# 3.0 AFFECTED ENVIRONMENT

## 3.1 GEOLOGY AND MINERALS

### 3.1.1 Physiography and Topography

The Uinta Basin is a bowl-shaped structural and sedimentary basin located in northeast Utah. The basin trends roughly east-west, is approximately 115 miles wide at the widest part, and narrows toward the west. The basin is bounded on the east by the Douglas Creek Arch, on the south by the Book Cliffs, on the west by the Wasatch Plateau, and to the north by the Uinta Mountains. The CWSA lies within the Central Badlands and Tavaputs Plateau Topographic Districts of the Uinta Basin (Figure 3.1-1, Appendix A) (Clark 1957). Elevations in the CWSA range from 4,600 to 5,500 feet. The Central Badlands district comprises badland topography consisting of steep erosional slopes, narrow ridges, gullies, and dry washes. There are also broad areas of pediment and plateau adjacent to the badlands within this topographic district. The Tavaputs Plateau District consists of a series of broad, discontinuous plateaus underlain largely by sandstones. Both flowing streams and dry washes are deeply incised in canyons that are up to 1,000 feet deep in the plateau. The depth to bedrock ranges from zero on rock outcrops and cliff faces to about 80 inches along ephemeral washes. In the majority of the CWSA, the depth to bedrock ranges from about 5 inches to about 60 inches (USDA 1995).

### 3.1.2 Stratigraphy

Figure 3.1-2 (Appendix A) illustrates the geologic map for the area surrounding the CWSA. The majority of the Uinta Basin is underlain by sedimentary rocks of various types. The geologic formations that are exposed at or near the surface within this area include the Eocene-Oligocene Duchesne River Formation and the Eocene Uinta Formation. Both of these formations tend to erode into low bluffs and ridges (Rowley et al. 1985). The Duchesne River Formation is comprised of red to orange colored sandstone, mudstone, conglomerate, shale, and siltstone. The Duchesne River Formation is also fossiliferous in places, containing vertebrate fossils. The Uinta Formation is comprised of multi-colored shale, mudstone, marlstone, siltstone, and sandstone that were deposited as river and lake deposits. The Uinta Formation contains abundant vertebrate fossils. Both of these formations are considered "type sections" that are used to delineate the Uintan and Duchesnean Land Mammal age subdivisions within the Eocene Epoch. Underlying rock formations within the CWSA include the Eocene Green River Formation, the Cretaceous Mesaverde Group, and the Cretaceous Mancos Shale. Figure 3.1-3 (Appendix A) presents a geologic cross-section of the basin. Quaternary alluvium and colluvium occurs in drainage bottoms and within dry washes. In other places, older alluvial deposits comprised of sand, gravel and rounded cobbles cover the surface exposures of bedrock, particularly on benches and mesa tops. Gravelly and sandy pediment slopes, sandy washes, low bluffs and cliffs, ledges and ridges of sandstone, and sandy shale characterize the surface exposures in much of the CWSA.

### 3.1.3 Structure

The Uinta Basin is a structural basin that has been partially filled with sediments. Structural characteristics of the Uinta Basin developed during the early Eocene Laramide Orogeny, a time of mountain building in the western United States (Clark, 1957). The structural axis of the basin generally trends west-northwest and drops to the northwest, as shown on Figure 3.1-2 (Appendix A). The Duchesne River follows a course parallel to and 10 miles south of the structural axis. The CWSA lies to the south of the structural axis in the eastern portion of the basin. Three large-scale folds are the dominant structural features within the basin. The northern flank of the basin is bounded by faults in many places. The bedrock strata generally dip about one to three degrees to the north in the central portion of the basin to greater than 30 degrees near the northern flank of the basin. Within the CWSA, strata are nearly flat to sub-horizontal showing a general shallow dip to the northeast, south of the structural axis, and a general shallow to moderate dip to the southwest, north of the structural axis.

### 3.1.4 Energy and Mineral Resources

The Uinta Basin contains extensive deposits of oil and natural gas. The CWSA is located within the Greater Natural Buttes (GNB) Field, which is located within the east-central part of the Uinta Basin in northeastern Utah. Oil and gas exploration and development within the Uinta Basin was initiated in the late 1920s. The first well to produce gas within the GNB Field was the Continental Oil #1, which was located within the Chapita Wells Unit and was drilled and completed in 1952. Reserves from this historical natural gas well were depleted within a few months. The Continental Oil #2 well, also located within the Chapita Wells Unit was completed in 1955 and was a productive natural gas well for several decades. Since these initial discoveries, about 15 gas fields have been discovered in the GNB Field. Mineral resources within the CWSA with known, proven economic reserves are largely limited to natural gas hydrocarbons. Existing gas and oil fields within and near the CWSA include the Red Wash, Wonsits Valley, White River, Brennan Bottom, and Coyote Basin oil fields, and the Horseshoe Bend and Chapita Wells gas fields (Figure 3.1-4, Appendix A). Development of a large oil and gas field is currently proposed for the area just north of the CWSA in the Greater Deadman Bench Region, as well as to the northeast in the North Chapita Field. Separate analyses under NEPA have been prepared for these two nearby oil and gas field developments.

At present, approximately 2,800 oil and gas wells are producing within the Vernal Field Office planning area. Over the span of oil and gas development in the Vernal Field Office planning area, approximately 19,783 acres have been disturbed. Existing sources of oil and gas related surface disturbance include: approximately 33 compressor sites (approximately 2 acres of surface disturbance per site), existing pipelines such as gathering/injection lines (approximately 0.47 acres disturbed per well); roads (approximately 0.15 miles disturbed per well, with 0.79 acre of surface disturbance per well); and approximately 73 miles of power lines (0.25 acres of surface disturbed per mile).

In addition to oil and gas reserves, the Uinta Basin also contains deposits of “Gilsonite”, tar sands, and oil shale. Gilsonite deposits are located several miles east of the CWSA (Figure 3.1-2, Appendix A). Gilsonite is composed of black, brittle hydrocarbon resins that resemble tar or asphalt. The deposits occur in vertical to near-vertical, long, thin northwest-trending veins that occur primarily in the Green River, Uinta, and lower Duchesne River Formations. The “Rainbow” Gilsonite vein is 14 miles long and some veins are up to 14 feet thick. These veins are mined primarily by shaft and stoping and open trench methods. Gilsonite has not been observed in commercial quantities within the CWSA and it appears unlikely that there are commercially recoverable amounts of these minerals within the CWSA boundaries.

Deposits of tar sands are located along the margins of the Uinta Basin (BLM 2005). These tar sand deposits contain heavy hydrocarbon residues such as bitumen (a general name for various solid and semi-solid hydrocarbons that are fusible and soluble in carbon bisulfide), tar, and degraded oils that have lost their volatile components. The bitumen fills the pore spaces in coarse sandstones or forms cement in loose, unconsolidated sands (Pruitt 1961). Certain tar sand deposits in the Uinta Basin have been divided into seven Special Tar Sand Areas (STSAs) designated by the United States Geological Survey (USGS) under direction from Congress pursuant to the Combined Hydrocarbon Leasing Act of 1981. These STSAs are named the Pariette, Sunnyside, Argyle Canyon – Willow Creek, Asphalt Ridge – Whiterocks, Hill Creek, P.R. Spring, and Raven Ridge – Rim Rock. These areas contain an estimated 10.46-11.64 billion barrels on bitumen (Blackett 1996). In addition, other minor tar sand deposits are located within the Uinta Basin, including an estimated 7.5-8 million barrels within the CWSA (Blackett 1996). There were four permitted tar sand mining operations in Uintah County as of October 2001 (BLM 2005).

Deposits of oil shale resources are also present within the Uinta Basin. Oil occurs as kerogen within marlstones of the Parachute Creek Member of the Green River Formation. The Mahogany Oil Shale Zone is the most notable kerogen-bearing unit of the Green River Formation. The Mahogany Zone varies in thickness throughout the Uinta Basin, and generally thickens toward the east (Cashion 1967).

The Uinta Basin appears to have a low potential for the occurrence of uranium and other metals. The basin does produce some stone, which is derived from the Green River Formation, and is used as decorative building materials. Small quantities of sand and gravel are also mined from several dry washes.

## 3.2 WATER RESOURCES

### 3.2.1 Hydrologic Setting

The Uinta Basin is drained by the Green River and its tributaries. Major tributaries include the Duchesne River and the White River. The White River drains the eastern portion of the basin, including those portions of the basin within Colorado. Within the Uinta Basin, the State of Utah has classified five drainages as hydrological sub-units: the Upper Green, the Green, the Ashley-Brush, the Duchesne/Strawberry, and the White River (Utah Division of Water Resources 1999). The CWSA lies within the White River sub-unit.

**Surface Water**

The CWSA lies east and northeast of the White River in the north-central portion of the Uinta Basin. The White River originates in Colorado and is a tributary of the Green River. It is a free-flowing river except for a small reservoir in western Colorado.

Figure 3.2-1 (Appendix A) illustrates the White River; the ephemeral washes within and near the CWSA and the watershed boundaries of these drainages. The southern portion of the CWSA is drained directly by the White River and several unnamed ephemeral drainages. Three named drainages drain the northern portion of the CWSA and flow into the White River. These drainages include:

- The southwest-flowing Antelope Draw in the northwest portion of the CWSA,
- The south and southwest-flowing Red Wash in the northwest portion of the CWSA, and
- The west-flowing Coyote Wash in the central portion of the CWSA.

All of the drainages that drain the CWSA to the White River are ephemeral and only flow in direct response to rainfall events. These drainages have developed a dendritic drainage pattern with up to 5 orders of tributaries, which indicates that the CWSA is a sediment source area. The drainages are incised with rills and gullies typical of badland topography.

### 3.2.1.1 Surface Water Flow

The USGS maintains or formerly maintained several gauging stations in the vicinity of the CWSA. The closest downstream USGS gauging station (USGS Site No. 09307000) to the CWSA is located on the Green River near Ouray, downstream from the confluence of the Duchesne and Green Rivers, approximately 10 miles from the eastern corner of the CWSA boundary. The elevation at this station is 4,637 feet above mean sea level (amsl) and the drainage area it gauges covers approximately 35,500 square miles. The period of record for this station is from October 1, 1947 to September 30, 1966. Annual mean discharge at this station has ranged from 2,148 cubic feet per second (cfs) in 1952 to 8,653 cfs in 1963. During this period, annual peak daily flows ranged from approximately 10,000 to 31,000 cfs during the spring runoff in response to snow melt.

The USGS maintains several gauging stations on the Green River. The most representative USGS gauging station (USGS Site No. 09261000) to the CWSA is located near Jensen approximately 15 miles north of the CWSA. The elevation at this station is 4,758 ft amsl and the drainage area it gauges covers approximately 29,660 square miles. The period of record for this station is from October 1, 1946 to the present. Figure 3.2-2 (Appendix A) shows the hydrograph for this station covering flow from between October 1992 through September 2003. During this period, peak flows ranged from less than 10,000 to 25,000 cfs during spring runoff in response to snow melt.

Since 1923, the USGS has maintained a surface water gauging station on the White River just off Highway 45 near Watson, Utah, approximately 10 miles east of the CWSA. This station gauges a drainage basin area of approximately 4,020 square miles. In Utah, the White River is perennial with high flows occurring in spring responding to snow melt in the mountains of Colorado. In summer, high flows occur due to short duration, high intensity thunderstorms. Annual mean discharge at this station has ranged from 289 cfs in 2002 to 1,761 cfs in 1929. Figure 3.2-3 shows the hydrograph for the White River at the Watson Gauging Station for the 10-year period October 1992 and September 2003. During this period, peak daily flows ranged from 500 to 4,600 cfs during the spring runoff. Mean daily flow during this period was 695 cfs.

The USGS also formerly maintained a gauging station (Station Number 09306878) near the mouth of Coyote Wash between October 1976 and October 1983. Annual mean discharge at this station has ranged from 1.42 cfs in 1977 to 7.51 cfs in 1979. Figure 3.2-4 shows the hydrograph for this station and illustrates the ephemeral nature of the drainage, with flows up to 600 cfs only occurring in direct response to rainfall events. The vertical nature of the peaks also indicates that the drainage is susceptible to flash flooding.

### 3.2.1.2 Surface Water Quality

The Utah Division of Water Quality monitors and assesses the Green and White Rivers on a regular basis to determine if the rivers are supporting their beneficial uses. Water quality data have been and are currently being collected from the Green River at station number 49370 and from the White River at station number 493352. Both stations are located south of the CWSA where the rivers cross Utah State Highway 88 near Ouray. In addition, the USGS collected water quality data from USGS stations 09306500 and 09306878.

Waters of the Green and White Rivers are similar in chemical nature with the predominant cations and anions being calcium, magnesium, and sulfate. In general, these rivers meet Utah Water Quality Standards for domestic, agricultural and recreation use. The water from Coyote Wash generally contains lower concentrations of major ions than the White River. For the Green River, total dissolved solids (TDS) range from 232 to 490 milligrams per liter (mg/L) with an average of 393 mg/L. Total dissolved solids are somewhat higher for the White River and range between 248 and 692 mg/L with an average of 542 mg/L. Mean total suspended solids concentrations are 152 mg/L for the Green River and 258 mg/L for the White River. Tabular summaries of water quality data from the State of Utah and USGS stations are provided in Appendix B.

The Utah Administrative Code under Title 317 has developed Water Quality Standards for waters in the State of Utah. Under this Title, the Green River and its tributaries (except where exempted) are classified as follows:

- *Class 1C:* Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water;
- *Class 2B*: Protected for secondary contact recreation such as boating, wading, or similar uses;
- *Class 3:* Protected for use by aquatic wildlife;
- *Class 3B*: Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain; and
- *Class 4:* Protected for agricultural uses including irrigation of crops and stock.

The White River and tributaries, from the confluence with the Green River to the State line is classified as 2B, 3B, and 4. No stream segments associated with the CWSA are contained on the State of Utah 303(d) list, which suggests that the designated uses are currently being supported.

Water quality data are not available for the washes within the CWSA. Levels of total suspended solids are likely elevated when these drainages are flowing in response to precipitation or snowmelt.

#### 3.2.1.3 Floodplains

The most recent data available regarding 100-year floodplains in the CWSA is a 1977 U.S. HUD and FEMA survey, which inventoried public and State lands in Uintah County. Floodplains were designated and mapped for the White River and drainages of Coyote Wash and Red Wash. These floodplain boundaries are illustrated in Figure 3.2-1 (Appendix A). Currently, floodplains are protected by EO 11988 which requires that all Federal agencies take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains.

### 3.2.2 Groundwater

The principal aquifers within the CWSA include alluvial deposits along the White and Green Rivers, and two consolidated aquifers within the Green River Formation (Schlotthauer 1981). The alluvial aquifers are usually unconfined whereas the consolidated aquifers are generally unconfined near outcrops and confined down dip. The permeability of the consolidated aquifers is generally low; however, fractures, bedding planes, and faults produce relatively high secondary permeability. General characteristics of these aquifers are presented in Appendix B.

In the CWSA, the unconsolidated materials present in valley fill and drainage channel deposits form the principal aquifers. These aquifers range in thickness from about 50 to 70 feet within the drainage channels to about 200 feet along the main alluvial valleys of the Green and White Rivers and near the mouths of tributary canyons. These alluvial aquifers can produce significant quantities of water (up to 1,000 gallons per minute [gpm]) from the floodplain deposits of the Green and White Rivers but generally produce lesser quantities from deposits located along the ephemeral or intermittent drainages (Hood 1978, Schlotthauer 1981).

Water-bearing zones are found in nearly all consolidated rock formations beneath the area, however, only two are considered to be significant water sources (Schlotthauer 1981). The two major aquifers are the Bird's Nest Aquifer and the Douglas Creek Aquifer, both of which lie within the Green River Formation. Zones of perched groundwater are also present within the Duchesne River Formation and the Uinta Formation.

The Duchesne River Formation consists of a sequence of sandstone, conglomerate and sandy shales, with interbedded unconsolidated deposits of boulders, cobbles, sand, silt, and clay (Schlotthauer 1981). The permeability of the Duchesne River Formation ranges from very low to very high (less than 0.5 to 500 feet/day), and is highest near the town of Roosevelt. Permeability within this formation varies according to the amount of fracturing present. Transmissivity ranges between 5 and 800 square feet/day (Hood 1976).

