plumeless thistle, dyers woad, houndstongue, musk thistle, spotted knapweed, diffuse knapweed, common burdock, purple loosestrife, and salt cedar (personal communication, May 2001, with Larry Justesen, Carbon County Weed and Pest District Supervisor).

### 3.2.2 Wildlife and Fisheries

The topography, water resources, soils, and vegetation on the HDEPA provide habitat for numerous wildlife species as discussed below.

#### 3.2.2.1 Big Game Animals

Two big game species, pronghorn antelope and mule deer, regularly occur on the HDEPA. Elk may also occasionally occur in the area but are not considered common residents.

Pronghorn Antelope. Pronghorn in the HDEPA belong to the Medicine Bow herd, which includes five hunt areas: 41, 42, 46, 47, and 48 (WGFD 2000). The WGFD population objective for the Medicine Bow herd is 45,000 animals, and the estimated end-of-year population in 1999 was approximately 31,542, 13,458 animals below objective. The 5-year population average for the herd is 27,802 or 62% of objective.

Approximately 2,804 acres (15%) of the pronghorn range on the HDEPA is considered crucial winter/year-long range (Figure 3.5). Winter/year-long range is that in which a portion of the area is used year-long but during winter has a significant influx of animals from other seasonal ranges (WGFD n.d.). In addition, crucial winter range is defined as winter range that has been documented as the determining factor in a population's ability to maintain itself at a desired level over the long-term (WGFD n.d.). Crucial winter/year-long range is located in the northern portion of the HDEPA on moderately dissected terrain containing sagebrush. The 2,804 acres of crucial winter range for pronghorn represent 15% of the total crucial winter range for the Medicine Bow herd. An estimated 7,152 acres (39%), located along the proposed pipeline corridor south of State Highway 30/287, is winter/year-long range. The remaining 45% of the HDEPA (8,195 acres) is considered year-long and spring/summer/fall pronghorn range.

Mule Deer. Mule deer in the HDEPA are part of three herds: the Shirley Mountain, Platte Valley, and Sheep Mountain herds (Figure 3.6). The Shirley Mountain herd unit contains hunt areas 70, 71, and 72 and occupies 52% of the HDEPA (9,461 acres). The WGFD population objective for the Shirley Mountain herd is 10,000 animals, and the estimated end-of-year population in 1999 was approximately 6,883 (WGFD 2000) or approximately 3,117 animals below objective. The 5-year population average was 7,367 mule deer, or 74% of objective. About 346 mule deer within this herd were harvested during the 1999 season.

Range types occupied by the Shirley Mountain herd within the HDEPA include year-long (41% of the HDEPA), crucial winter/year-long (<3%), and winter/year-long (8%) (Figure 3.6). The 540 acres of crucial winter/year-long range in the HDEPA represent <1% of the crucial winter range within the Shirley Mountain herd. Crucial winter/year-long range occurs along the Medicine Bow River in the HDEPA.

Less than 1% of the HDEPA is occupied by the Platte Valley mule deer herd (Figure 3.6), which includes hunt areas 78, 79, 80, 81, 83, and 161. The WGFD population objective for this herd

Figure 3.5 Medicine Bow Pronghorn Antelope Herd Range Types.

Figure 3.6 Shirley Mountain, Sheep Mountain, and Platte Valley Mule Deer Herd Range Types.

is 20,000 animals, and the estimated 1999 end-of-year population was approximately 16,206 (WGFD 2000) or 3,794 animals below objective; the 5-year population average was 14,001 mule deer, or 70% of objective for the herd. A total of 1,180 mule deer was harvested from the Platte Valley herd during the 1999 season. The only range type for this herd in the HDEPA is year-long range (77 acres).

Areas south of State Highway 30/287 within the proposed gas sales pipeline corridor are within the area occupied by the Sheep Mountain mule deer herd (hunt areas 61, 74, 75, 76, and 77); it comprises 54% (8,126 acres) of the HDEPA. The population objective for 2000 was 15,000 mule deer; actual population was estimated to be 13,656 or 1,344 deer below objective. About 477 mule deer within this herd unit were harvested in 1999. The only range type for this herd along the sales pipeline route is winter/year-long range. The pipeline corridor south of State Highway 30/287 crosses 8,533 acres (47% of the HDEPA) of winter/year-long range for the Sheep Mountain mule deer herd (Figure 3.6).

The southern portion of the pipeline corridor passes through elk winter/year-long range for the Snowy Range Herd. The project area is not considered to be range for white-tailed deer or moose, although white-tailed deer may be rare visitors (WGFD 2000).

3.2.2.2 Other Mammals

Based upon range and habitat preference, eight mammalian predator species are likely to occur on the HDEPA and adjacent areas (WGFD 1999; Clark and Stromberg 1987). These are coyote, raccoon, long-tailed weasel, badger, western spotted skunk, striped skunk, mountain lion, and bobcat.

Also based upon range and habitat information, three lagomorph species--desert cottontail, black-tailed jackrabbit, and white-tailed jackrabbit--would likely occur on the HDEPA (USGS 1996; Clark and Stromberg 1987; WGFD 1996; Mariah Associates, Inc. 1979). Other small mammals present would likely include least chipmunk, Wyoming ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, olive-backed pocket mouse, Ord's kangaroo rat, deer mouse, northern grasshopper mouse, bushy-tailed woodrat, and vole. White-tailed prairie dog colonies are also known to be present (Figure 3.7).

#### 3.2.2.3 Raptors

All raptors and their nests are protected from take or disturbance under the *Migratory Bird Treaty Act* (16 U.S.C. 701-715) and *Wyoming Statutes* 23-1-101 and 23-3-108. Certain species are also afforded protection under the *Bald Eagle Protection Act* (16 U.S.C. 668-668d) and ESA (16 U.S.C. 1531 et seq.).

Raptor species known to occur or to potentially occur in the project area include bald eagle, golden eagle, ferruginous hawk, rough-legged hawk, red-tailed hawk, Swainson's hawk, prairie falcon, peregrine falcon, American kestrel, merlin, Cooper's hawk, sharp-shinned hawk, northern harrier, turkey vulture, osprey, great-horned owl, and burrowing owl. Most breeding species migrate to more hospitable climates during the winter; however, golden eagles and great-horned owls may remain year-round.

Twenty-two known ferruginous hawk nests, two Swainson's hawk nests, five golden eagle nests, three red-tailed hawk nests, three prairie falcon nests, and four unknown raptor nests (Figure 3.8) are known to occur on or within 1.0 mi of HDEPA. The known raptor nests are located in topographically diverse areas within the HDEPA, and the numerous rock outcrops and cliffs in and adjacent to the HDEPA provide suitable substrates for raptor nesting; consequently, other nests are likely to occur in the vicinity. The entire HDEPA is considered suitable habitat for raptor hunting, foraging, and perching.

#### 3.2.2.4 Upland Game Birds

Two species of upland game birds, greater sage-grouse and mourning dove, occur within and adjacent to the HDEPA.

Figure 3.7 Prairie Dog Colonies.

Figure 3.8 Known Raptor Nests on or Adjacent to the HDEPA (Includes Nests that Are More Than 1.0 Mile from the Project Area Boundary).

Greater Sage-Grouse. Greater sage-grouse habitat is found throughout the HDEPA on bottomlands and uplands. Four known greater sage-grouse leks (strutting and breeding areas) occur in the proposed exploration area, one of which was found to be active in 2000 (Figure 3.9). Five leks occur within 2.0 mi of the proposed drilling area, two of which were active in 2000 and one of these two was active in 2001. An additional 23 lek locations occur on or within 2.0 mi of the proposed pipeline corridor, and two of these were active in 2001.

No greater sage-grouse wintering habitat occurs in the proposed exploration area (TRC Mariah Associates Inc. 2001). Approximately 1,500 acres within 2.0 mi of the pipeline corridor is greater sage-grouse wintering habitat (Figure 3.9) (TRC Mariah Associates Inc. 2001). The area within 2 mi of a lek is considered potential nesting habitat. Approximately 1,485 acres (8.2%) of the HDEPA is greater sage-grouse breeding habitat, and approximately 12,693 acres (70.2%) is potential nesting habitat (Figure 3.9). These acreages represent 1.1% and 1.8% of known breeding and nesting habitats respectively within the Great Divide Resource Area.

Mourning Dove. This species is a common breeding bird in HDEPA habitats (BLM 1993), although they migrate from the area during the fall and winter. Mourning dove concentrations are usually highest around power lines, buildings, and other areas of human disturbance. Doves likely occur in shrub-covered areas along perennial water sources and washes that provide nesting and roosting cover, and they may fly through the area.

#### 3.2.2.5 Other Birds

Numerous other birds may occur in the project area. The sagebrush steppe habitat attracts an assemblage of songbirds. Local waters/riparian areas attract numerous species of waterfowl, shorebirds, and waders.

Common nongame birds in the HDEPA, based upon range and habitat preference (USGS 1996; WGFD 1996), include common nighthawk, Say's phoebe, western kingbird, horned lark, swallow (violet-green, barn, etc.), black-billed magpie, common raven, rock wren, mountain bluebird, loggerhead shrike, Brewer's sparrow, vesper sparrow, sage sparrow, lark bunting, McCown's

Figure 3.9 Greater Sage-Grouse Habitat Within 2.0 Miles of the HDEPA.

longspur, red-winged blackbird, western meadowlark, Brewer's blackbird, common grackle, and brown-headed cowbird.