The Uinta Formation aquifer consists of sandstones, siltstones, shale, and limestones, and has a maximum thickness of about 4,000 feet. ~~(~~The actual thickness of the aquifers present in the Uinta Formation is on the order of inches to approximately 50 feet thick in some of the larger paleo channels. They are mostly all sandstone beds, old river channels, and stringers within the finer-grained mudstones.~~)~~ Hydraulic conductivities range between less than 0.5 feet/day to more than 500 feet/day. The hydraulic conductivity is enhanced by faults and fractured systems in some locations (Hood 1976; Schlotthauer 1981). Water is generally present in small, discontinuous perched aquifers. The formation has a very low primary permeability, and in many places has been drained by deeply incised creeks. The permeability is locally higher where the formation is fractured, such as near veins of Gilsonite. In most cases, the formation yields only a couple gpm of saline water to wells and springs (Howells et al. 1987). Locally, some wells yield fresh to slightly saline water and larger yields.

The Green River Formation is often considered an aquiclude and prevents downward movement of groundwater, however, two zones within the formation are considered to be regional aquifers. The Bird's-Nest Aquifer lies between the upper part of the Parachute Creek Member and the Mahogany Oil Shale Zone. This aquifer outcrops along the White River and Evacuation Creek to the southwest of the Project Area. This aquifer is characterized by nodules of nahcolite (natural sodium bicarbonate) set in marlstone overlain by thin, brittle, shale beds and sandstone. The aquifer is generally 90 to 205 ft. thick, with an average thickness of about 115 ft. The hydraulic conductivity of the aquifer is enhanced by the dissolution of the nahcolite and fracturing of the sandstones. Well yields from the Green River Formation range from about 0.5 to 220 gpm (Feltis 1968).

The Douglas Creek Aquifer underlies much of the southern Uinta Basin and consists of beds of sandstone and limestone of the Douglas Creek Member (Middle Member) of the

Green River Formation and some intertonguing sandstone beds of the Wasatch Formation (Howells et al. 1987). This aquifer crops out in Desolation Canyon to the south of the Project Area and is generally about 500 feet thick. Aquifer tests conducted in the Douglas Creek aquifer show that transmissivity ranges from about 16 to 170 square feet per day, and the storage coefficient ranges from about $7 \times 10^{-4}$ to $2.5 \times 10^{-4}$.

Deeper water-bearing zones beneath the CWSA include sandstone zones in the Mesaverde Formation and the Jurassic Navajo Sandstone. Hydraulic conductivity of the Mesaverde Formation aquifers ranges from about 0.5 to 500 feet per day. Well yields from this formation can be substantial.

#### 3.2.2.1 Recharge and Discharge of Aquifers

Recharge to groundwater aquifers is principally from precipitation that falls directly within the aquifers recharge area. Most of the recharge occurs during spring snowmelt. Little recharge occurs during short duration, high intensity thunderstorms during the summer (Hood, 1978). Groundwater recharge of the consolidated aquifers occurs mainly in the mountains and flows down dip into the subsurface, toward the center of the basin. Significant quantities of recharge also come from the Green and White rivers from infiltration into the bedrock and also along pathways of increased secondary permeability along bedding planes, faults, and fractures. In areas where irrigation is taking place, such as in the western portion of the CWSA, irrigation water from canals and sprinkler systems infiltrates and recharges the shallow unconsolidated/unconfined groundwater systems.

Groundwater in shallow unconsolidated/unconfined deposits generally flows toward and discharges into drainages and the major rivers. Discharge from the consolidated bedrock aquifers is from springs and seeps to the surface, from seepage into streambeds, by upward leakage into the overlying formations, and by downward leakage into underlying formations.

#### 3.2.2.2 Groundwater Quality

Groundwater in the northern Uinta Basin ranges in chemical quality from relatively fresh (TDS <1,000 mg/l) within the unconfined alluvial aquifers and sandstone beds of the Uinta Formation to briny (TDS >35,000 mg/l) within the lower rock units such as the Wasatch Formation, Mesaverde Group, and the Mancos Shale. Fresh to slightly saline water (TDS <3,000 mg/l) can be found in the shallow aquifers. The highest quality water occurs near the mountains that surround the basin. As the groundwater moves downgradient toward the center of the basin, it becomes increasingly saline.

Water salinity is based in TDS concentrations, classified as follows (Howells et al, 1987):

| | |
|---|---|
| Fresh | TDS of <1,000 mg/L |
| Slightly Saline | TDS of 1,000 to 3,000 mg/L |
| Moderately Saline | TDS of 3,000 to 10,000 mg/L |
| Very Saline | TDS of 10,000 to 35,000 mg/L |
| Brine | TDS of >35,000 mg/L |

Water quality from the consolidated aquifers is generally high in dissolved solids. According to Hood (1978), the principal ions in groundwater within the Uinta and Green River formations are bicarbonate, carbonate, calcium, magnesium, and sodium. Away from outcrop areas, water quality generally is poorer and becomes much higher in dissolved solids with depth. Groundwater in the Green River Formation beneath the CWSA is considered to be moderately saline but still usable for industrial purposes (>3000 mg/L).

Groundwater in unconsolidated deposits generally reflects the overall water quality of the drainages, river, or the recharge sources (i.e. irrigation canal).

In the CWSA, groundwater quality data are virtually nonexistent. According to the Utah Department of Natural Resources (UDNR), all wells drilled to about 300 feet below ground surface have been dry (http://www.waterrights.utah.gov). Measurements of TDS for five wells drilled in the CWSA were reported to the BLM Vernal Field Office. Water from two wells drilled in the Uinta Formation (located in Section 10, T9S, R22E and Section 31, T9S, R23E) contained TDS of 585 mg/L and 1,250 mg/L. TDS was reported as 5,000 mg/L and 8,000 mg/L for two wells drilled in the Green River Formation (located in Section 25, T9S, R22E and Section 31, T9S, R23E). The lower value of 5,000 mg/L was reported from a well completed in the Bird's Nest Aquifer of the Green River Formation. TDS for one well completed in the Wasatch Formation in Section 31, T8S, R22E was reported as 48,005 mg/L.

#### 3.2.2.3 Groundwater Use

In the CWSA, permitted groundwater wells are held by private landowners and industries. These rights are issued for wells that are completed in shallow bedrock or unconsolidated alluvial material. Use of groundwater from the Uinta and Green River Formations is limited to livestock watering and industrial uses because of its poor quality in terms of total dissolved solids and hardness.

## 3.3 CLIMATE AND AIR QUALITY

### 3.3.1 Climate

The CWSA is located in the Uinta Basin; a semiarid mid-continental climate regime typified by dry windy conditions and limited precipitation. The closest climate measurements were recorded at the Deseret Generating and Transmission power plant near Bonanza, Utah (1948-1993). The Bonanza station is located approximately 10 miles south-southeast of the CWSA at an elevation of 5,460 feet above sea level (Western Regional Climate Center 2003). **Table 3.3-1** shows the mean temperature range, mean total precipitation, and mean total snowfall by month.

Air masses originating from the Pacific Ocean are typically interrupted by the western mountain ranges before reaching the Uinta Basin. As a result, the CWSA receives relatively slight amounts of precipitation. Summer thunderstorms provide greater amounts of rainfall to the higher elevations of the southern portion of the Basin. The annual mean precipitation at Bonanza is only 8.87 inches, and ranges from a minimum of 4.14 inches recorded in 1958, to a maximum of 13.23 inches recorded in 1957. On average, February is the driest month with a monthly mean precipitation of 0.43 inches, and October is the wettest month with a monthly mean precipitation of 1.05 inches. The annual average snowfall is 25 inches. December, January, and February are the snowiest months. A maximum annual snowfall of 38.7 inches was recorded in 1951.

The CWSA and surrounding area has an annual mean temperature of 48.1°F. However, abundant sunshine and rapid nighttime cooling result in a wide daily range in temperature. Average winter temperatures range from 11°F to 34°F, while average summer temperatures range from 54°F to 89°F. Recorded extreme temperatures are minus 32°F in 1990 and 106°F in 1981.

**Table 3.3-1. Average Temperature and Precipitation and Snowfall at Bonanza, Utah (1948-1993)**

| Season | Month | Average Temperature Range (° Fahrenheit) | Average Total Precipitation (inches) | Average Total Snowfall (inches) |
|---|---|---|---|---|
| **Spring** | March | 25.1 – 49.9 | 0.70 | 4.3 |
| | April | 34.1 – 63.3 | 0.79 | 1.0 |
| | May | 42.1 – 73.3 | 1.03 | 0.0 |
| | *Total Spring Average* | *33.8 – 61.2* | *2.52* | *5.3* |
| **Summer** | June | **50.1 – 85.3** | 0.73 | 0.0 |
| | July | 57.0 – 92.3 | 0.83 | 0.0 |
| | August | 54.6 – 89.6 | 0.91 | 0.0 |
| | *Total Summer Average* | *53.9 – 89.06* | *2.47* | *0.0* |
| **Fall** | September | 46.5 – 80.9 | 0.83 | 0.0 |
| | October | 35.5 – 66.2 | 1.05 | 0.5 |
| | November | 23.6 – 48.3 | 0.49 | 1.7 |
| | *Total Fall Average* | *35.2 – 65.1* | *2.37* | *2.2* |
| **Winter** | December | 12.7 – 34.8 | 0.52 | 5.3 |
| | January | 7.3 – 30.4 | 0.58 | 6.4 |
| | February | 13.4 – 37.2 | 0.43 | 5.3 |
| | *Total Winter Average* | *11.1 – 34.1* | *1.53* | *17* |
| ***Total Annual Average*** | | ***33.5 – 62.6*** | ***8.87*** | ***24.5*** |

Source: Western Regional Climate Center (2003). Data collected at Bonanza, Utah from 1948 to 1993.

Wind speed and direction, along with turbulence in the lower atmosphere, affect the transport and dispersion of air pollutants. The potential for atmospheric dispersion is relatively high for the area due to the frequency of strong winds and warm temperatures. However, calm periods and nighttime cooling enhance air stability and inhibit air pollutant transport and dilution. The area can experience frequent temperature inversions in winter when cold stable air masses settle into the valleys and snow cover and shorter days inhibit ground-level warming. During temperature inversions, cold air is trapped at the surface and vertical upward transport of pollutants is limited. Although temperature inversions occur during the summer, they last for a much shorter time because daytime ground-level heating rapidly leads to inversion break-up.

The nearest meteorological data were recorded at the Deseret Generating and Transmission power plant near Bonanza, Utah for the years 1985, 1986, 1987, and 1992. (Utah Department of Environmental Quality - Division of Air Quality [UDAQ], 1998). The wind data are shown on Figure 3.3-1 (Appendix A), which includes a wind rose that depicts wind speed and direction for all four years of data. Note that the data represent the direction from which the wind is blowing. For example, winds blowing from the northeast would transport pollutants to the southwest. As shown, winds originate from the east-northeast 16.7 percent of the time. The average measured wind speed is 6.8 miles per hour (3.02 meters/second).

## 3.3.2 Air Quality

### 3.3.2.1 Regulatory Environment

The EPA has primary regulatory authority for implementing various environmental statutes established by Congress. However, EPA has delegated this authority to Utah on non-Indian lands. The EPA retains statutory authority on Indian country while UDAQ has primacy for implementing the Federal Clean Air Act (CAA) and the permitting and operational compliance of air emission sources elsewhere.

National and Utah Ambient Air Quality Standards have been promulgated for the purpose of protecting human health and welfare with an adequate margin of safety. Pollutants for which standards have been set include sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), carbon monoxide (CO), and particulate matter less than 10 or 2.5 microns in effective diameter ($PM_{10}$ and $PM_{2.5}$). Existing air quality in the region is acceptable based on standards set for the protection of human health. Uintah County is designated as an attainment area, meaning that the concentration of criteria pollutants in the ambient air is less than the National Ambient Air Quality Standards (NAAQS). Site-specific air quality monitoring data are not available for the CWSA. However, background criteria pollutant concentrations for Uintah County (**Table 3.3-2**) are relatively low and consistent with a rural area with industrial development (UDAQ 2003).

Under the Prevention of Significant Deterioration (PSD) provisions, incremental increases of specific pollutant concentrations are limited above a legally defined baseline level. Many national parks and wilderness areas are designated as PSD Class I. The PSD program protects air quality within Class I areas by allowing only slight incremental increases in pollutant concentrations. Areas of the State not designated as PSD Class I are classified as Class II. For Class II areas, greater incremental increases in ambient pollutant concentrations are allowed as a result of controlled and well-managed growth. The PSD increments for both Class I and II areas are presented in **Table 3.3-2**.

The CWSA and surrounding region is Federally designated as a PSD Class II area. The nearest PSD Class I areas are Flat Tops and Maroon Bells Wilderness Areas in Colorado, and Arches and Canyonlands National Parks in Utah.

**Table 3.3-2. Ambient Criteria Pollutant Concentrations, National and State Ambient Air Quality Standards, and PSD Increments**

| Pollutant | Averaging Period(s) | Uintah County Background Concentration [a] ($\mu g/m^3$) [b] | NAAQS ($\mu g/m^3$) | PSD Class I Increment ($\mu g/m^3$) | PSD Class II Increment ($\mu g/m^3$) |
|---|---|---|---|---|---|
| $SO_2$ | Annual<br>24-hour<br>3-hour | 5<br>10<br>20 | 80<br>365<br>1,300 | 2<br>5<br>25 | 20<br>91<br>512 |
| $NO_2$ | Annual | 10 | 100 | 2.5 | 25 |
| $PM_{10}$ | Annual<br>24-hour | 10<br>28 | 50<br>150 | 4<br>8 | 30<br>17 |
| CO | 8-hour<br>1-hour | 4,236<br>6,984 | 10,000<br>40,000 | None<br>None | None<br>None |

[a] Source: Air Quality Technical Report for the Vernal Resource Management Plan DEIS (BLM 2005b)
[b] Micrograms per cubic meter ($\mu g/m^3$)

Hazardous air pollutants (HAPs) are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental impacts. The EPA has classified 189 air pollutants as HAPs. Examples of listed HAPs associated with the oil and gas industry include formaldehyde, BTEX compounds (benzene, toluene, ethylbenzene, isomers of xylene), and normal-hexane (*n*-hexane).

There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health. Therefore, reference concentrations (RfC) for chronic inhalation exposure and Reference Exposure Levels (REL) for acute inhalation exposures are applied as significance criteria. **Table 3.3-3** provides the RfCs and RELs. RfCs represent an estimate of the continuous (i.e. annual average) inhalation exposure rate to the human population (including sensitive subgroups such as children and the elderly) without an appreciable risk of harmful effects. The REL is the acute (i.e. one-hour average) concentration at or below which no adverse health effects are expected. Both the RfC and REL guideline values are for non-cancer effects.

**Table 3.3-3. HAP Reference Exposure Levels and Reference Concentrations**

| Hazardous Air Pollutant (HAP) | Reference Exposure Level [REL 1-hr Average] ($\mu g/m^3$) | Reference Concentration [a] [RfC Annual Average] ($\mu g/m^3$) |
|---|---|---|
| Benzene | 1,300 [b] | 30 |
| Toluene | 37,000 [b] | 400 |
| Ethylbenzene | 350,000 [c] | 1,000 |
| Xylenes | 22,000 [b] | 100 |
| n-Hexane | 390,000 [c] | 200 |
| Formaldehyde | 94 [b] | 9.8 |

[a] EPA Air Toxics Database
[b] EPA Air Toxics Database
[c] Immediately Dangerous to Life or Health (IDLH)/10, EPA Air Toxics Database since no available REL

The State of Utah has adopted Toxic Screening Levels (TSLs) which are applied during the air permitting process to assist in the evaluation of hazardous air pollutants released into the atmosphere (UDAQ, 2000). The TSLs are derived from Threshold Limit Values (TLVs) published in the American Conference of Governmental Industrial Hygienists (ACGIH) – "Threshold Limit Values for Chemical Substances and Physical Agents" (American Conference of Governmental Industrial Hygienists 2003). These levels are not standards that must be met, but screening thresholds which if exceeded, would suggest that additional information is needed to evaluate potential health and environmental impacts. The TSLs will be compared against modeling concentrations for averaging periods of 1-hour (short-term) and 24-hour (chronic). **Table 3.3-4** lists the corresponding TSLs for each applicable HAP.

**Table 3.3-4 Utah Toxic Screening Levels (TSLs)**

| Pollutant and Averaging Time | Toxic Screening Levels [b] ($\mu g/m^3$) |
|---|---|
| Formaldehyde (1-hour) | **37** |
| Benzene [a] (24-hour) | **53** |
| Toluene (24-hour) | **6,280** |
| Ethylbenzene (1-hour) | **54,274** |
| Ethylbenzene (24-hour) | **14,473** |
| Xylene (1-hour) | **65,129** |
| Xylene (24-hour) | **14,473** |
| n-Hexane (24-hour) | **5,875** |

[a] Although there exists an acute TLV for benzene, the State of Utah does not apply a comparison to an acute TSL since the chronic TSL is more stringent.
[b] Source: Utah Department of Environmental Quality - Air Quality Division (2000).