Several species of wading/shore birds and waterfowl may occur along the Medicine Bow River and within and around small perennial ponds in the HDEPA. Wading/shore birds may include such species as great blue heron, snowy egret, black-crowned night heron, American white pelican, killdeer, American avocet, and spotted sandpiper. Waterfowl species probably occurring on the HDEPA include pied-billed grebe, American coot, Canada goose, mallard, green-winged teal, northern pintail, blue-winged teal, northern shoveler, gadwall, American wigeon, common merganser, and ruddy duck. Any of these species may occasionally nest within the HDEPA (USGS 1996; WGFD 1999).

#### 3.2.2.6 Fisheries

The Medicine Bow River contains such game fish as brook trout, brown trout, rainbow trout, and walleye (BLM 1990c). Nongame fish include suckers (longnose and white), darters (Iowa and Johnny), creek chub, sand shiner, longnose dace, and carp. Hanna Draw contains fish species such as brook trout, brown trout, and creek chub, although additional species may move into Hanna Draw during periods of high flow. Fishing pressure on these drainages is minimal (BLM 1990c).

#### 3.2.2.7 Other Species

Several species of snakes likely occur in the HDEPA and adjacent lands, as do tiger salamander, northern leopard frog, eastern short-horned lizard, and northern sagebrush lizard.

### 3.2.3 Threatened, Endangered, Proposed, Candidate , and State-Sensitive Species

The ESA protects plants and animals and their critical habitats listed as TEP&C species. The USFWS provided a list of TEP&C species potentially present in the general HDEPA (Table 3.7). BLM’s list of sensitive species (BLM 2001) was used to identify other sensitive species

Table 3.7 USFWS List of TEP&C Species Potentially Affected by the Project.

| Common Name | Scientific Name | Status[1] | Habitat/Location |
|---|---|---|---|
| Bald eagle | *Haliaeetus leucocephalus* | T | Found throughout state |
| Black-footed ferret | *Mustela nigripes* | E | Prairie dog colonies |
| Canada lynx | *Lynx canadensis* | T | Montane forests |
| Mountain plover | *Charadrius montanus* | P | Grasslands |
| Blowout penstemon | *Penstemon haydenii* | E | Sand dunes north of Ferris Mountains |
| Platte River species | Various [2] | E | Downstream riverine habitat of the Platte River in Nebraska |
| Colorado River fish species | Various [3] | E | Downstream riverine habitat of the Yampa, Green, and Colorado River Systems |

1 T = threatened, E = endangered, P = proposed for listing as threatened or endangered.
2 Whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), and prairie fringed orchid (*Platanthera praeclara*).
3 Not listed here because the project area is not within the Colorado River Watershed.

potentially occurring in the area (Table 3.8). Canada lynx (threatened) and blowout penstemon (endangered) are listed as potentially occurring in Carbon County; however, no suitable habitat is present for these species and they are not discussed further in this EA. The project area is not within the Colorado River watershed so Colorado River fish (endangered) would not be affected. Bald eagle, black-footed ferret, mountain plover, and Platte River species are the only TEP&C species that may occur in or adjacent to the HDEPA. These species are discussed below.

Bald Eagle. The bald eagle is a federally threatened species (downlisted from endangered and now proposed for removal from federal listing). One known bald eagle nest occurs within about 2.5 mi of the southern end of the proposed pipeline corridor, south of I-80. Bald eagles are known to occur in the HDEPA (BLM 1993). No known bald eagle winter roosts are present on the HDEPA or within the adjacent 2-mi buffer, but it is possible that bald eagles use trees and

Table 3.8 BLM Wyoming Animal and Plant Species of Concern Documented or Potentially Occurring on or in the Vicinity of the HDEPA.[1]