### 3.3.2.2 Pollutant Sources and Characteristics

Existing sources of air pollution within the CWSA and surrounding region include:

- exhaust emissions, primarily CO, nitrogen oxides ($NO_x$), and HAPs from natural gas fired compressor engines used in production and transportation of natural gas;
- natural gas dehydrator still-vent emissions of BTEX and *n*-hexane;
- gasoline and diesel-fueled vehicle tailpipe emissions of volatile organic compounds (VOC), NOx, CO, $SO_2$, $PM_{10}$, and $PM_{2.5}$;
- fugitive dust ($PM_{10}$ and $PM_{2.5}$) from construction activities, vehicle traffic on unpaved roads, wind erosion in areas of soil disturbance, and road sanding during winter months;
- $NO_x$, $SO_2$, CO, and $PM_{10}$ emissions from the Bonanza coal-fired power plant; and
- long-range transport of pollutants from distant sources contributing to regional haze.

### 3.3.2.3 Air Quality Related Values

Class I areas and some Class II areas of special concern are monitored for Air Quality Related Value (AQRV) impacts. These AQRVs include acidic deposition and visibility impairment.

Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and is reported as the mass of material deposited on an area in a period of time (kilograms per hectare per year or kg/ha/yr). Air pollutants are deposited by wet deposition (precipitation) and by dry deposition (gravitational settling of particles and adherence of gaseous pollutants). Total deposition refers to the sum of airborne material transferred to the earth's surface by both wet and dry deposition.

Acid Neutralization Capacity

Aquatic bodies such as lakes and streams are important resources in most Class I areas. Acid deposition resulting from industrial emissions of sulfur and nitrogen based compounds can have a toxic effect on the flora and fauna of an aquatic ecosystem. Lakes and streams differ in their inherent sensitivity to inputs of acidifying compounds from the atmosphere. For pristine watersheds, the acid neutralization capacity (ANC) is a good indicator of the sensitivity and buffering capacity of the water body to acid deposition. The ANC for fresh surface waters can be characterized by the combined concentrations of base cations (calcium, magnesium, potassium, and sodium), expressed in microequivalents per liter (µeq/l). The lower the ANC, the more sensitive the water body to acidifying compounds and their toxic effects.

Visibility

Visibility is characterized by three parameters; standard visual range (SVR), the light-extinction coefficient ($b_{ext}$), and impairment expressed as deciview. The visual range parameter represents the greatest distance that a large dark object can be seen. The light extinction coefficient represents the attenuation of light per unit distance due to scattering and absorption by gases and particulate matter in the atmosphere. Good visibility conditions are represented by long visual ranges and low light extinction values, while poor visibility conditions are represented by short visual ranges and high light extinction.

Visibility impairment is expressed in terms of deciview (dv). The deciview index was developed as a linear perceived visual change. A change in visibility of 1.0 dv represents a "just noticeable change" by the average person under most circumstances. Increasing deciview values represent proportionately larger perceived visibility impairments.

Visibility conditions within the Uinta Basin are reported to be very good. No background visibility data are available specifically for the CWSA. However, the nearest measurements, recorded at nearby Class I areas, are available from the Federal Land Managers' Air Quality Related Values Workgroup (FLAG, 2000) report. A standard annual visual range of 251 km ($b_{ext}$ of 15.6) is reported for Arches and Canyonlands National Parks, and 249 km ($b_{ext}$ of 15.7) for Flat Tops Wilderness. These areas are considered to have good visibility conditions.

## 3.4 SOIL RESOURCES

Soils within the CWSA are distributed according to the major soil forming factors. In this arid environment, the factors primarily include climate (effective moisture and temperature), parent material, and topographic position and slope. Baseline soil information was obtained from the U.S. Department of Agriculture – Natural Resource Conservation Service county-wide Soil Survey Geographic Database (SSURGO) (USDA-NRCS 2004). These data are based on potential or existing agricultural mapping prompted by the 1995 Farm Bill and include soil information on Federal and State owned properties. No soil data are currently available for Tribal/allotted land; however, it can be assumed that soil types on Tribal/allotted land would be similar to those found on adjacent properties. The depth to bedrock varies by soil association, and ranges from zero on rock outcrops to about 80 inches for the Nakoy loamy fine sand, which comprises only 0.02 percent of the CWSA.

According to SSURGO maps (USDA-NRCS 2004), there are 12 soil associations within the CWSA (Figure 3.4-1, Appendix A). Some of these associations are composed of the same soil series components but occur on different slopes. **Table 3.4-1** summarizes the 12 soil units identified in the Soil Survey of Uintah Area – Parts of Daggett, Grand, and Uintah Counties (USDA 1995) and lists the map symbol, soil name, slope, soil reaction, salinity, clay content, hydrologic group, erosion potential, and depth to bedrock.

<u>Slope (%)</u>

The erosion potential of a soil is directly related to its topographical slope. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. According to the USDA-NRCS (2004), all soils occurring on slopes greater than 40 percent have poor reclamation potential based upon their high erosion rates. Three soil units in the CWSA have the potential to occur on slopes greater than 40 percent (**Table 3.4-1)**.

<u>Soil Reaction (pH)</u>

The term soil reaction refers to the acidity or alkalinity of a soil (i.e., pH). Soil acidity or alkalinity is important when evaluating soil fertility and stabilization, and in determining the risk of soil corrosion. According to the USDA-NRCS (2004), all soils with a pH lower than 4.5 or greater than 9.1 have a “poor potential for reclamation” based upon poor fertility and stabilization. Six soil units in the CWSA have soils that are classified as poor for reclamation, based on potentially strong alkalinity (pH > 9). These units are highlighted in **Table 3.4-1**.

<u>Salinity</u>

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract. The salinity of soils is affected by the quality of water and the frequency of water applications. Salinity affects the suitability of a soil for plant growth, as well as the ability of soil to withstand erosion. According to the USDA-NRCS (2004), all soils with a salinity greater than 9 mmhos/cm have a “poor potential for reclamation” based upon poor fertility and stabilization. Six soil units in the CWSA have soils that are classified as poor for reclamation, based on high salinity (> 9 mmhos/cm). These units are highlighted in **Table 3.4-1**.

Clay Content

The content of sand, silt and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification. The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to absorb cations and to retain moisture. Clays influence shrink-swell potential, saturated hydraulic conductivity, plasticity, the ease of soil dispersion, and other soil properties. According to the USDA-NRCS (2004), all soils with clay content greater than 60 percent have a “poor potential for reclamation” based upon poor fertility. No soil units in the CWSA have clay content greater than 60 percent.

Hydrologic Group

Hydrologic groups are used to estimate precipitation runoff where soils are not protected by vegetation. The groups (labeled A through D) are based on infiltration of water when soils are thoroughly wet. In general, the slower the rate of infiltration, the greater the amount of run-off. Group A soils have high rates of infiltration when thoroughly wet. These consist mainly of deep, well drained to excessively drained soils or gravelly sands. Group B soils have moderate rates of infiltration. These consist chiefly of moderately deep or deep, moderately well drained or well-drained soils that have moderately fine texture to moderately coarse texture. Group C soils have a slow rate of infiltration. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture. Group D soils have a very slow rate of infiltration. These consist chiefly of clays that have high shrink-swell potential, soils that have a high water table, soils that have a claypan, and soils that are shallow over nearly impervious material. Six soils in the CWSA are in hydrologic soil group D, and would therefore be difficult to reclaim based upon high run-off potential.

Erosion Potential

The SSURGO database rates each of the soil units according to its soil erosion potential. The erosion potential indicates the susceptibility of a soil to sheet and rill because of both water and wind. These estimates are based primarily on the percentage of silt, sand and organic matter present in the soil. Erosion hazards become critical issues when protective vegetation is removed during and following activities such as road and well pad construction. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. Soils with more fines are at greater risk of wind erosion, and soils with more gravel and/or stones have a lower risk of wind erosion. No soils in the CWSA would have erosion factors of over 5 tons/acre/year.

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**Table 3.4-1. Soil Characteristics of the CWSA**

| Map Symbol | Soil Name | Acreage in CWSA | Slope | pH | Salinity (mmhos/cm) | Clay (%) | Hydrologic Group | Erosion Factor (tons/ac /year) | Depth to Bedrock (inches) |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Badland-Rock outcrop complex | 120 ac | 1 to 100% | 7.9 – 11.0 | 4.0 – 20.0 | 40-60 | D | 1 | 0-2 |
| 13 | Badland-Tipperary association | 6,743 ac | 1 to 8% | 7.9 – 11.0 | 4.0 – 20.0 | 40-60 | D | 1-5 | 0-60 |
| 33 | Cadrina association | 4,506 ac | 2 to 25% | 7.9 - 9.0 | 0.0 – 2.0 | 18-27 | D | 1 | 5-20 |
| 36 | Cadrina extremely stony loam-Rock outcrop complex | 1,077 ac | 25 to 50% | 7.9 - 9.0 | 0.0 – 4.0 | 18-27 | D | 1 | 0-20 |
| 38 | Cadrina-Casmos-Rock outcrop complex | 304 ac | 2 to 40% | 7.9 - 9.0 | 0.0 – 4.0 | 18-27 | D | 1 | 0-20 |
| 80 | Gilston-Muff-Cadrina complex | 8,209 ac | 1 to 25% | 7.9 - 9.0 | 0.0 – 16.0 | 18-34 | D | 1-5 | 5-68 |
| 90 | Green River-Fluvaquents complex | 37 ac | 0 to 2% | 7.9 - 11.0 | 0.0 – 8.0 | 0-27 | C | 5 | 5-60 |
| 95 | Hanksville silty clay loam | 14 ac | 2 to 25% | 8.5 - 11.0 | 2.0 – 16.0 | 35-55 | C | 3 | 20-40 |
| 120 | Jenrid sandy loam | 131 ac | 0 to 2% | 7.9 – 9.0 | 2.0 – 16.0 | 10-18 | B | 5 | 20-60 |
| 121 | Jenrid-Eghelm complex | 1,154 ac | 0 to 3% | 7.9 – 11.0 | 0.0 – 16.0 | 2-27 | B | 3-5 | 26-60 |

| Map Symbol | Soil Name | Acreage in CWSA | Slope | pH | Salinity (mmhos/ cm) | Clay (%) | Hydrologic Group | Erosion Factor (tons/ac /year) | Depth to Bedrock (inches) |
|---|---|---|---|---|---|---|---|---|---|
| 159 | Muff-Cadrina, Cool association | 3,748 ac | 1 to 25% | 8.5 – 11.0 | 0.0 – 8.0 | 18-34 | C | 1-3 | 5-40 |
| 160 | Nakoy loamy fine sand | 74 ac | 1 to 5% | 7.9 – 9.0 | 0.0 – 2.0 | 3-18 | B | 5 | 40-80 |

# 3.5 VEGETATION

## 3.5.1 Regional Overview and Vegetation Communities within the CWSA

Vegetation communities in the Uinta Basin are controlled by factors including elevation, slope, and soil parent material. Arid and semi-arid desert shrub communities, primarily consisting of rabbitbrush, greasewood, and horsebrush are found within the lower elevation areas of the Basin. As the plateau gently rises, the vegetation generally shifts to sagebrush, pinyon-juniper woodlands, and then to mixed coniferous forests. Riparian corridors and grasslands also occur along perennial streams and springs throughout the Basin.

The composition and extent of native plant communities within the Uinta Basin have been modified by livestock grazing, residential development, the development of oil and gas resources, and other land uses. Livestock grazing has decreased native plant species composition and has promoted establishment of noxious weeds where overgrazing has occurred. However, in general, while populations of undesirable weedy species are common where native plant communities have been disturbed or removed, they do not appear to be invasive in undisturbed communities.

The vegetation communities identified in this section are described using data obtained from the SSURGO Database (UDSA-NRCS 2004). No vegetation mapping currently exist for Tribal/allotted lands in the CWSA, however, it can be assumed that plant communities in these adjacent areas would be similar to those found in the CWSA.

Elevation in the CWSA ranges from 4,600 to 5,500 feet, and the rolling topography creates a conglomerate of changing slopes across the landscape. Topographic influences along with soil characteristics and precipitation have led to four primary vegetation communities within the CWSA: sagebrush shrub, desert shrub, riparian corridors, and badlands. Each community type is described in detail below. Figure 3.5-1 (Appendix A) provides a map of these communities in the CWSA.

Sagebrush Shrublands

Sagebrush shrublands occur throughout Utah typically at elevations between 4,000 and 7,000 feet. This community type is found most often on mountain flattops, plains, and valley bottoms, near drainages. In the CWSA, this community type is characterized by a somewhat sparse to dense shrub layer (20 percent to 80 percent) dominated by mountain big sagebrush (*Artemisia tridentata* var *wyomingensis*) or black sagebrush (*Artemisia nova*) depending on soil type. The understory within this community includes a variety of perennial grasses such as Sandburg bluegrass (*Poa secunda*), needle-and-thread-grass (*Stipa comata*), sand dropseed (*Sporobolus cryptandrus*), western wheatgrass (*Agropyron smithii*), Indian ricegrass (*Stipa hymenoides*), galleta grass (*Hilaria jamesii*), and localized populations of cheatgrass (*Bromus tectorum*). The sagebrush shrub community is the dominant plant community found in the CWSA. Sagebrush shrublands span across the entire central portion of the CWSA primarily between Coyote Wash and the White River.

Desert Shrub

The desert shrub vegetative community tends to be variable in its composition and dominance by shadscale (*Atriplex confertifolia*), fourwing saltbush (*Artiplex canescens*), rabbitbrush (*Chrysothamnus viscidiflorus*), and black greasewood (*Sarcobatus vermiculatus*). Soils in this community group range from shallow clay loam to deep sands, which along with soil chemistry and has set the pattern of shrub dominance and species composition on various sites. Winter grazing by sheep has also changed species composition in some areas of the unit, increasing the density of greasewood, snakeweed (*Gutierrezia microcephala*) and horsebrush (*Tetradymia glabrata*) within the community type. Transition areas of this community with Badlands and Rock Outcropping tend to have shallow soils, have low water holding capacity and are sparsely vegetated.

<u>Riparian Corridors and Wetlands</u>

Riparian corridors within the CWSA are limited to small sections of land along the White River. Plant species found with the CWSA riparian habitats include Fremont cottonwood (*Populus fremontii*), cattails (*Typha* sp.), some willow species (*Salix* sp.), as well as characteristic sedges (*Carex* sp.), rushes (*Juncus* sp.), and saltgrass. Tamarisk (*Tamarix ramosissima*) is a County listed noxious plant that has become a dominate species in the riparian community. Russian olive (*Elaeagnus angustifolia*) and perennial pepperweed (*Lepidium latifolium*) are also becoming dominate weed species in the riparian communities, especially along the White River. Riparian habitat is associated with the White River, which passes through the western edge of the CWSA. While riparian corridors within the CWSA may provide potential wetland habitats, no wetlands have been identified or mapped within the CWSA.

<u>Badlands</u>

Badlands are areas of severe erosion, usually found in semi-arid climates characterized by gullies, steep ridges, and sparse vegetation. Steep eroding slopes are generally devoid of vegetation except for a few annuals that come out in the spring when moisture conditions are favorable. Gardner's saltbush (*Atriplex gardneri*) and mat saltbush (*Atriplex corrugata*) grow on the toe slopes and areas of sediment deposition. Badlands consist of unconsolidated siltstone and claystone that are highly erodible, by the generally short, heavy shower events that sweep away the loose soil surface. Depressions gradually deepen into gullies. These areas are present throughout the western portions of the CWSA primarily along the White River and where the badlands transition to the desert shrub and sagebrush communities.

### 3.5.2 Invasive and Noxious Weeds

The spread of non-native plants and noxious weeds is a concern in areas proposed for surface disturbance. Noxious weeds are plants that are designated by a Federal, State, or county government as injurious to public health, agriculture, recreation, wildlife, or property. A noxious weed is commonly defined as a plant that grows out of place and is competitive, persistent, and pernicious (James et al. 1991). Invasive weeds include plants that are not native to this country. Many consider a plant invasive if it has been introduced into an environment where it did not evolve. As a result, invasive plants do not have any natural enemies (e.g. insects, other plants) to limit their reproduction. Both invasive and noxious weeds can spread through areas undeterred, producing significant changes to native vegetation communities. Specific negative effects of noxious and invasive weeds can include: 1) reduction in the overall visual character of any area; 2) competition with, or elimination of native plants; 3) reduction or fragmentation of wildlife habitats; and 4) increased soil erosion.