| Species | | Other Designation and Ranking: Wyoming Natural Heritage Program; U.S. Forest Service Regions 2 and 4; Wyoming Game and Fish Department[2] | Documented in or Adjacent to the HDEPA[3] | Habitat Type(s)[4] |
|---|---|---|---|---|
| Common Name | Scientific Name | | | |
| **MAMMALS** | | | | |
| Swift fox | *Vulpes velox* | Removed from candidate list | No | UB |
| Townsend's big-eared bat | *Corynorhinus townsendii* | G4/S1B, S2N FSR2, FSR4, NSS2 | No | UB |
| White-tailed prairie dog | *Cynomys leucurus* | G4/S2S3, NSS3 | Yes[5] | UB |
| **BIRDS** | | | | |
| Baird's sparrow | *Ammodramus bairdii* | G4/S1B, SZN, FSR2, TBNG, MT | No | UB |
| Brewer's sparrow | *Spizella breweri* | G5/S3B, SZN | No[5] | UB |
| Burrowing owl | *Athene cunicularia* | G4/S3B, SZN, FSR2, NSS4 | Yes[5] | PD |
| Ferruginous hawk | *Buteo regalis* | G4/S3B, S3N, FSR2, NSS3 | Yes[5] | UB |
| Greater sage-grouse | *Centrocercus urophasianus* | G5/S3 | Yes[5] | UB |
| Loggerhead shrike | *Lanius ludovicianus* | G5/S4B, SZN, FSR2, | No[5] | UB/FT |
| Long-billed curlew | *Numenius americanus* | G5/S3B, SZN FSR2, NSS3 | Yes | UB |
| Northern goshawk | *Accipiter gentilis* | G5/S23B, S4N, FSR2, FSR4, NSS4 | No[5] | FT |
| Peregrine falcon | *Falco peregrinus* | G4/T3/S1B, S2N, FSR2, NSS4 | No | FT |
| Sage sparrow | *Amphispiza billineata* | G5/S3B, SZN | No[5] | UB |
| Sage thrasher | *Oreoscoptes montanus* | G5/S3B, SZN | No[5] | UB |
| **PLANTS** | | | | |
| Gibbon's beardtongue | *Penstemon gibbensii* | G1/S1 | No | UB |
| Nelson's milkvetch | *Astragalus nelsonianus* | G2/S2, CO | No | UB |

1 From Draft Wyoming BLM State Director's Sensitive Species List (Animals and Plants) (BLM 2001).

2 Rankings:

**Wyoming Natural Heritage Program**

Uses a standardized system developed by The Nature Conservancy's Natural Heritage Network to assess the global and state wide conservation status of each plant and animal species, subspecies, and variety. Each taxon is ranked on a scale of 1-5, from highest conservation concern to lowest. Codes are as follows:

G = Global rank: rank refers to the rangewide status of a species.
T = Trinomial rank: rank refers to the rangewide status of a subspecies or variety.
S = State rank: rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.
1 = Critically imperiled because of extreme rarity (often known from five or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.

Table 3.8 (Continued)

2 = Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.
3 = Rare, or local, throughout its range or found locally in a restricted range (usually from 21-100 occurrences).
4 = Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
5 = Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.
CO = Colorado.
MT = Montana.
H = Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.
X = Believed to be extinct.
A = Accidental or vagrant: a taxon that is not known to regularly breed in the state, or which appears very infrequently (typically refers to birds and bats).
B = Breeding rank: a state-rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats).
N = Nonbreeding rank: a state-rank modifier indicating the status of a migratory species during the nonbreeding season (used mostly for migratory birds and bats) ZN or ZB. Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.
U = Possibly in peril, but status uncertain; more information is needed.
Q = Questions exist regarding the taxonomic validity of a species, subspecies, or variety.
? = Questions exist regarding the assigned G, T, or S rank of a taxon.

**U.S. Forest Service** (FS)
Region 2 = Rocky Mountain Region.
Region 4 = Intermountain Region.

**Wyoming Game and Fish Department**

The Wyoming Game and Fish Department has developed a matrix of habitat and population variables to determine the conservation priority of all native, breeding bird and mammal species in the state. Six classes of native status species (NSS) are recognized, of which classes 1, 2, and 3 are considered to be high priorities for conservation attention.

These classes can be defined as follows:
NSS1 = Includes species with on-going significant loss of habitat and with populations that are greatly restricted or declining (extirpation appears possible).
NSS2 = Species in which (1) habitat is restricted or vulnerable (but no recent or significant loss has occurred) and populations are greatly restricted or declining; or (2) species with ongoing significant loss of habitat and populations that are declining or restricted in numbers and distribution (but extirpation is not imminent).
NSS3 = Species in which (1) habitat is not restricted, but populations are greatly restricted or declining (extirpation appears possible); or (2) habitat is restricted or vulnerable (but no recent or significant loss has occurred) and populations are declining or restricted in numbers or distribution (but extirpation is not imminent); or (3) significant habitat loss is ongoing but the species is widely distributed and population trends are thought to be stable.

[3] Indicates documentation of amphibian, reptile, or bird species in Carbon County (Baxter and Stone 1980; WNDD 2001); documentation of amphibian, mammal, or bird species within latitude 41°, longitude 107° (Dorn and Dorn 1990; WGFD 1999).

[4] UB = ubiquitous, PD = prairie dog colonies; FT = fly through.

[5] Animal species has been documented breeding within latitude 41°, longitude 107° (Dorn and Dorn 1990; WGFD 1999).

cliffs adjacent to the Medicine Bow River as winter roosting and/or perching sites. Bald eagles require cliffs or large trees associated with concentrated food sources (e.g., fisheries, waterfowl concentration areas) or sheltered canyons for nesting or roosting areas (Call 1978; Edwards 1969; Peterson 1986; Snow 1973; Steenhof 1978;). The lack of such habitat in the HDEPA limits its suitability for nesting or roosting habitat. Bald eagles have been observed nesting and roosting along the North Platte River more than 10 mi southwest of the HDEPA, and migrating bald eagles and those nesting and roosting along the North Platte River may occasionally use the HDEPA for foraging and perching; such use would likely be intermittent and for relatively short periods. Since no known nests or roosts occur near the HDEPA nor are any nests or roosts likely to be established, the proposed project is unlikely to adversely affect bald eagles, and the species is not discussed further in this EA.

Black-footed Ferret. Historically, this part of the Hanna Basin provided ferret habitat--confirmed ferret observations were recorded in 1968 and 1979, and in 1991 two observations of experimental population ferrets were recorded 13 mi north and 20 mi northeast of the Hanna Draw Federal Unit (BLM 1993). The area occupied by prairie dog colonies (potential black-footed ferret habitat) was substantially greater in the early 1990s (4,550 acres) than at present (111 acres). The decline may be due to pest control by ranchers or natural dynamics of the prairie dog population.

Black-footed ferrets were re-introduced in the Shirley Basin of central Wyoming between 1991 and 1994. The HDEPA is within an area designated as "ferret-free" (WGFD and BLM 1991) prior to the reintroduction into Shirley Basin; thus, any ferrets that occur within the HDEPA would be considered part of an experimental/nonessential population.

The Hanna Draw Federal Unit, the northern portion of pipeline corridor, and surrounding areas are located within the Shirley Basin/Medicine Bow Black-footed Ferret Management Area, which itself is divided into Primary Management Zones (PMZs) 1 and 2 and areas outside the PMZs. PMZs are areas designated by WGFD and USFWS to assist in the management of the black-footed ferret reintroduction effort (WGFD and BLM 1991). As in the early 1990s, a majority of the colonies are located within PMZ 2, just outside of the proposed exploration area and along the pipeline corridor (Figure 3.7). The four small colonies within the exploration area are outside the PMZs but within the Shirley Basin/Medicine Bow Black-Footed Ferret Management Area.

In May 2001, prairie dog colonies on all federal lands and on private lands accessible via public access within the Hanna Draw Federal Unit and the proposed pipeline corridor were mapped in the field using an ocular estimate of colony boundaries and a global positioning system. An estimated 111 acres of white-tailed prairie dog colonies occur within and adjacent to the HDEPA (Figure 3.7). The mapped area does not meet the acreage criterion to be a complex of suitable black-footed ferret habitat (i.e., two or more white-tailed prairie dog colonies within 4.3 mi of each other occupying 200 acres or more). However, additional colonies may occur on private land to which public access is restricted, so there is potential for the HDEPA to contain possible black-footed ferret habitat. Any ferrets that occur in the project area would be considered part of the experimental/nonessential population.

Mountain Plover. Mountain plover has been proposed for federal listing as a threatened species by the USFWS. Suitable mountain plover habitat occurs in patches throughout the HDEPA (Figure 3.10). Mountain plover have not been documented in the project area (BLM 1993; Wyoming Natural Diversity Database [WNDD] 2001). No mountain plover have been observed in the Simpson Ridge area, which has been monitored for several years as part of a proposed windpower project (Johnson et al. 2000). Mountain plover surveys have been completed in suitable habitat within the exploration area in May and June 2001 (in accordance with USFWS guidelines [USFWS 2001]), and no mountain plover have been observed. Since pipeline construction would not commence during the 2001 mountain plover breeding season, no surveys along the pipeline are presently required. Mountain plover surveys of the pipeline disturbance area (0.25-mi buffer) would be conducted if pipeline construction would occur during the mountain plover breeding season in any subsequent years.

North Platte River Water Depletions. Since 1978, the USFWS has consistently taken the position in its Section 7 consultation that federal agency actions resulting in water depletions to

Figure 3.10 Mountain Plover Habitat.

the Platte River systems may affect the endangered whooping crane, interior least tern, pallid sturgeon, and Eskimo curlew, as well as the threatened piping plover, bald eagle (see above), and western prairie fringed orchid. North Platte River depletions are not anticipated as a result of the proposed project due to the depth of ground water-producing formations (approximately 5,000 ft) and the age of the ground water produced (approximately 5,000 years before present). All produced water would be discharged into the water containment reservoir where it would evaporate, so no net gain or loss of water in the surface water system would occur. Thus, the proposed project is unlikely to adversely affect downstream Platte River species.