Weed invasion and establishment is moderate to high within the CWSA. The most common locations include existing disturbance areas such as well pads, roadsides, pipeline ROWs, adjacent washes, and areas where grazing has removed native species. The most common invasive species in the CWSA are Russian thistle (*Salsola iberica*), halogeton (*Halogeton glomeratus*), and cheatgrass (*Bromus tectorum*).

The BLM Weed Management Program of inventory mapping and control measures currently shows no known occurrences of noxious weeds in the CWSA listed by the State of Utah. Canada thistle (*Cirsium arvense*), Field bindweed, and (*Convolvulus arvensis*), Hoary cress (*Cardaria draba*) Russian knapweed (*Centaurea repens*), Scotch thistle (*Onopordum acanthium*) and Perennial pepperweed (*Lepidium latifolium*) occur in areas adjacent to the CWSA and have potential to occur in the CWSA. Salt cedar (*Tamarix ramosissima)* is a Uintah County listed noxious weed that occurs in the CWSA along drainages, ponds and sites where water collects along roads.

The following weeds are officially designated and published as noxious for the State of Utah, as per the authority vested in the Commissioner of Agriculture under Section 4-17-3, Utah Noxious Weed Act:

Bermudagrass (*Cynodon dactylon*)
Canada thistle (*Cirsium arvense*)
Diffuse knapweed (*Centaurea diffusa*)
Dyers woad (*Isatis tinctoria L*)
Field bindweed (*Convolvulus arvensis*)
Hoary cress (*Cardaria drabe*)
Johnsongrass (*Sorghum halepense*)
Leafy spurge (*Euphorbia esula*)
Medusahead (*Taeniatherum caput-medusae*)
Musk thistle (*Carduus mutans*)
Perennial pepperweed (*Lepidium latifolium*)
Perennial sorghum (*Sorghum halepense L & Sorghum almum*)
Purple loosestrife (*Lythrum salicaria L*.)
Quackgrass (*Agropyron repens*)
Russian knapweed (*Centaurea repens*)
Scotch thistle (*Onopordum acanthium*)
Spotted knapweed (*Centaurea maculosa*)
Squarrose knapweed (*Centaurea squarrosa*)
Yellow starthistle (*Centaurea solstitialis*)

### 3.5.3 Special Status Plant Species

The State of Utah does not have any plant species designated as sensitive, threatened, or endangered. However, the BLM has a sensitive species list for the State of Utah. The Vernal Field Office's list of Special Status Plant species that is used in Appendix C is composed of species that occur or have potential to occur on lands administered by the Vernal Field Office, and is developed from the BLM sensitive species list and the USFWS' Threatened, Endangered and Candidate species list.

In accordance with the Endangered Species Act of 1973 (ESA), as amended, the lead agency, in coordination with the USFWS, must ensure that any Federal action to be authorized, funded, or implemented would not adversely affect a Federally listed threatened or endangered species. It is BLM's current policy that USFWS candidate species and BLM State-sensitive species also are to be managed to prevent a future Federal listing as threatened or endangered. A list of Federally threatened, endangered and candidate plant species with the potential to occur in the CWSA was provided by the USFWS Utah Field Office during public scoping of this EIS. Existing BLM District files were examined for presence of known locations of Federal and BLM special status plant species, and the potential for habitat to occur within the CWSA was evaluated. Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*) and Ute Ladies'-tresses (*Spiranthes diluvialis*) are the only special status plant species that have potential to occur in the CWSA (Appendix C).

#### 3.5.3.1 Uinta Basin Hookless Cactus (*Sclerocactus wetlandicus*)

Two sub-species of the Uinta Basin hookless cactus (*Sclerocactus brevispinus* and *Sclerocactus wetlandicus*) occur in Duchesne and Uintah Counties. Both sub-species of the Uinta Basin hookless cactus are Federally threatened under the ESA. *S. brevispinus* is found primarily on clay badland soils most often in the salt desert shrub community. This sub-species has globose stems, with shorter spines and smaller flowers than *S. wetlandicus*. *S. wetlandicus* is found on silty soils with cobbles and gravel on river terrace deposits. Populations of *S. wetlandicus* are found throughout the Uinta Basin; however the species primarily occurs within 3 miles of the White, Green, and Duchesne rivers.

No potential habitat for *S. brevispinus* occurs in the CWSA. Potential habitat for *S. wetlandicus* is found along the White River corridor, primarily in the southwest portion of the CWSA. This species has not been identified in the CWSA; however, two known occurrences are located less than ½-mile from the CWSA boundary in Sections 33 and 34 T9S, R22E.

#### 3.5.3.2 Ute Ladies'-tresses (*Spiranthes diluvialis*)

Ute ladies'-tresses (Federally threatened) is a perennial, terrestrial orchid (Coyner 1990 and 1991). Across its range, habitat for the Ute ladies'-tresses occurs primarily on moist, permanently sub-irrigated, or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering springs, lakes, rivers, or perennial streams at elevations between 4,300 to 7,000 feet. However, some Ute ladies'-tresses populations north of Utah occur at elevations below 4,300 feet.

The species often occurs on recently created riparian habitats such as point bars or sand bars, as well as areas that are regularly flooded, such as backwaters. Recurrent disturbance, either through direct manipulation, such as irrigation, grazing or mowing, or restoration of the historic disturbance regime is a key factor in the establishment and maintenance of Ute ladies'-tresses populations (USFWS 1995a).

The central populations of Ute ladies'-tresses, such as those found on Utah BLM lands, are found in wet or mesic riparian meadows or in understory wetland meadows of riparian habitats in the Colorado River drainage (USFWS 1995a). Common associated vegetation of the central Ute ladies'-tresses populations consists of redtop (*Agrostis stolonifera*), reedgrass (*Calamagrostis* spp.), sedges (*Carex* spp.), thistle (*Cirsium* spp.), orchardgrass (*Dactylis glomerata*), helleborine (*Epipactis gigantea*), horsetail (*Equisetum* spp.), evening primrose (*Oenothera elata*), self-heal (*Prunella vulgaris*), coyote willow (*Salix exigua*), and Canada goldenrod (*Solidago canadensis*). The Ute ladies'-tresses has not been identified in the CWSA, and has not been identified in the greater Book Cliffs RMP planning area. However, marginally potential habitat for this species is present within the riparian corridors of the White River.

## 3.6 WILDLIFE AND FISHERIES

### 3.6.1 Introduction

The CWSA supports a diversity of wildlife and wildlife habitats. Species' occurrences are typically dependent on habitat availability, relative carrying capacities, and the degree of existing habitat disturbance. The CWSA supports approximately 31,872 acres of wildlife habitat encompassing large, fairly contiguous upland habitats, dissected by incised drainages and canyon systems. Water resources are limited within the CWSA and therefore, provide the greatest habitat value for wildlife. For a more detailed description of the habitat types in the CWSA please refer to Section 3.5 (Vegetation).

### 3.6.2 General Wildlife

Small mammals potentially found within the CWSA and surrounding region include cottontail rabbits (*Sylvilagus* spp.), black-tailed jackrabbit (*Lepus californicus*), white-tailed prairie dog (*Cynomys leucurus*), coyote (*Canis latrans*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale gracilis*), and various species of rodents and bats. Smaller migratory birds (see Section 3.6.6) common to the region include black-billed magpie (*Pica pica*), horned lark (*Eremophila alpestris*), common raven (*Corvus corax*), loggerhead shrike (*Lanius excubitor*), several species of sparrow, and numerous others. Herptiles potentially found in the region include wandering garter snake (*Thamnophis elegans vagrans*), Great Basin gopher snake (*Pituophis catenifer deserticola*), Great Basin spadefoot (*Scaphiopus intermontana*), western whiptail (*Cnemidophorus tigris*), sagebrush lizard (*Sceloporus graciosus*), and shorthorned lizard (*Phymosoma douglassii*).

Although all of these species are important members of wildland ecosystems and communities, most are common and have wide distributions within the region. Consequently, the relationship of most of these species to the proposed project is not discussed in the same depth as species that are threatened, endangered, sensitive, of special economic interest, or are otherwise of high interest or unique value.

### 3.6.3 Big Game

Four resident big game species are commonly found in the Uinta Basin: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), rocky mountain bighorn sheep (*Ovis canadensis*), and elk (*Cervus elaphus*). Pronghorn, mule deer, and bighorn sheep ranges have been mapped by the UDWR as occurring within the CWSA.

For big game species, the Book Cliffs RMP identifies habitat types occurring within the Book Cliffs planning area. As most of the CWSA leases pre-date the Book Cliffs RMP, seasonal restrictions associated with crucial winter ranges found within the CWSA do not apply to the CWSA leases.

The UDWR has identified various types of seasonal ranges (i.e., summer, winter, yearlong) throughout Utah. In comparison to the Book Cliffs RMP data, UDWR's big game data are frequently evaluated and updated and are generally considered to be the most current in terms of their use for NEPA analysis. Descriptions of these UDWR-designated habitat types within the CWSA are described in the following sections. It is important to note that BLM seasonal restrictions would not apply to UDWR-designated habitats.

UDWR-designated ranges are ranked according to their relative biological value (Dalton et al., 1990). Each UDWR ranking is defined in detail below.

- *Critical (Crucial)*: Critical ranges are "sensitive" use areas that are limited in availability or provide unique qualities for high-interest wildlife. These areas constitute irreplaceable, critical requirements for these species. The function of critical winter range (as defined by UDWR) is to provide shelter and forage to big game, ensuring their survival during periods of significant winter stress. It is important to note that the BLM reserves the term "critical" for describing critical threatened and endangered species' habitats. Therefore, hereinafter, discussions of UDWR-designated critical habitats in this EIS have been revised to use the term "crucial".
- *High priority*: High-priority ranges are "intensive" use areas that, due to relatively wide distribution, do not constitute crucial values but which are highly important to high-interest wildlife.
- *Substantial:* Substantial ranges are areas that provide "frequent" use by a wildlife species. These areas do not provide habitat for resident populations, although animals do consistently use these areas throughout a season.
- *Limited:* Limited ranges are areas that provide for only "occasional" use by a wildlife species. These areas do not provide habitat for resident populations, and animals use these areas only on a limited basis.

<u>Pronghorn Antelope</u>

Pronghorn typically inhabit grasslands and semi-desert shrublands of the western and southwestern United States. This species is most abundant in short- and mixed-grass habitats between 4,000-6,000 feet. Pronghorn are typically less abundant in xeric habitats, preferring areas that average 12-15 inches of precipitation per year. Home ranges for pronghorn can vary between 400 and 5,600 acres, according to factors including season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movements do not exceed six miles. Some pronghorn make seasonal migrations between summer and winter habitats, but these migrations are often triggered by availability of succulent plants and not local weather conditions.

Antelope from the Bonanza portion of the Vernal Herd Unit occupy much of the greater CWSA on a year-round basis. According to UDWR data, pronghorn habitats in the CWSA consist of approximately 18,681 acres of high priority habitat; 8,375 acres of crucial habitat, and 4,810 acres of limited habitat (see Figure 3.6-1, Appendix A) (UDWR 2004b).

<u>Mule Deer</u>

Mule deer occur throughout the western mountains, forests, deserts, and brushlands. Typical habitats include short-grass and mixed-grass prairies, sagebrush and other shrublands, coniferous forests, and forested and shrubby riparian areas. The species is common state-wide in Utah, where it can be found in many types of habitat, ranging from open deserts to high mountains to urban areas. Mule deer usually are migratory, spending the warmer months at higher elevations. During this time mule deer prefer foraging on the succulent regrowth of forbs and the new twigs of trees and shrubs. As summer progresses and the herbaceous plants mature and dry, the diet shifts more toward woody browse. This diet then continues as the deer are driven down to foothill areas in winter (Wilson and Ruff 1999). Fawn mortality is typically due to predation or starvation. Adult mortality often occurs from hunting, winter starvation, and automobile collisions. Potential predators in the CWSA would include coyotes and bobcats, and to a lesser extent golden eagles, mountain lions, and bears.

Mule deer from the Vernal Herd Unit occupy much of the greater CWSA on a year-round basis. According to UDWR data, a total of approximately 28,816 acres of limited habitat, 2,395 acres of crucial habitat, and 369 acres of high priority habitat occur in the CWSA (see Figure 3.6-2, Appendix A) (UDWR 2004b).

Rocky Mountain Bighorn Sheep

The Rocky Mountain bighorn sheep is native to rugged mountainous areas of western North America. In Utah, a great deal of effort has gone into re-establishing Rocky Mountain bighorn sheep, and the species can now be found in a number of mountain ranges. Rocky Mountain bighorn sheep prefer steep rocky slopes, and may migrate from higher elevations to lower valleys in the winter. Young are born in May or June. Females give birth to one or two lambs that can follow their mother shortly after birth. The diet of the species consists of a wide variety of plants, which vary with the season.

The UDWR has identified a small portion of the CWSA along the White River as "desirable potential crucial year long habitat" (UDWR 2004b). In past years, bighorn sheep have been observed within this habitat in the southwest corner of the CWSA near the White River.

### 3.6.4 Raptors

Some of the more common and visible birds within the CWSA include raptors, or birds of prey. The CWSA provides diverse breeding and foraging habitat for raptors: cool desert shrub communities, rocky outcrops, riparian zones, and lower elevation shrublands. **Table 3.6-1** identifies the raptor species with the potential to occur in the CWSA, and a description of typical nesting habitats.

**Table 3.6-1 Raptor Species with the Potential to Occur in the CWSA**

| Common Name | Scientific Name | Nesting Habitats |
|---|---|---|
| Golden Eagle | *Aquila chrysaetos* | Cliff ledges and rock outcrops |
| Long-eared Owl | *Asio otus* | Coniferous and deciduous forests, and shrublands |
| Great-horned Owl | *Bubo virginianus* | Cliff ledges or nests of other species |
| Ferruginous Hawk | *Buteo regalis* | Ground, pinyon-juniper woodlands, balanced pinnacles |
| Red-tailed Hawk | *Buteo jamaicensis* | Cliff ledges, rock outcrops, aspen, pinyon-juniper woodlands, etc. |
| Swainson's Hawk | *Buteo swainsonii* | Cottonwoods, spruce or serviceberry |
| Turkey Vulture | *Cathartes aura* | Rock outcrops, caves, and tree cavities |
| Prairie Falcon | *Falco mexicanus* | Cliff ledges |
| American Kestrel | *Falco sparverius* | Tree cavities, cliff crevices |
| Western Burrowing Owl | *Athene cunicularia* | Prairie dog colonies |

Bald eagles (*Haliaeetus leucocephalus*) have been documented using the CWSA during winter months, primarily using cottonwood trees along the White River for hunting. Bald eagle nesting is not likely to occur in the CWSA due to the absence of preferred nesting habitat.

All raptor species and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (MBTA) (16 USC, 703 et seq.).

Bald eagles, golden eagles, ferruginous hawks, and western burrowing owls are Special Status Wildlife Species and are therefore discussed in detail in Section 3.6.8.

Historical Data

BLM records document a total of 32 raptor nests in and within a one-mile radius of the CWSA. Of these nests, only 7 have been active within the last 3 years. This total number of recently active nests includes 5 nests within the boundaries of the CWSA (red-tailed hawk, ferruginous hawk, prairie falcon, golden eagle, and burrowing owl), and 2 nests within a one-mile radius of the CWSA (2 unknown species). Individual raptor nests left unused for several years are frequently reoccupied. For species like the golden eagle and ferruginous hawk, non-use of existing nests during any given year is often attributed to prey fluctuations caused by such things as drought (USFWS 2002a). Based on numerous factors including habitat types, local resident species, known raptor phenology, and lack of comprehensive survey data, additional breeding raptors may have established or could establish territories/nests within the CWSA and/or within the one-mile radius analyzed. Nest sites could occur on other cliff faces, rock outcrops, and in white-tailed prairie dog colonies.

### 3.6.5 Upland Game Birds

Three species of upland game birds are known to occur in or around the CWSA: greater sage-grouse (*Centrocercus urophasianus*), mourning dove (*Zenaida macroura*), and wild turkey (*Meleagris gallopavo*).

Greater Sage-grouse

The greater sage-grouse is listed as a sensitive species in the State of Utah. Based on its petitioned status as State-sensitive species, the greater sage-grouse is addressed in Section 3.6.8 under Special Status Wildlife Species.

Mourning Dove

The mourning dove is a common spring and fall migrant and summer resident occurring in appropriate habitats throughout the State of Utah (including the CWSA). This species is typically associated with open, upland communities with shrubs and trees that are large enough for nesting (Sibley 2003). Weed patches and grains in proximity to nesting and roosting cover provide excellent food. The mourning dove is the most widely distributed upland game bird in North America. Habitat for this species is found in all 29 counties throughout Utah. Approximately 250,000 mourning doves are killed annually by hunters in the State (Rawley et al., 1996). The UDWR has identified crucial value year-long mourning dove habitat as occurring in the shrub and riparian communities of the CWSA (UDWR 2004b). Due to the extensive range of the mourning dove throughout the State, and since EOG's development plans would generally avoid riparian habitat along the White River, neither the Proposed Action nor the No Action Alternative are likely to affect the species. Therefore, the mourning dove is not discussed further in this EIS.

Wild Turkey

The wild turkey is a fairly common resident in the foothills and mesas of the western states. The species' preferred habitat is the ponderosa pine community with an understory of scrub oak. Tall pine trees within this community are used for roosting. Turkeys also occur in mountain mahogany, pinyon-juniper woodlands, foothill riparian corridors, and in agricultural areas (Rawley et al. 1996). A total of 2,317 acres of crucial yearlong wild turkey habitat exists in the CWSA. Turkeys have been observed along drainage bottoms and along the White River in the CWSA. Due to the extensive range of the species throughout the State, and since EOG's development plans would generally avoid riparian habitat along the White River, neither the Proposed Action nor the No Action Alternative are likely to affect the wild turkey. Therefore, the species is not discussed further in this EIS.

### 3.6.6 Migratory Birds

The MBTA as amended was implemented for the protection of migratory birds. Unless permitted by regulations, the MBTA makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition to the MBTA, EO 13186 sets forth the responsibilities of Federal agencies to further implement the provisions of the MBTA by integrating bird conservation principles and practices into agency activities and by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds.

Numerous migratory bird species occupy the CWSA. Those migratory bird species that are listed under the ESA, or listed as sensitive by the BLM, are addressed in Section 3.6.8. This section addresses migratory birds that may inhabit the proposed CWSA, including those species classified as High-Priority birds by Partners in Flight. Partners in Flight is a cooperative partnership among Federal, State, and local government agencies as well as public organizations and individuals organized to emphasize the conservation of birds not covered by existing conservation initiatives. High-Priority species are denoted by an asterisk (*). Migratory bird species are addressed according to the habitat types found within the CWSA.

<u>Sagebrush/Desert Shrub</u>

Avian species commonly associated with the sagebrush/desert shrub communities include the horned lark (*Eremophila alpestris*), sage sparrow (*Amphispiza belli*), vesper sparrow (*Pooecetes gramineus*), black-throated sparrow (*Amphispiza bilineata*), sage thrasher* (*Oreoscoptes montanus*), Brewer's sparrow* (*Spizella breweri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), prairie falcon, and Swainson's hawk.

<u>Riparian Habitats</u>

Bird species commonly found in riparian habitats of the CWSA include hermit thrush (*Catharus guttatus*), veery (*Catharus fuscescens*), yellow-breasted chat (*Icteria virens*), Cordilleran flycatcher (*Empidonax occidentalis*), Lewis' woodpecker* (*Melanerpes erythrocephalus*), Wilson's warbler (*Wilsonia pusilla*), black-chinned hummingbird* (*Archilochus alexandri*), broad-tailed hummingbird* (*Selasphorus platycercus*), and Swainson's thrush (*Catharus ustulatus*).

<u>Badland and Desert Sands</u>

Badlands and desert sand areas are typically not preferred by migratory bird species because of the lack of vegetation used for cover. Migrating raptor species may use badland outcrops as temporary roosting structures as they travel across seasonal ranges, however these structures would more commonly be used by resident species.

### 3.6.7 Fisheries

The CWSA is located along the Upper Colorado River Basin. The White River occurs within the CWSA and provides habitat for numerous fish species. Several ephemeral washes also occur in the CWSA (Antelope Draw, Red Wash, and Coyote Wash), but based on their ephemeral nature, they generally do hold enough water to support fish. Those fish species that are Federally listed under the Endangered Species Act of 1973, as amended (ESA), or listed as sensitive by the BLM, are addressed in Section 3.6.8. **Table 3.6.2** lists fish species that could occur in the portion of the White River that flows through the CWSA.

**Table 3.6.2 Fish Species Potentially Found in the White River and CWSA**

| Common Name | Scientific Name | Status | Native/Non-Native |
|---|---|---|---|
| Bluehead Sucker | *Catostomus discobolus* | Sensitive | Native |
| Bonytail | *Gila elegans* | Federally Endangered | Native |
| Carp | *Cyprinus carpio* | Common | Non-Native |
| Channel Catfish | *Ictalurus punctatus* | Common | Native |
| Colorado Pikeminnow | *Ptychocheilus lucius* | Federally Endangered | Native |
| Flathead Minnow | *Pimephales promelas* | Common | Non-Native |
| Flannelmouth Sucker | *Catostomus latipinnis* | Sensitive | Native |
| Humpback Chub | *Gila cypha* | Federally Endangered | Native |
| Northern Pike | *Esox lucius* | Common | Native |
| Razorback Sucker | *Xyrauchen texanus* | Federally Endangered | Native |
| Red Shiner | *Cyprinella lutrensis* | Common | Non-Native |
| Roundtail Chub | *Gila robusta* | State Threatened Species | Native |

### 3.6.8 Special Status Wildlife Species

This section discusses species that have a Federal and/or State special-status designation. This includes:

- Species listed as threatened or endangered, proposed for listing as threatened or endangered, or considered a candidate for listing as threatened or endangered under the ESA;
- Species listed as sensitive by BLM; and
- Species listed as threatened, endangered, or a species of special concern by the UDWR.

In accordance with the ESA, the lead agency, in coordination with the USFWS, must ensure that any Federal action to be authorized, funded, or implemented would not adversely affect a Federally listed threatened or endangered species. It is BLM's current policy that USFWS candidate species and State-sensitive species also be managed to prevent a future Federal listing as threatened or endangered.

Numerous Federally listed and Utah sensitive species have the potential to occur within the CWSA. The list of threatened, endangered and candidate species with the potential to occur in the CWSA was provided by the USFWS Ecological Services Office. A brief description of each of the Federally listed and sensitive species with the potential to occur in the CWSA is presented in the following sections, as well as briefly discussed in Appendix C. Appendix C also briefly discusses special status wildlife species that were considered but eliminated from detailed analysis in this EIS.

**Black-footed Ferret (*Mustela nigripes*)**

The black-footed ferret is a Federally endangered species. The species' original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In Utah, white-tailed prairie dog (*Cynomys leucurus*) colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising young (Fagerstone 1987). In accordance with the USFWS' current threshold for white-tailed prairie dog colonies, a minimum of 200 acres of contiguous habitat and a minimum density of eight active burrows per acre is required to sustain a viable ferret population (USFWS 1989). Although prairie dog colonies are scattered throughout the CWSA, no formal prairie dog colony surveys or burrow density estimates have been completed.

In 1999, black-footed ferrets were released in Coyote Basin, an area approximately 32 miles southeast of Vernal, Utah and 10 miles from the northeastern end of the CWSA (USDOI-BLM-UDWR-USFWS 1999). The ferret release location and surrounding area was termed the Coyote Basin Black-Footed Ferret Primary Management Zone (PMZ). Ferret reintroduction in the Coyote Basin PMZ was authorized by the USFWS, in cooperation with the BLM, the Colorado Division of Wildlife and the UDWR. Section 10j of the ESA classifies reintroduced populations such as those ferrets in the Coyote Basin as "nonessential-experimental". The provisions of section 10j allow for more flexible management of the animal and ease the more stringent requirements of the ESA.

The BLM, USFWS, and UDWR are monitoring the released population closely and have noted that the ferrets are expanding into surrounding areas. Although ferrets have not been documented within the specific CWSA, it is possible that the species could eventually migrate into the CWSA as released populations grow and expand into other suitable habitats.

**White-Tailed Prairie Dog (*Cynomys Leucurus*)**

The white-tailed prairie dog (WTPD) is a Utah State Sensitive Species. In Utah, WTPD occur in the eastern portion of the state, primarily in the Uinta Basin and the northern portion of the Colorado Plateau. Rangewide, the WTPD is estimated at one to two million individuals (Knowles 2002). In northeastern Utah, the species occurs in areas around Flaming Gorge/Manila, Diamond Mountain, and in the Uintah Basin.

White-tailed prairie-dogs inhabit mountain valleys, semi-desert grasslands, agricultural areas, and open shrublands in Western North America (Hall 1981). They are distributed in relatively large, sparsely populated complexes and live in loosely knit family groups or "clans" (Tileston and Lechleitner 1966). Clan boundaries are ill-defined with most activity being concentrated around feeding sites.

Breeding occurs in late March to early April after adults emerge from burrows. Females produce a single litter each year. Gestation lasts 30 days (Bakko and Brown 1967) with an average of 5.6 young born in late April to May. White-tailed prairie dogs, however, are dynamic breeders and appear to be able to adjust their reproductive output in response to resource abundance (Menkens and Anderson 1989). Reproductive success has been found to be dependent on body weight with heavier males siring more offspring, juveniles reaching sexual maturity earlier, and litter size correlating directly with female body mass (Rayor 1985, Hoogland 2001).

The main threat to WTPD populations has been the introduction of sylvatic plague (*Yersinia pestis*) into North America in the late 1930's (Lechleitner et al. 1968, Cully 1993). Prairie-dogs appear to have little immunity to this disease, and plague epizootics frequently kill > 99 percent of prairie-dogs in infected colonies (Cully and Williams 2001, Clark et al. 1989). Other threats include habitat loss, conversion of land to agriculture, and Federal and State sponsored eradication campaigns. Recreational shooting pressure is capable of reducing prairie-dog numbers on a local scale, in conjunction with outbreaks of sylvatic plague. However, it has not been documented to threaten population stability alone (Knowles 2002).

Although prairie dog colonies are scattered throughout the CWSA, no formal prairie dog colony surveys or burrow density estimates have been completed.

**Bald Eagle (*Haliaeetus leucocephalus*)**

The bald eagle is a Federally threatened species under the ESA, and is also protected under the Bald Eagle Protection Act. Bald eagle nesting is currently limited in Utah to four known locations. No bald eagle nests have been documented within the CWSA. At the time of this writing, the closest documented bald eagle nest is located along the White River just inside the Colorado state line, about 13 miles east of the CWSA.

Bald eagle wintering habitat is typically associated with food source concentrations. These areas include major rivers that remain unfrozen whereby fish and waterfowl are available, and near ungulate winter ranges that provide carrion (Montana Bald Eagle Working Group 1990). Bald eagles are often seen in and near the western portion of the CWSA during winter months, usually from early November through late March. They normally roost in cottonwoods along the White River and forage in upland habitats for carrion and small mammals.

**Golden Eagle (*Aquila chrysaetos*)**

The golden eagle is protected under the Bald Eagle Protection Act, based upon the similarity of the juvenile bald eagle's physical appearance to that of the adult golden eagle. Throughout the summer, golden eagles are found in mountainous areas, canyons, shrub-land and grassland. During the winter, they inhabit shrub-steppe vegetation, as well as wetlands, river systems and estuaries. Golden eagles are quite common to Uintah County and the Book Cliffs resource area. A total of nine golden eagle nests, plus a one-mile buffer, are located within the CWSA. Of these eight nests, two of which have been documented as active within the last three years.

**Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)**

The western yellow-billed cuckoo, a Federal candidate for listing under the ESA, is a riparian obligate bird that feeds in cottonwood groves and nests in willow thickets. Nest sites have been correlated with large and relatively large willow-cottonwood patches, dense understories, high local humidity, low local temperature, and in proximity to slow or standing water. In Utah, this Neotropical migrant nests in riparian areas and has been documented in cottonwood habitat along the Green River (Howe and Hanberg 2000). Similar breeding habitat occurs in the western portion of the CWSA along the White River. Therefore, the species has the potential to occur there.

### Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon has recently been delisted by the USFWS and is no longer considered a Federally listed endangered species. This species is still State-listed as endangered, and it will still be considered a sensitive species during the five-year monitoring period required as part of delisting. The peregrine falcon breeds in Utah on the Colorado Plateau and in the Great Basin. Nesting peregrines prefer high cliffs in close proximity to water, where riparian and wetland areas provide suitable foraging habitat. No peregrine falcon nests have been documented in the CWSA, and species occurrence is not likely due to the absence of nesting habitat. Based on this information, the alternatives would not affect the peregrine falcon and the species is therefore, not discussed further in this EIS.

### Ferruginous Hawk (*Buteo regalis*)

The ferruginous hawk is a State threatened raptor. Throughout their range, ferruginous hawks have been found nesting on a wide variety of substrates (Evans 1982). The ferruginous hawk is a common species in western, northeastern, and southeastern Utah. Within the State of Utah, ferruginous hawks nest on junipers, pinyon pines, cottonwoods, on the ground, on low hills and knolls, on low cliffs, and on artificial structures (Smith and Murphy 1978). Generally, this species nests where visibility is extensive and this, in part, may contribute to the species' relatively high sensitivity to human disturbance (Suter and Joness 1981). Ferruginous hawks lay eggs from mid-March through early April and the young fledge from early June to early July (Call 1978).

In the CWSA, ferruginous hawk stick nests are typically located on rock outcrops and low cliffs elevated from the surrounding terrain, as well as in isolated junipers. BLM records document eight ferruginous hawk nests within the CWSA or a one-mile radius. Notations within BLM records along with Buys & Associates ground surveillance indicate that only one of these nests has been active in the last 4 years. However, raptors will regularly return to nests even after several years of inactivity.

### Short-eared Owl (*Asio flammeus*)

The short-eared owl is classified by UDWR as a Species of Special Concern due to declining populations (UDWR 2004b). In northern and central Utah, this owl species typically occurs in open desert and semi-desert habitats, particularly near wetland vegetation. This species may be declining in Utah because of habitat loss associated with agricultural and urban development. Limited habitat for the short-eared owl exists within the CWSA, in association with intermittent drainages containing greasewood and big sagebrush, which are suitable for use as nesting habitat. No short-eared owl nests have been documented in the CWSA and the likelihood for this species to occur in the CWSA is low.

### Western Burrowing Owl (*Athene cunicularia*)

The western burrowing owl is a UDWR Species of Special Concern. Western burrowing owls are summer residents on the plains over much of Utah and usually arrive on breeding grounds from late March to mid-April (Johnsgard 1988). The species is associated with dry, open habitat that has short vegetation and contains an abundance of burrows (Thomsen 1971; Wedgwood 1978; Haug and Oliphant 1990). In Utah, prairie dog burrows are the most important source of western burrowing owl nest sites. Western burrowing owl use of abandoned prairie dog towns is minimal, and active dog towns are the primary habitat for the owls (Butts 1973). As the range and abundance of these burrowing mammals have decreased, so too has the status of the Western burrowing owl. One active western burrowing owl nest has been documented in the northern portion of the CWSA. Potential habitat exists within active prairie dog towns in the CWSA.

**Greater Sage-grouse (*Centrocercus urophasianus*)**

The greater sage-grouse is an important game bird found in the Uinta Basin. Greater sage-grouse, as the name implies, are restricted to sagebrush habitats. The greater sage-grouse is listed as a sensitive species in the State of Utah. Factors involved in the declines in both the distribution and abundance of greater sage-grouse include permanent loss, degradation, and fragmentation of sagebrush-steppe habitat throughout the western states including Utah (Heath et al. 1996, Braun 1998); however no single causative factor has been identified, and combinations of multiple factors are probably responsible in most instances. It has been conservatively estimated that at least one-half of the original area occupied by sage-grouse is no longer capable of supporting this species on an annual basis (Braun et al. 1976, Braun 1995). Since 1967, the abundance of male grouse attending breeding grounds in Utah has declined by approximately 50 percent. Brood counts and harvest data show similar trends.

Greater sage-grouse habitat is primarily located in the sagebrush shrub community and can be found throughout central portions of the CWSA. Approximately 450 acres of sage-grouse winter range is found in the CWSA. While sage grouse have been recorded in the CWSA, and potential leks may exist, neither BLM nor UDWR have recorded any leks in the CWSA.

### 3.6.9 Special Status Fish Species

The USFWS (1994) has identified four Federally listed fish species historically associated with the Upper Colorado River Basin: Colorado pikeminnow (*Ptychochelius lucius*), humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*). These fish are Federally and State-listed as endangered and have experienced severe population declines. Critical habitat has been designated for the four endangered fish in the Green River 100-year floodplain. The White River floodplain, south of the CWSA, is designated as critical habitat for the razorback sucker (USFWS 1994b).