Grab samples of Hanna Draw Well No. 19 (a producing well) and Seminoe Reservoir were analyzed for deuterium and $O^{16}/O^{18}$ to assess the probable age of produced water. Both samples show that the waters are of meteoric origin; however, they have very different stable isotopic compositions and are not directly related to one another (personal communication, June 2001, with Joe Frank, HydroGeo, Inc.). The Well No. 19 sample had a very negative isotopic composition that is commonly seen in ground water that has been recharged at high elevations or during the last major cold climatic regime, typically an ice age. Ground water in Well No. 19 could not have recharged from a high elevation, given its geographic location; therefore, the well water must have been recharged to the aquifer during the last ice age in this region (about 5,000 years ago), at the earliest.

Water production would not result in Platte River depletions, nor would any development or operation activities, and thus depletions are not discussed further in this EA.

<u>State-Sensitive Species</u>. Three state-sensitive mammal species potentially occur within and/or adjacent to the HDEPA (BLM 2001) (Table 3.8): Townsend's big-eared bat, white-tailed prairie dog, and swift fox. Of these, only white-tailed prairie dog has been documented within the HDEPA (TRC Mariah Associates Inc. 2001; WNDD 2001).

White-tailed prairie dogs occupy grass, shrub-grass, and desert grass communities in Wyoming (Clark and Stromberg 1987) and are distributed throughout the HDEPA (Figure 3.7). These prairie dog colonies provide a prey base and/or habitat for a variety of state-sensitive raptor species, including ferruginous hawk and burrowing owl, as well as for other wildlife.

Eleven state-sensitive bird species are known to occur or potentially occur within or adjacent to the HDEPA: ferruginous hawk, northern goshawk, peregrine falcon, greater sage-grouse (see above), long-billed curlew, burrowing owl, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, and Baird's sparrow (BLM 2001; WNDD 2001). Northern goshawk and peregrine falcon may occasionally use the project vicinity for foraging or as a stop-over during migration but probably remain in the area for short periods only. Ferruginous hawk and greater sage-grouse are known to nest in the HDEPA. Long-billed curlew and burrowing owl have been observed in the HDEPA (WNDD 2001) and possibly nest along the Medicine Bow River or in prairie dog colonies, respectively. Breeding and nesting habitat for the other five species occurs within and adjacent to the HDEPA, so these species may be summer residents.

Two state-sensitive plant species potentially occur within and adjacent to the HDEPA: Nelson's milkvetch and Gibbon's beardtongue. Nelson's milkvetch prefers alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, and cushion plant communities at 5,200-7,600 ft above sea level. Gibbon's beardtongue inhabits sparsely vegetated shale or sandy clay slopes at 5,500-7,700 ft. Habitat for both of these species may occur within the mosaic of shrubland/grassland vegetation in the HDEPA, but none have been observed in the area (WNDD 2001).

## 3.3 CULTURAL RESOURCES

Cultural resources, which are protected under the *National Historic Preservation Act of 1966*, are nonrenewable remains of past human activity. A total of 60 prehistoric or historic sites has been recorded in the HDEPA. No protohistoric sites, which represent the period when European influences began to have a major effect on Native American lifeways, are known from the HDEPA.

A total of 24 cultural resource investigations has been conducted within the HDEPA between 1955 and 1999. The types of investigations include Class III inventories for pipelines (5), Class II sampling inventories for mines (4), well pad and associated access road inventories (4), Class III inventories for transmission lines (4), Class III inventories for fiber optic lines (2), and one each of a Class II pipeline inventory, a Class II fiber optic inventory, a Class III buried telephone line inventory, a Class III road repair inventory, and a mitigation project associated with the Union Pacific Railroad (UPRR).

### 3.3.1 Prehistoric Resources

The Northwestern Plains appears to have been inhabited by aboriginal hunting and gathering peoples for over 11,000 years. A chronological framework, pertinent to the HDEPA, has been established for the Northwestern Plains based mostly on artifact typology (primarily projectile points) and radiocarbon-dated archaeological sites. Period names are based on Frison's (1991) modification of Mulloy's (1958) framework for the Northwestern Plains prehistory (Figure 3.11).

The Paleoindian period is associated with big game hunting and includes a series of cultural complexes identified by distinctive large projectile points which are often associated with the remains of large now-extinct mammals (e.g., mammoth, bison, camel, and other megafauna). The Plains Archaic period (which is subdivided into Early, Middle, and Late) is characterized by a range of smaller side-notched, stemmed, or corner-notched projectiles and by more generalized subsistence pursuits including hunting of numerous species of animals and gathering of plant resources. This lifestyle continues throughout the Late Prehistoric period which is marked by the technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Plains Archaic and Late Prehistoric periods, the HDEPA was occupied by small bands of hunter-gatherers whose movements were determined to a large degree by seasonal changes in the occurrence of subsistence resources (BLM 1987:99-100).