Three additional fish species are endemic to the Colorado River Basin and have been affected by flow alterations, habitat loss or alteration, and introduction of non-native fish: roundtail chub (*Gila robusta*), flannelmouth sucker (*Catostomus latipinnis*), and bluehead sucker (C*atostomus discobolus*). The roundtail chub is a State-listed threatened species, while the two suckers are species of special concern due to declining population numbers and distribution.

**Colorado Pikeminnow**

The Colorado pikeminnow is Federally listed as endangered. The Colorado pikeminnow thrives in swift flowing muddy rivers with quiet, warm backwaters. Colorado pikeminnow are primarily piscivorous (fish-eaters), but smaller individuals also eat insects and other invertebrates. The species spawns during the spring and summer over riffle areas with gravel or cobble substrate. Eggs are randomly splayed onto the bottom, and usually hatch in less than one week (Sigler and Sigler 1996).

Colorado pikeminnow were historically found in the mainstem Colorado River and its tributaries from Wyoming to the Gulf of California. Currently, wild populations of pikeminnow persist only in the upper basin. The White River currently supports some of the highest densities of Colorado pikeminnow in the Green River sub-basin. The White River is used for year round residence and also as a migration corridor to other connected habitats in the Green and Yampa rivers. Adult Colorado pikeminnow are present in the White River upstream to the Taylor Draw Dam. Portions of the White and Green rivers and their 100-year floodplains in and near the CWSA are officially designated as critical habitat for the Colorado pikeminnow (USFWS 1994b).

**Humpback Chub**

The humpback chub is a Federally endangered minnow found in the Upper Colorado River Basin. The humpback prefers deep, fast-moving, turbid waters often associated with large boulders and steep cliffs. Humpback chubs feed predominately on small aquatic insects, diatoms and filamentous algae. Spawning occurs between April and July during high flows from snowmelt (Sigler and Sigler 1996).

Historically, the humpback chub inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White and Little Colorado rivers. Today, populations currently exist near the Colorado/Utah border in Westwater Canyon in Utah and at Black Rocks, in Colorado. Smaller numbers have been found in the Yampa and Green rivers in Dinosaur National Monument, Desolation and Gray canyons on the Green River in Utah, Cataract Canyon on the Colorado River in Utah and the Colorado River in Arizona. The largest known population is in the Little Colorado River in the Grand Canyon, where there may be up to 10,000 fish. There are no population estimates available for the rest of the upper Colorado River basin (USFWS 1994b).

**Bonytail**

The bonytail is a Federally listed endangered species found in the Upper Colorado River Basin. This fish typically lives in large, fast-flowing waterways of the Colorado River system; however, their distribution and habitat status are largely unknown. Adult bonytail feed on terrestrial insects, zooplankton, algae and plant debris. Young feed mainly on aquatic insects. Although bonytail spawning in the wild is now rare, the species does spawn in the spring and summer over gravel substrate. Many bonytail are now produced in fish hatcheries, with the offspring released into the wild when they are large enough to survive in the altered Colorado River system environment (Sigler and Sigler 1996).

Bonytail once were common in portions of the upper and lower Colorado River basins. The bonytail is now the rarest of the endangered fish species in the Colorado River basin. Upstream of Lake Powell, this fish is nearly extinct, and in the last decade only a handful have been captured on the Yampa River in Dinosaur National Monument, on the Green River at Desolation and Gray canyons and on the Colorado River at the Colorado/Utah border. In the lower basin, bonytail exist in Lake Mohave and Lake Havasu (USFWS 1994b).

**Razorback Sucker**

The razorback sucker is a Federally listed endangered species found in the Upper Colorado River Basin. This species is a large, bronze to yellow fish that grows to a weight of about 15 pounds and has a sharp-edged keel behind the head. Razorbacks are found in deep, clear to turbid waters of large rivers and some reservoirs over mud, sand or gravel. Like most suckers, the razorback feeds on both plant and animal matter. The razorback sucker spawns in the spring. Breeding males turn black up to the lateral line, with brilliant orange extending across the belly (Sigler and Sigler 1996).

Historically, the Federally endangered razorback sucker inhabited the Colorado River and its tributaries from Wyoming to the Gulf of California. The current distribution of razorback suckers in the Upper Colorado River basin is confined to small groups of fish in several widely distributed locations. Most of these fish occur in an area including the lower Yampa River, and the Green River from the mouth of the Yampa River downstream to its confluence with the Duchesne River. Small populations may also occur in the lower Green River, the Colorado River at Grand Valley, and in the San Juan River upstream from Lake Powell. Portions of the White and Green rivers and their 100-year floodplains are officially designated as critical habitat for the razorback sucker (USFWS 1994b).

**Roundtail Chub**

The roundtail chub is a Utah State threatened species that is found in the Upper Colorado River Basin. This species is a large member of the minnow family found most often in major rivers and smaller tributary streams. Although movement patterns are poorly understood, the roundtail chub has been described as sedentary and mobile, depending on life stage and habitat conditions. Roundtail chubs typically mature from ages three to five, and fecundity varies with fish from as low as 1,000 eggs to over 40,000 eggs per female (UDWR 2004b).

Extant roundtail chub populations include the Green River from the Colorado River confluence upstream to Echo Park and in the White River from the Green River confluence upstream to near Meeker, Colorado. The roundtail chub now occupies approximately 45 percent of its historical range in the Colorado River Basin. In the Upper Colorado River Basin (New Mexico, Utah, Colorado and Wyoming), it has been extirpated from approximately 45 percent of its historical range, including the Price River and portions of the San Juan, Gunnison and Green rivers. Data on smaller tributary systems are largely unavailable, and population abundance estimates are available only for short, isolated river reaches (UDWR 2004b).

**Flannelmouth Sucker**

The flannelmouth sucker is a Utah State sensitive species found in the Upper Colorado River Basin. Flannelmouth suckers typically inhabit deep water habitats of large rivers, but are also found in small streams and occasionally in lakes. Flannelmouth typically spawn during March and April in the southern portions of Utah and from May to June in the North and higher elevations. Fecundity of females is proportional to fish size and varies with environmental conditions (UDWR 2004b).

Extant flannelmouth sucker populations can be found from the Green River at the Colorado River confluence upstream to Flaming Gorge Reservoir, and the White River from the Green River confluence to Kenny Reservoir, Colorado. Recent investigations of historical accounts, museum specimens, and comparison with recent observations indicate that flannelmouth suckers occupy approximately 50 percent of their historic range in the Upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico). Populations have declined since the 1960s due to impoundment of the mainstream Green River in Wyoming and Utah (Flaming Gorge Reservoir) and the Colorado River in Glen Canyon, Utah (Lake Powell) (UDWR 2004b).

**Bluehead Sucker**

The bluehead sucker is a Utah State sensitive species found in the Upper Colorado River Basin. Bluehead suckers occur in small to large streams and rivers and tributaries in the

Upper and Lower Colorado River Basin and in the Weber and Bear River drainages in the Bonneville basin. Large adult bluehead may inhabit stream environments as deep as two to three meters, although they most commonly feed in riffles and swift runs. Life expectancy is typically six to eight years. Spawning occurs in spring and early summer at lower elevations and mid- to late summer in higher, colder waters. Spawning occurs on gravel beds in shallow water (UDWR 2004b).

Bluehead suckers historically occurred in the Colorado River Basin above the mouth of the Grand Canyon in mainstream and tributary habitats. In Utah, bluehead suckers continue to be found in mainstream rivers and tributary streams above Glen Canyon Dam to headwater reaches of the Green and Colorado rivers. Populations currently occur in the mainstream Green River from the Colorado River confluence upstream to Lodore, Colorado, and in the White River from the Green River confluence upstream to Meeker, Colorado. In the upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico), bluehead suckers currently occupy approximately 45 percent of their historical habitat. Recent declines of the species have occurred in the White River below Taylor Draw Dam, and in the upper Green River (UDWR 2004b).

## 3.7 RANGELAND MANAGEMENT

The CWSA contains portions of six grazing allotments on BLM and State lands: Antelope Draw, Horned Toad, Little Emma, Olsen, Seven Sisters, and West Tabyago. All six allotments in the CWSA are grazed by sheep during various grazing periods.

An animal unit month (AUM) is defined as the amount of forage needed to feed one cow, one goat, or five sheep for one month. Between the six allotments, there are approximately 24,692 acres of land allotted for grazing by the BLM within the boundaries of the CWSA. There are 2,390 AUMs within the CWSA. Details on each allotment within the CWSA are provided in **Table 3.7.1**.

On Tribal/allotted lands in the CWSA, livestock grazing (cattle and sheep) occurs throughout most portions of the CWSA. The majority of the livestock Tribal/allotted land is owned and operated by Ute Tribe Livestock enterprise. Formal allotments and grazing seasons have not been identified on Tribal or private lands. However, based on BLM Acres / AUM, it was assumed that an average of 13 acres is needed to provide one AUM on Tribal/allotted lands.

**Table 3.7.1 Grazing Allotments on BLM and State Land in the CWSA**

| Allotment Name | Type | Total Allotment Acres | Total Allotment AUMs | Acres / AUM | Acres within CWSA | AUMs within CWSA |
|---|---|---|---|---|---|---|
| Antelope Draw | sheep | 56,927 | 3,679 | 15 | 5,840 | 389 |
| Horned Toad | sheep | 19,773 | 2,238 | 8 | 95 | 12 |
| Little Emma | sheep | 38,472 | 3,626 | 10 | 5,868 | 587 |
| Olsen | sheep | 103,239 | 9,268 | 11 | 535 | 49 |
| Seven Sisters | sheep | 17,051 | 1,920 | 8 | 10,064 | 1,258 |
| West Tabyago | sheep | 4,674 | 187 | 24 | 2,290 | 95 |

| Allotment Name | Type | Total Allotment Acres | Total Allotment AUMs | Acres / AUM | Acres within CWSA | AUMs within CWSA |
|---|---|---|---|---|---|---|
| **Total** | **NA** | **NA** | **NA** | **NA** | **24,692** | **2,390** |

## 3.8 CULTURAL RESOURCES

### 3.8.1 Introduction

The Uintah Basin (including the CWSA) has been a region of human activity for thousands of years. Much has been written about the prehistory and history of the eastern Utah region. Comprehensive overviews of the prehistory and history of the Uinta Basin are available in Paradigms and Perspectives, a Class I Overview of Cultural Resources in the Uinta Basin and Tavaputs Plateau (Spangler 1995, update in progress) and A History of Uintah County, Scratching the Surface. Spangler incorporated data from southwest Wyoming, northwest Colorado, and areas adjacent to those administered by BLM, Vernal Field Office into his review.

Spangler divided the cultural history of the broader eastern Utah region into five basic occupation periods (or cultural affiliations) that are defined temporally, behaviorally, and technologically. They are largely based on differences in artifact assemblage data through time although behavior pattern data and use practice data are also taken into consideration. The five cultural affiliations provided as a basic context in which to consider known cultural resources are:

- Paleoindian period - 12,000 to 6,000 B.C.
- Early Archaic period - 6,000 to 3,000 B.C.
- Middle Archaic period - 3,000 to 500 B.C.
- Late Archaic period - 500 B.C. to 550 A.D.
- Formative stage - 500 to 1300 A.D.
- Shoshonean stage - 1300 A.D. to present
- Historic Euroamerican period - 1776 A.D. to present.

### 3.8.2 Class I Inventory of the CWSA

A Class I Inventory of the CWSA was completed by Grand River Institute in October 2004. This Class I inventory was designed to meet the initial needs of compiling existing data concerning cultural resource management (CRM) projects and historical properties within the Area of Potential Effects (APE). An APE is further defined as the geographic areas within which an undertaking may cause changes in the character or use of historic properties in accordance with 36 CFR 800.2, NHPA section 301(7) and section 110 (16 U.S.C. 470), and IM 99-039 (1/7/99). A complete Class I Inventory Report was provided to the BLM Vernal Field Office as part of the official project file for this EIS (Grand River Institute 2004). However, as that report contains sensitive cultural resource location information, it is not available for public review. The following discussion provides a summary of cultural resources within the CWSA.

### 3.8.3 Summary of Cultural Sites within the CWSA

The computerized management and analysis of large number of sites and site data requires that sites be classified into types. These site types are generally based upon the morphological characteristics of the site, its observed features, materials, and other site attributes. Two basic approaches have been previously utilized over the years: a descriptive classification (i.e. outcrop-face lithic site, or sherd and lithic scatter); and an interpretive classification (i.e. habitation site, or extractive site). In all cases, site classification depends upon accurate field observation and recording.

The previous classificatory schemes have been replaced within a more generalized classification system. In this way, all the sites can be consistently classified whether or not site function or all potential site characteristics are apparent from the surface indications. These types include the following:

- **Burial** - human remains, historic or prehistoric. Includes all forms of disposal: cremation, and primary or secondary graves.
- **Historic** - sites containing some form of historical structure such as cabins, corrals, barns, root cellars etc.; or historical trash such as glass, ceramic crockery, or cans, etc.
- **Isolated Find** (IF) - single artifacts, features, or other phenomena. There are a wide variety of definitions for this type, unfortunately, not all of which are single artifacts.
- **Linear Feature/Historic** - path or passageway and/or a prepared path somewhat wider than a trail. Includes such features as roads or railroad grades, as well as excavated features such as canals and ditches.
- **Linear Feature/Prehistoric** - path or passageway and/or a prepared path somewhat wider than a trail.
- **Multiple** - site containing both historical and prehistorical cultural materials.
- **Open Architectural** - prehistoric sites situated in open topographic situations and containing architectural features. These features may be stone walls, pit houses, stone alignments, enclosures, game drives, hunting blinds, multi or single room structures, and wickiups in forested situations.
- **Open Camp** - sites consisting of features or artifacts which indicate domestic activities, and which are located in an open topographic situation. The presence of two or more of the following items define the activities: fire features such as charcoal and ash stains, hearths and/or fire-cracked rock, ground stone, ceramics, lithic tools and/or debitage, or middens.
- **Open Lithic** - lithic scatters located in open topographic situations. Cultural materials include chipped stone tools and waste flakes without the presence of ground stone; or, ground stone without the presence of chipped stone tools or waste flakes. This site type is often referred to as a limited activity loci, a lithic scatter, chipping station, or resource extraction site.
- **Quarry** - site where actual extraction, selection, and preliminary processing of raw lithic material is displayed.
- **Rock Art** - pictographs and/or petroglyphs that are not associated with any other class of site or cultural material. For example, rock art associated with a rock shelter would be classified as a feature in a sheltered camp.
- **Sheltered Architectural** - these sites are similar to open architectural sites except that they are located in rock shelters, overhangs, or alcoves. Granaries, storage cists, dry laid walls, or wickiups in rock shelters are contained in this category.
- **Sheltered Lithic** - these sites are located in rock shelters, overhangs, or alcoves and contain chipped stone tools and waste flakes without ground stone, or ground stone tools without chipped stone tools or waste flakes. They are similar to open lithic sites except for their sheltered nature.

- **Unknown** - Site type is presently unknown and/or undefined.

As of June 2005, 93 cultural sites have been recorded within the CWSA, 35 of which are eligible to the National Register of Historic Places (NRHP). The components of these sites were classified as to type and presented in **Table 3.8-1**. Many of these sites are hallmarked by an absence of diagnostic cultural materials such as projectile points, ceramics, or rock art, and may be indicative of differential activities such as gathering versus hunting. However, it is equally probable that these "non-diagnostic" sites also represent the last remains of sites surface-collected or eroded away, or the first appearance of sites still buried. About 60 percent of the known sites have assigned cultural affiliations (**Table 3.8-2**).

**Table 3.8-1 Known Cultural Site Types in the CWSA**

| Site Type | Frequency |
|---|---|
| Lithic scatter | 22 |
| Prehistoric camp | 20 |
| Prehistoric sheltered camp | 2 |
| Rock Art | 1 |
| Lithic Procurement | 4 |
| Burial / Rock Circle | 4 |
| Historic camp | 14 |
| Historic rock art | 5 |
| Trail | 1 |
| Livestock Structure | 1 |
| Transportation | 4 |
| Communication | 1 |
| Trash scatter | 8 |
| Rock Cairn | 5 |
| Other | 1 |
| **Total** | 93 |

**Table 3.8-2 Sites Identified by Prehistory and Cultural Affiliation within the CWSA**

| Prehistory | Cultural Affiliation | Frequency |
|---|---|---|
| Archaic Period | Archaic | 4 |
| Fremont Era | Fremont | 2 |
| Historic Period | EuroAmerican | 21 |
| Historic Period | Ute Reservation Period | 5 |
| Historic Period | Ute Late Historic | 3 |
| Unknown Prehistoric period | Unknown Prehistoric | 44 |
| Unknown Historic period | Unknown Historic | 14 |
| | **Total** | **93** |

## 3.8.4 Nature and Distribution of Cultural Sites in the CWSA

Cultural sites are differentially distributed throughout the CWSA despite the fact that the environment is relatively homogeneous. Some conclusions can be drawn from the data, including that the greatest number of sites are adjacent to water (from small drainage courses to the river corridor within its larger vegetative community), on vantage point localities, along ecozone edges (i.e., between riparian and desert shrub communities), and on slopes of less than 30 percent.