A review of the Wyoming SHPO, Cultural Records Office, indicated 45 sites with prehistoric components in the HDEPA (43 prehistoric sites and two sites with prehistoric and historic

Figure 3.11 Chronological Cultural History Framework for the Northwestern Plains.

components). Site types include open camps (25), open camps with stone circles (4), lithic scatters (12), lithic scatters with stone circles (1), lithic scatter with an identified Medicine Wheel (1), and stone circle sites (2). Of the 45 prehistoric sites, five sites are eligible to the National Register of Historic Places (NRHP) (three sites have been recommended as eligible and two sites have been found eligible by the SHPO), 16 sites are not eligible to the NRHP (15 sites have been recommended as not eligible and one site has been found not eligible by the SHPO), and the remaining 24 sites remain unevaluated to the NRHP.

Large-scale block surveys and testing projects conducted for the Medicine Bow Mine southwest of the HDEPA suggest that additional prehistoric site types may occur within uninventoried portions of the project area. Lithic procurement sites associated with river gravels and rock art sites were identified (Zier et al. 1981), and housepit habitation sites have also been documented (McGuire et al. 1984). Rockshelter locations may also be found in the area. Prehistoric site distribution on and adjacent to the HDEPA is most dense near water sources and in association with aeolian deposits (Zier et al. 1981; Kainer and Rodriguez 1982).

### 3.3.2 Historic Resources

Historic land use in the region began with fur trading expeditions. The Ashley-Smith Expedition entered Carbon County in 1825 (Seiersen 1981), followed by John C. Fremont in 1843. In 1849, a wagon train passed through southern Carbon County along what became known as the Cherokee Trail. The Stansburry Expedition, led by Jim Bridger, also passed through the region in 1849 along a different route farther to the north which became known as the Overland Trail. Construction of the UPRR reached Carbon County in 1868, which spurred the area's economy by encouraging lumbering and mining.

The town of Carbon, approximately 8 mi southeast of the HDEPA, was established by the UPRR in 1868 as the first coal mining town in the area (Seiersen 1981). Mining operations were initiated by the Wyoming Coal and Mining Company and were later taken over by the Union Pacific Coal Company. Coal deposits were depleted at Carbon around 1900, when most coal mining shifted to the Hanna area. A branch line was established to connect the town of Hanna with the UPRR mainline in 1890, and the economy of Hanna is still closely tied to the railroad and coal mining.

The railroad also promoted the growth of the livestock industry in Carbon County. Large ranches became major landholders in the region before 1880; however, severe droughts and winters in the late 1880s bankrupted many of these ranchers (Seiersen 1981). Large-scale sheep grazing started in the area in the late 1800s.

Seventeen sites with historic components have been recorded in the HDEPA (15 historic sites and two prehistoric/historic sites). Site types include sites with historic debris (6), sheepherder camps (4), and one site type each of an historic cairn, a dugout structure, an historic power line, the historic UPRR, the Como Railroad Siding, the Fort Halleck Road, and the Lincoln Highway. Of the 17 historic sites, two sites (the UPRR and the Lincoln Highway) are eligible to the NRHP with SHPO concurrence, seven sites were recommended by the consultants as not eligible to the NRHP, six sites are not eligible to the NRHP with SHPO concurrence, and the remaining two sites remain unevaluated to the NRHP.

## 3.4 SOCIOECONOMICS

The HDEPA is in Carbon County, which had a population of 15,639 in 2000 compared to a population of 16,659 in 1990--a decrease of 6.1% (U.S. Department of Commerce [USDC] 2001; Wyoming Department of Administration and Information, Division of Economic Analysis 2001). Carbon County is the third largest county in Wyoming, covering nearly 8,000 $mi^2$. The Medicine Bow National Forest covers much of the southern portion of the county. Rawlins, the largest city in Carbon County, is located along I-80 in central Carbon County and serves as the county seat and economic hub. Rawlins has built a facility and service structure to accommodate the needs of its residents.

Carbon County's economy is structured around the basic industries of extractive minerals, agriculture, timber, and manufacturing. The mining/oil and gas industry is a major contributor to employment and the general economy; however, employment figures in the mining/oil and gas industry declined from 11.8% of the population in 1990 to 5.5% in 1999. Wages earned in the mining/oil and gas industry averaged $50,421 in 1997--223% of the Carbon County average of $22,574 (Wyoming Department of Employment [WDE] 2000). New technologies to enhance productivity within the mining industry will likely cause a decrease in the rate of job growth within this industry as the industry becomes more mechanized (i.e., capital intensive). In 1998, there were 17,000 jobs in Wyoming's mining sector, whereas average annual employment in

1999 was 15,600 jobs--a decrease of 1,400 jobs. However, these industries are very sensitive to changes in commodity prices, and changes are difficult to predict.

The seasonally adjusted unemployment rate in Carbon County in December 2000 was 4.5%, whereas the statewide seasonally adjusted unemployment rate at that time was 3.7% (WDE 2001).

Surface transportation in Carbon County is provided by a network of primary, secondary, local, and primitive roads. I-80 is the principle roadway linking Carbon County towns and cities within southern Wyoming and the national highway system. I-80 is approximately 20 mi south of the HDEPA, and Highway 287, which accesses the towns of Bosler, Rock River, Medicine Bow, Hanna, and Elmo, is approximately 8 mi south of the HDEPA. The Hanna Draw Road bisects the Hanna Draw Federal Unit.

## 3.5 LAND USE

Carbon County occupies an area of nearly 8,000 $mi^2$ and contains a diversity of landscapes. The most common land uses in the county include livestock grazing, wildlife habitat, mining/oil and gas, agriculture, and forestry, and Carbon County lands yield a variety of products including wool, beef, timber, trona, jade, clay, oil, gas, and coal. The principle land uses within and adjacent to the HDEPA, although limited, are oil and gas exploration and development (i.e., the current proposal), livestock grazing (Section 3.5.1), wildlife habitat (see Section 3.2.2), coal mining, recreation (Section 3.5.2), and transportation (Section 3.4). There are no residences or dwellings on or adjacent to the HDEPA.

### 3.5.1 Agriculture/Rangeland

Due to arid conditions and limited soil and water resources, livestock grazing represents the primary form of agriculture in the general HDEPA; however, small floodplain areas adjacent to the Medicine Bow River are used for hay production. Portions of two grazing allotments (Dana Block North and Chase Block) occur in the HDEPA, and domestic cattle, sheep, and horses are grazed (personal communication, June 2001, with Cheryl Newberry, BLM). Grazing on these allotments occurs year-round. Three operators graze livestock on both private and public land within the HDEPA.

The Dana Block North Allotment contains 29,780 federal acres, supporting 4,962 animal unit months (AUMs) for approximately 6 acres per AUM . This allotment occupies 5,180 acres (91% of the exploration area) and contains approximately 863 AUMs on the HDEPA. Three hundred twenty acres within the exploration area are not included in any allotment. The remaining 180 acres are within the Chase Block Allotments (see below).

The Chace Block Allotment (14,996 federal acres and 1,585 AUMs) averages 9 acres per AUM and occurs on 12,971 acres (72%) of the HDEPA. This allotment contains approximately 1,441 AUMs on the HDEPA.

### 3.5.2 Recreation

Public land on and adjacent to the HDEPA is an important recreational resource for local residents and nonresidents alike. These areas offer a wide variety of recreational opportunities in diverse settings, including camping, ORV use, snowmobiling, fishing, hunting, and hiking. However, the checkerboard landownership pattern within the HDEPA limits recreational opportunities for most individuals to the public lands adjacent to County Road 291.

While only limited recreational use data are available for the HDEPA, big game hunting is likely the predominant recreational activity. No developed recreation sites occur on the HDEPA.

### 3.5.3 Land Status and Prior Rights

The 18,151-acre HDEPA includes 6,735 acres (37%) of federal surface, with the remaining area in state and private ownership (i.e., checkerboard landownership pattern) (Figure 1.2). Williams has submitted a sundry notice for the use of the existing road developed by MetFuel in the early 1990s, they have obtained a ROW across federal lands to the south of the exploration area (although they have limited use through the mine area at this time), and they have drilled nine wells on private land in the exploration area. The estimated surface disturbance from these developments is approximately 49.0 acres. Surface or mineral ownership would not change as a result of the proposed project, nor would the rights of existing ROW holders (e.g., County Road 291) be violated, and these subjects are not discussed further in this EA.

## 3.6 AESTHETICS AND VISUAL RESOURCES

The HDEPA is within VRM Class III and Class IV areas. The exploration area and the northern portion of the pipeline corridor are within a Class IV area, which allows for major modifications of the existing character of the landscape. South of State Highway 30/287, the pipeline corridor is within a Class III area, which calls for partial retention of the existing character of the landscape, and modifications should not dominate the view of the casual observer.

Human intrusions currently affect the visual quality of the HDEPA and surrounding areas, including the presence of highways, roads, railroads, coal mines, towns, pipelines, transmission lines, substations, and existing gas wells.

## 3.7 HAZARDOUS MATERIALS

Hazardous substances present on the HDEPA include those used and produced in association with natural gas exploration, development, and production as identified in Section 2.1.9 and Appendix E. No hazardous materials are known to be present except those being used or produced under state and federal rules and regulations.