One of the strongest apparent patterns in the CWSA is the tendency for sites to cluster in a linear fashion along drainages. This association of the sites with drainages not only reflects the importance of drainages as sources of food and water for humans and animals, it also emphasizes their importance as travel corridors within a larger transportation/trail system. The locations of the sites along the drainage corridors may reflect this, and may help illuminate the relationships between prehistoric resource locations and modern floral/faunal distribution patterns.

Interestingly, but as yet unexplained, is that those occurring the greatest distance from the White River are all open camps and, in a couple cases, sheltered camps. This factor may indicate a basic pattern of adaptation to seasonal distributions of floral and faunal resources by general elevation. That is, the location of the open camp sites generally depends on the season of the year and what particular resource(s) is being exploited, which could influence the decision as to whether or not one activity interferes with another, or whether it is best to locate the camp at or between the resources being exploited. Clear-cut distinctions seldom exist in the archaeological record, and overlapping variability is often the norm rather than the exception. Coupled with the vagaries of chronological control, lack of diagnostic artifacts (often due to vandals' surface collection), and multiple or mixed occupations, there are seldom any clear answers.

This Class I study indicated that 65 percent of those recorded cultural properties are situated in areas within about 1.85 miles of permanent or intermittent water sources. More than half of these previously recorded sites are within 1.85 miles of the White River. This may be a substantive correlation not only because of its relation to a water resource but also to winter concentrations of large mammals. This inference is limited because faunal populations expand to whatever niches are available and capable of supporting them, and it is difficult to prove a direct relationship between the modern game distributions and the location of prehistoric sites. However, if archaeologists are going to continue to utilize modern floral distributions in their analysis and interpretation of prehistoric site locations, then modern faunal distributions should be utilized on an equal level. For years, the argument against this has been centered on the mobility of faunal populations versus the more sedentary nature of floral distributions. But this argument ignores the very nature of faunal mobility, which is dependant on the sedentary plant resources.

Also of interest is the high occurrence of sites (78 percent) within a relatively tight elevation zone of 4700-5000 feet, which is an even greater occurrence than those found near the White River. This elevation is well below the heavy snow line, and generally corresponds to the lowest average precipitation for the period of October to April. This elevation range contains the best zone for both dry land and flood-water irrigation of corn and other domesticates for horticultural groups, and has the most reliable growing season temperature ranges. These elevations also encompass the contact of the Riparian Corridor and Desert Shrub communities, which produce the greatest amount of storable seeds, roots, tubers, bulbs, and berries within the Uintah Basin valley. It is notable that few of the previously recorded sites occur within the riparian zone, which may be accounted for by flooding and heavy vegetation.

Another hypothesis that may account for this occurrence involves the flow and layering of cold air. Temperature inversions are formed when surface high-pressure systems settle in the east-west trending valleys along the Colorado/Utah border causing air flows to stagnate. There may be as much as a 30-degree (F) increase in air temperature above the inversion level. The normal monthly range for these temperature inversions is from November to February, and the strongest inversions occur from mid-December through January.

However, the frequency of these temperature inversions is dynamic and highly variable on a year-to-year basis and much depends on snow and cloud cover. In the CWSA, as in other large valleys, the coldest air would sink toward the river corridors where it is overlain by a warmer layer, probably within a few hundred feet.

Another consideration is that placing the winter camps/habitations within the small drainages and near the river corridor was likely a means of gaining shelter from the winds that have nothing to break them on the open valley floor.

Specific prehistoric site locations were chosen based upon local topographic variables and micro-environmental factors, so their generalized resource extractive tasks may be tentatively identified according to the chipped- or ground-stone tool assemblages present. Then, specific identification of the resource extractive tasks can be verified by excavation and appropriate analyses. In the near future, in-depth analysis can be conducted by combining the general site type categories (such as sheltered camps) with sub-queries on various features, tools, time period, etc., and linking them with various environmental variables such as drainage, vegetation, faunal distributions, elevation, soils, and geologic data by using Geographic Information System (GIS) analysis. Through GIS analysis, it is possible to examine the distribution of the sites in terms of broad cultural-ecological adaptations within a particular sub-region.

## 3.9 PALEONTOLOGY

### 3.9.1 Regional Overview

The CWSA is located in the Uinta Basin of northeastern Utah, on the north edge of the Colorado Plateau province. The Uinta Basin is an asymmetric synclinal basin trending east-west immediately south of the Uinta Mountains, west of the Douglas Creek Arch, northwest of the Uncompahgre Plateau, southeast of the San Rafael Swell and Wasatch Plateau, and east of the Wasatch Mountains (See Figure 3.1-1, Appendix A). This intermontane basin formed in early Tertiary times, subsiding as a response to the uplift of the Uinta Arch. Rivers in southern and eastern Utah and western Colorado drained toward the basin creating a huge fresh-water lake during the Late Paleocene. This lake, called Lake Uinta, lasted into the Late Eocene and would extend at times into the Bridger Basin in southwestern Wyoming and the Piceance Basin in western Colorado. Deposition of sediments continued during gradual subsidence of the Uinta Basin, filling it with nearly three vertical miles of lacustrine and terrestrial strata during the Tertiary (Hintze 1964).

The CWSA occupies a small portion of the Uinta Basin; in a topographic district Clark (1957) called the Central Badlands District. In the northern portion of the CWSA, this Badland District is composed of fairly stable Pleistocene and Quaternary pediments of sand and silty soils, and erosional benches carved and dissected by ephemeral drainages, exposing vast badland rims of variegated mudstone and thin sandstone units of the lower Duchesne River Formation (Brennan Basin Member) and inter-tongued beds of the upper Uinta Formation (Myton Member, Uinta C). In the central and southern portions of the CWSA is composed of the Wagonhound Member of the Uinta Formation (Uinta B) and is characterized by sandstone-rich units that form resistant benches and buttes and are incised by deep-cut drainages. These Eocene bedrock units dip gently north northeastward, resulting in the lower units being exposed primarily in the southwest portion of the CWSA.

The Uinta Formation consists of fluvial deposits of wide meandering streams in the east and west ends of the basin and predominantly lacustrine sediments near the center of the basin, recording the last several million years of the dwindling Lake Uinta. Fluvial channel sands trend north-northwest and are often feldspar-rich; suggesting the source for the Uinta Formation was from the erosion of Laramide uplifts of western Colorado (Stagner 1941; Brun et al. 1986). Originally, the Uinta Formation was divided into three lithologic units: Uinta A (lower), B (middle) and C (upper) (Osborn 1895, 1929). Years later, Uinta A and B were combined into the Wagonhound Member, and Uinta C, exclusive of the lower beds of the Duchesne River Formation, was named the Myton Member (Wood 1934). Uinta A has rarely yielded fossil mammals, but to the credit of two classic localities within the White River Pocket (in the Uinta B) and the Myton Pocket (in the Uinta C), two distinct mammalian faunas were identified. These faunas have been referred to as the early Uintan mammal and late Uintan mammal assemblages, which correlate to Uinta B and C members (Riggs 1912; Peterson and Kay 1931; Kay 1934). The emphasis in more recent decades on magnetostratigraphy, radioscopic chronology, and continental biostratigraphy (Flynn 1986; Prothero 1990; Prothero and Swisher 1990, 1992; Walsh 1996) has produced better stratigraphic control. With the more recent discovery of localities throughout the Uinta Formation, the faunal turnover between early and late Uintan becomes less apparent (Rasmussen et al. 1999; Townsend et al. 2000). In addition to mammals, the Uinta bears a diverse assemblage of turtles, fish, crocodiles, flamingoes, and fresh-water mollusks.

The Duchesne River Formation consists of predominantly south-southwest trending fluvial deposits of a distal alluvial plain of recycled sedimentary and low-grade meta-sedimentary rocks from the actively rising and eroding Uinta Mountains (Anderson and Picard 1972; Picard & Anderson 1975; Maxwell & Picard 1976). It is composed of pale reddish sandstones and mudstones of low gradient meandering streams and overbank floodplain deposits in a broad east-west swath across the northern part of the Uinta Basin. Four members of the Duchesne River Formation are recognized: the lower Brennan Basin Member (which includes the Randlett and lower Halfway Horizons); the Dry Gulch Creek Member (which includes the upper Halfway Horizon); the Lapoint Member; and the upper Star Flat Member (Anderson & Picard 1972). Of these four members, the Brennan Basin Member is the most fossiliferous, with a fauna regarded as Uintan in age. The remaining members of the Duchesne River Formation contain sparse fossils, except for the Lapoint Horizon, which is the basis for the type locality for the Duchesnean North American Land Mammal Age (Rasmussen et al. 1999; Clark et al. 1967).

Scientific interest in the paleontologic record of the Uinta Basin lies in the major fossil assemblages that are preserved in a fairly continuous record of deposition within a closed basin throughout Eocene times. More specifically, most of the attention has focused on the fossiliferous beds of the Uinta and Duchesne River Formations that were laid down 49 to 40 million years ago (Prothero 1990, 1996; Prothero & Swisher 1990, 1992). During this time, the Uinta Basin was changing from a tropical/subtropical region teeming with rich floral and faunal ecosystems to drier and more seasonal climates with corresponding changes in evolutionary trends. These changes were global, due to the separation of Europe from North America and eventually the splitting of Antarctica from Australia. These tectonic events changed the pattern of oceanic currents, which had a profound effect on climates (Prothero 1996). Changes in the ecosystems within the Uinta Basin were compounded due to the increased elevation and rising highlands surrounding the basin (Rasmussen et al. 1999). Comparisons of coeval faunas from other parts of the country help to define these changes (Rasmussen & Townsend 1995).

Collection of Eocene vertebrates from the Uinta Basin began with O.C. Marsh of the Yale Peabody Museum in 1870. In the 1880's, Princeton University amassed extensive collections from the Uinta Basin that were subsequently studied by W.B. Scott and H.F.

Osborn (Scott & Osborn 1887, 1890). Their work showed a distinctive evolutionary stage in Tertiary mammals that was later formalized as the Uintan Land Mammal Age by Wood and others in 1941 (Rasmussen et al. 1999). Brief collecting trips were conducted by the Carnegie Museum during the first half of the 20th century with an emphasis on large mammals, and then only recently by Washington University, St. Louis, for the small and minute mammalian taxa (Rasmussen et al. 1999). Other institutions have collected only briefly in the Uinta Basin over the last century (e.g., Field Columbian Museum of Chicago, Utah Museum of Natural History, Brigham Young University, and others) for a sample of Uinta Basin fossils for their collections or for samples of exhibit quality specimens. Many localities known today are a result of the collecting by the Utah Field House in Vernal and through paleontologic surveys required of oil and gas interests by the BLM before ground disturbing activities are conducted.

### 3.9.2 Paleontologic Resources in the CWSA

Small paleontological resource surveys, restricted to well pads and pipelines in the area of the CWSA, have resulted in the discovery of a large number of fossil localities; however, the bulk of the area is largely unsurveyed. Despite the limited areas of surveys, 98 fossil localities have been reported within the boundaries of the CWSA. Only seven localities were found to occur in the Myton member of the Uinta Formation. The Myton beds are found in the northern regions of the CWSA, inter-tongued with southwestward thinning wedges of the Duchesne River Formation along the south side of Glen Bench. Ordinarily, the Myton member is very fossiliferous, but the minimal number of localities is likely due to limited exposures and the limited surveys in the area of Myton outcrop. Exposures of the Wagonhound Member of the Uinta Formation are the predominant outcrop in the rest of region. Sixteen of the early localities were not identified to geologic units, nor to taxonomic status (all were archaeological surveys), but many of them occur in areas that are mostly Wagonhound outcrop. The fossil taxa found within the CWSA are typical of taxa found throughout the Uinta and Duchesne River Formations consisting of a diverse variety of primitive mammals, crocodiles, and turtles.

In efforts to manage paleontologic resources on public lands, several protective measures have been utilized. Fossil resources on BLM-managed public lands are managed under existing FLPMA, NEPA, CFR and USC codes and under other guidance as outlined in the BLM 8270 Manual and Handbook (1998) for the Management of Paleontological Resources and as per the DOI Museum Property Handbook, Department Manual (DM) 411 (1997) for the Management of Museum Collections. The BLM 8270 Handbook for the Management of Paleontological Resources ranks formations according to their paleontological potential, as follows:

- *Condition 1* – Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources would be necessary if the 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 very 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 eolian 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.

The Vernal Field Office in consultation with the BLM Regional Paleontologist is currently employing these classifications. Although these guidelines apply mostly to vertebrate fossils, they are designed to help protect rare plant and invertebrate fossils, especially existing and potential “Type” localities. Likewise, many fossils, though common and unimpressive in and of themselves, can be important indicators of paleoenvironment, depositional regime, and chronostratigraphy (i.e., temporal relationships).

### 3.9.3 Existing Paleontological Resource Impacts in the CWSA

Beneficial and adverse impacts on paleontological resources already occur within the CWSA, both due to naturally occurring and man-made disturbances. High erosion rates on steep bedrock slopes in portions of the CWSA have the benefit of constantly exposing subsurface materials, including new fossils. Discovery and documenting these fossils during reconnaissance surveys by paleontologists increases our knowledge base and helps to preserve the resource. However, when exposed for long periods of time, these fossils erode from the confining sediments, often “float” on the ground surface, and gradually deteriorate. Impacts such as mechanical breakage and disarticulation of surface fossils, due to trampling by animals and damage caused by human activities undoubtedly occur in the CWSA. Collecting of common invertebrates and plant fossils is a traditional and ongoing recreational activity in eastern Utah. Although several fossil enthusiasts have reported vertebrate and other scientifically important fossil discoveries to land managers and BLM-permitted paleontologists, illegal collection of surface fossils still occurs and is an ongoing problem. Recreational activities, such as OHV use and exploring off designated roads and trails, either on foot or by mechanized means, pose inadvertent impacts on paleontologic resources. Construction of previously approved well pads, roads, and pipelines also pose a risk to fossil resources.

## 3.10 LAND USE AND STATUS

The CWSA, located approximately 25 miles south of Vernal, Utah, is comprised of about 31,872 acres entirely within Uintah County, Utah. The CWSA includes a mix of mostly Federal public lands administered by the BLM Vernal Field Office, State of Utah lands administered by the State Institutional Trust Lands Administration (SITLA), Ute Tribal/allotted lands on the Uintah and Ouray Indian Reservation, and various privately-owned properties. All lands within the CWSA lie within the Book Cliffs Resource Area. **Table 3.10-1** provides a breakdown of land ownership in the CWSA. Figure 1-1 (Appendix A) shows the extent of Federal, Tribal, State, and private lands in the CWSA.

**Table 3.10-1 Land Ownership in the CWSA**

| Ownership | Acres | Percent of CWSA |
|---|---|---|
| Federal – BLM Administered | 22,693 | 71% |
| State of Utah | 1,914 | 6% |
| Northern Ute Tribe | 6,577 | 21% |
| Private | 688 | 2% |
| **Total** | **31,872** | **100** |

Current land uses within and adjacent to the CWSA consist of existing natural gas development, wildlife habitat, dispersed recreation, recreation along the White River and at Fantasy Canyon, limited small game hunting, and livestock grazing. Recreational activities along the White River and at Fantasy Canyon are described in detail in Section 3.12 - Recreation. Apart from oil and gas facilities, there are very few developed land uses in the CWSA and the general land character is open and unpopulated. There are no commercial businesses, nor private residences within the CWSA. The CWSA includes a total of six grazing allotments on public lands, which were described in detail in Section 3.7 – Rangeland Management. There is also limited irrigated agriculture adjacent to and west of the White River on the west side of the CWSA.

In terms of man-made structures and surface disturbance, there are approximately 325 producing natural gas wells in the CWSA, along with an extensive road network, aboveground and buried pipelines, tank batteries, ponds, compressor stations, and miscellaneous gas treatment equipment. Routine operation and maintenance activities associated with existing gas exploration and production generate most vehicle traffic and human activity in and around the CWSA.

The Book Cliffs RMP authorizes the leasing and development of Federal oil and gas resources, provided appropriate protection of other resource values is incorporated into exploration and production activities. Oil and gas development in the Book Cliffs resource area is subject to various Federal On-shore Orders, UDOGM regulations, site-specific and area-wide lease stipulations, BLM Information Notices, site- or project-specific COAs based on the sensitivity of resources present, and various other regulatory authorities. Natural gas development in the CWSA is consistent with the planning objectives of the BLM.

Mineral ownership within the CWSA is illustrated in Figure 1-2 (Appendix A). The majority of minerals within the CWSA are owned by the Federal government. There are a total of 774.5 acres of Indian minerals subject to three different leases within the entire CWSA, all of which are located in T9S:R22E. The mineral estate on Ute Tribal/allotted lands is owned by the Tribe, Ute Distribution Corporation and administered in trust by the BIA, or by allottees. No formal management plan exists for Tribal/allotted lands under the jurisdiction of the BIA. Instead, the elected Tribal Business Committee and the BIA determine approval of land use activities (including gas development) on Tribal/allotted lands. One of the BIA's objectives is to produce funding for the Tribe. Production on Tribal leases provides royalties and damage fees to the Tribe, thus the alternatives are consistent with the planning objectives of the BIA and Tribe.

Several existing and permitted ROWs are found across BLM administered lands within the CWSA. These include roads maintained by Uintah County, resource roads used by oil and gas operators, and natural gas pipelines (BLM 2004g). **Table 3.10-2** lists existing and authorized ROWs granted by BLM in the CWSA.

**Table 3.10-2 BLM ROWs in the CWSA**

| Permittee | Type | Location | Acreage[1] |
|---|---|---|---|
| Questar Pipeline Co. | Oil/Gas Pipeline | T8S, R22E, Sec. 34<br>T9S, R22E, 3 | 327.1 |
| Chevron Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 3, 4<br>T9S, R22E, 3, 4 | 186.6 |
| Colorado Interstate Gas | Oil/Gas Pipeline | T9S, R22E, 13, 14, 15, 24<br>T9S, R23E, 19, 20, 21, 22 | 110.9 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 3, 10, 11, 12, 13, 14, 15, 22, 23, 26, 27, 28<br>T9S, R23E, 19, 20, 28, 29 | 97.4 |
| Chevron Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 3 | 97 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T9S, R22E, 13, 14, 15, T9S, R23E, 19, 20, 21, 22 | 87.2 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 19, 20, 21, 22, 23 | 60.1 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T8S, R22E, Sec. 34,<br>T9S,R22E, 3 | 50.3 |
| Westport Oil and Gas Co. | Oil/Gas Pipeline | T9S, R23E, 21, 28, 33,<br>T10S,R23E, 4, 5, 10 | 38.8 |
| EnCana Gathering Services | ROW (roads) | T9S, R23E, 3 | 30.6 |
| Noble Energy Inc. | ROW (roads) | T10S, R23E, 10 | 27.1 |
| Newfield Production Co. | ROW (roads) | T10S, R23E, 10 | 25 |
| BLM | ROW (other) | T9S, R22E, 3, 10, 15, 22, 27, 30 | 22.9 |
| Westport Oil and Gas Co. | ROW (roads) | T9S, R23E, 30, 31 | 19.6 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 30, 31 | 18.2 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 10, 11, 13, 14, 15, 22, 26, 28 | 13.8 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 18, 27, 28 | 13.8 |
| EnCana Gathering Service | Oil/Gas Pipeline | T8S, R22E, 34 | 12.7 |
| CIG Exploration Inc. | Roads ROW | T9S, R22E, 24, 25 | 10.6 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 25<br>T9S, R23E, 19, 30 | 10.3 |
| Westport Field Services | Oil/Gas Pipeline | T9S, R23E, 31 | 9.5 |
| QEP Uinta Basin Inc. | ROW (roads) | T9S, R23E, 14, 23 | 7.8 |
| Hot Rod Oil | Oil/Gas Pipeline | T9S, R23E, 14, 15, 22 | 7.6 |
| Westport Oil and Gas Co. | Oil/Gas Pipeline | T9S, R23E, 31 | 7.5 |
| Westport Oil and Gas Co. | ROW (roads) | T10S, R23E, 3, 4, 10 | 7.1 |
| QEP Uinta Basin Inc. | Oil/Gas Pipeline | T9S, R23E, 10, 15, 21, 22 | 6.7 |
| QEP Uinta Basin Inc. | ROW (roads) | T9S, R22E, 24, T9S, R23E, 18, 19 | 6.6 |
| EOG Resources | ROW (roads) | T9S, R23E, 33, 34 | 4.9 |
| Moon Lake Electric Association | Power Line | T9S, R23E, 3 | 4.6 |
| EOG Resources | Oil/Gas Pipeline | T9S, R23E, 28, 33, 34 | 4.6 |
| QEP Uinta Basin Inc. | ROW (roads) | T9S, R23E, 8 | 4 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T8S, R22E, 34<br>T9S, R22E, 3 | 3.8 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 15 | 3.2 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 3 | 3.1 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 3, 10, 15 | 2.8 |

| Permittee | Type | Location | Acreage[1] |
|---|---|---|---|
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 15 | 2.7 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 19, 30 | 2.5 |
| Houston Exploration Co. | ROW (roads) | T9S, R23E, 13, 14 | 2.5 |
| EOG Resources | Oil/Gas Pipeline | T8S, R22E, Sec. 34, | 2.2 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 12, 13 | 2.2 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 29, 30 | 2.1 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 11, 12 | 1.8 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 19 | 1.7 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 23 | 1.6 |
| QEP Uinta Basin Inc. | Oil/Gas Pipeline | T9S, R23E, 18, 19 | 1.6 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 10, 11 | 1.5 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 22 | 1.5 |
| EOG Resources | ROW (roads) | T9S, R23E, 19 | 1.5 |
| Westport Oil and Gas Co. | Oil/Gas Pipeline | T9S, R23E, 33 | 1.4 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 25 | 1.3 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 14 | 1.2 |
| Houston Exploration Co. | ROW (roads) | T9S, R23E, 14 | 1.2 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 23 | 0.9 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 13 | 0.7 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 25 | 0.6 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R23E, 30 | 0.6 |
| QEP Uinta Basin Inc. | Oil/Gas Pipeline | T9S, R23E, 23 | 0.6 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 25 | 0.5 |
| QEP Uinta Basin Inc. | Oil/Gas Pipeline | T9S, R23E, 8 | 0.5 |
| EnCana Gathering Service | Road | T9S, R22E, 1 | 0.2 |
| EOG Resources | Oil/Gas Pipeline | T9S, R22E, 35 | 0.2 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T8S, R22E, Sec. 34<br>T9S, R22E, 3 | 327.1 |
| Chevron Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 3, 4<br>T9S, R22E, 3, 4 | 186.6 |
| Colorado Interstate Gas | Oil/Gas Pipeline | T9S, R22E, 13, 14, 15, 24<br>T9S, R23E, 19, 20, 21, 22 | 110.9 |
| Questar Gas Management Co. | Oil/Gas Pipeline | T9S, R22E, 3, 10, 11, 12, 13, 14, 15, 22, 23, 26, 27, 28<br>T9S, R23E, 19, 20, 28, 29 | 97.4 |
| Chevron Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 3 | 97 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T9S, R22E, 13, 14, 15, T9S, R23E, 19, 20, 21, 22 | 87.2 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T9S, R23E, 19, 20, 21, 22, 23 | 60.1 |
| Questar Pipeline Co. | Oil/Gas Pipeline | T8S, R22E, Sec. 34, T9S, R22E, 3 | 50.3 |
| Westport Oil and Gas Co. | Oil/Gas Pipeline | T9S, R23E, 21, 28, 33, T10S, R23E, 4, 5, 10 | 38.8 |
| EnCana Gathering Services | ROW (roads) | T9S, R23E, 3 | 30.6 |
| Noble Energy Inc. | ROW (roads) | T10S, R23E, 10 | 27.1 |
| Newfield Production Co. | ROW (roads) | T10S, R23E, 10 | 25 |

Source: BLM LR2000 Database
[1] Indicates acreage in multiple ROWs

With respect to Uintah County land use planning policies and objectives, the Uintah County Plan (Uintah County 2005) contains specific policy statements and regulations addressing land uses related to natural resource development on public lands, including natural gas extraction. In general, the Uintah County Plan supports multiple use management practices, adequate public and private access to BLM lands, responsible increases in recreational activity on public lands, and underscores the importance of oil and gas development to the local and regional economy.

## 3.11 TRANSPORTATION

The existing transportation system within the CWSA consists of approximately 121 miles of unpaved access roads that service existing oil and gas operations, livestock transportation for grazing, and recreational users. Most of these roads are claimed by Uintah County. Class “B” roads are claimed, maintained, and improved by the County. Class “D” roads are claimed by the County but are generally maintained by the operators.

Primary access to the CWSA would be by the Glen Bench Road. Traffic levels on some roads that could be used for access are monitored by the Utah DOT. Traffic volume data available from 2000, reflect average annual daily traffic (AADT) on roads that could be used to access the CWSA and are listed below in **Table 3.11-1**.

**Table 3.11-1 Average Annual Daily Traffic on Major nearby Roads**

| Route | AADT |
|---|---|
| State HW 45 south of intersection with Old Bonanza Highway | 820 |
| Watson Road at Ouray | 700 |
| Glen Bench Road south of intersection with State HW 45: | |
| Fidar and Glen Bench Intersections | 1,000 |
| Mountain Fuel Bridge – 675 per day | 675 |
| Chapita Grove/Glen Bench – 852 per day. | 852 |

## 3.12 RECREATION

The CWSA is located primarily on public lands administered by the BLM, with a large portion of Tribal/allotted land in the western part of the CWSA and small areas of State and private properties interspersed. As previously discussed, the CWSA contains numerous unpaved roads that provide ample access to and from the area. These roads, along with existing oil and gas facilities, livestock management facilities, power lines, and other man-made features, have reduced the natural character of the CWSA for visitors who seek relatively pristine landscapes. Recreational use in most of the CWSA primarily consists of dispersed activities such as OHV use where permitted, hunting, visits to Fantasy Canyon, and floating/boating on the White River. Hunting, Fantasy Canyon, and White River recreation are discussed further in the following sections.

Hunting primarily occurs in the fall and winter months and is limited to cottontail rabbit, pronghorn, coyote, waterfowl, and to a lesser extent, mule deer. Hunting permits on public lands are issued by the UDWR. Hunting activities on Tribal/allotted land is limited to Tribal members and authorized guests of the Tribe. Hunting permits on Tribal/allotted land are issued by the Ute Indian Tribe Department of Fish and Wildlife.

Fantasy Canyon is the official name of an area composed of unique erosional features located in the NW1/4 Section 12, T9S, R22E (see Figure 3.12-1, Appendix A), and is one of the most noteworthy recreational features of the CWSA. Fantasy Canyon is not an actual canyon, but instead is formed by a series of sandstone outcrops. The area is noted in Native American folklore, and is part of "The Devil's Playground," a term coined by Earl Douglas, who presented some of the first photographs of the area in a 1909 publication called *The Columbian Magazine*. The sandstone formations at Fantasy Canyon are the result of the erosion of weaker sandstone around harder, oil-saturated sandstone and have taken thousands of years to form. Fantasy Canyon, which is accessible via gravel roads maintained primarily by EOG, contains some of the most unique geologic features in the Uinta Basin. The BLM has constructed an interpretive kiosk, vaulted restroom, and informal parking area at the entrance to Fantasy Canyon, and volunteers have established a rock-lined trail system that leads visitors past all of the named formations. Fantasy Canyon receives an estimated 4,500 visitors annually. Peak visitation to Fantasy Canyon occurs on weekends during the spring. The Book Cliffs RMP prohibits oil and gas development within a 60-acre area surrounding Fantasy Canyon. This No Surface Occupancy (NSO) area was established to protect the interpretive value of the unique erosional figures that comprise Fantasy Canyon. While driving the five miles into Fantasy Canyon off the main access route of the paved Glen Bench Road, 14 producing natural gas wells can be seen within the Chapita Wells Unit. These seven wells can be seen from elevated portions of the Fantasy Canyon trail system.

The White River flows across the western side of the CWSA and also provides some of the most noteworthy recreational opportunities for visitors in the CWSA. Recreational activities on and adjacent to the White River include rafting and canoeing, boating, fishing, hunting, and sightseeing. Fishing and waterfowl hunting activity on Tribal/allotted land along the White River is limited to Tribal members and guests of the Tribe.

The segment of the river from the Utah-Colorado State line to approximately Section 28, T9S, R22E is know for its canyon scenery and relative solitude. Peak recreational use occurs during the spring (mid-May to mid-June), with some summer and fall use. Boater use data compiled by the BLM and cited in BLM, 2004, indicate that approximately 2,000 boaters floated the White River during the 2004 season. The BLM expects this use to remain constant as trends have not increased in the past 10 years because of a short season of use due to higher water flows only occurring from spring snow melt and the on-set of the gnat and mosquito season in early June through August. Numerous launch sites exist along the river, however, 90 percent of all takeouts occur near the EOG #20 gas well (Section 28, T9S, R22E), located within the CWSA (BLM 1999). This takeout location has an earthen cut ramp, a vaulted restroom and three primitive camp sites.

The National Park Service (NPS) has determined that the White River, from the Colorado State line to its confluence with the Green River, meets the minimum eligibility criteria for wild and scenic river designation and qualifies for further study and possible inclusion into the National Wild and Scenic Rivers System (NPS 1982). Within this study, it was determined that the White River possessed three "Outstandingly Remarkable" values: recreation, fish and wildlife. The Vernal Field Office is in the process of revising their current RMP. The draft RMP identifies the segment of the White River with the CWSA as "eligible" under the authority of the Wild and Scenic Rivers Act. Eligibility means that the river is "free-flowing" and that it possesses at least one outstandingly remarkable value. The RMP process and subsequent decision will determine if this stretch is suitable. If it is determined to be suitable then the outstandingly remarkable values listed above would be managed so as not to diminish those qualities and jeopardize a possible future designation by Congress as a segment of the Federal Wild and Scenic Rivers System.

As previously stated, no designated wilderness areas, wilderness study areas, or wilderness characteristics areas occur within the CWSA. The White River Wilderness Inventory Unit occurs approximately 2.5 miles south of the eastern boundary of the Chapita Wells Unit. The White River Wilderness Inventory Unit encompasses approximately 15,800 acres of public lands administered by the BLM and State lands on both sides of the river.

## 3.13 VISUAL RESOURCES

The CWSA falls within existing and active oil and gas units. As such, numerous well pads, ancillary facilities, access roads, surface pipelines, and power lines have modified the natural character of the CWSA on Federal, Tribal, State, and private lands.

Public lands managed by BLM within the CWSA have been classified according to BLM's VRM system, an analytical process used to inventory, manage, and set management objectives for visual resources on public lands. Tribal and SITLA lands within VRM areas are not explicitly managed for visual resource protection. As part of the VRM system, visual management classes are identified that designate permissible levels of landscape alteration with the goal of protecting the overall visual quality of public lands. Visual management classes are as follows:

- Class I Objective: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- Class III Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Class IV Objective: To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

The area VRM classification can be used to determine the visual impact of proposed activities and to measure the amount of disturbance an area can tolerate before the proposed activity exceeds the designated VRM objectives.

The majority of BLM lands in the CWSA fall within approximately VRM Class IV (Figure 3.13-1, Appendix A). Therefore, the level of change to the characteristic landscape can be high. Management actions within VRM Class IV may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of activities in areas through careful location, minimal surface disturbance, and repeating the basic landscape elements. Lands designated as VRM Class IV constitute about 77 percent of the CWSA.

Approximately three percent of the CWSA along the White River corridor in the southwestern portion of the CWSA is designated Class III. This area is designated VRM Class III because it is within the viewshed of recreational users on the White River. The management objective of Class III areas is to partially retain the existing character with a moderate level of change to the landscape. Management activities with VRM Class III areas may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The remaining portion of the CWSA consists of State, Tribal/allotted or private lands, and has no designated visual classification.

## 3.14 NOISE

Noise is generally described as unwanted sound. Discussions of environmental noise do not focus on pure tones because commonly heard sounds have complex frequency and pressure characteristics. Accordingly, sound measurement equipment has been designed to account for the sensitivity of human hearing to different frequencies. Correction factors for adjusting actual sound pressure levels to correspond with human hearing have been determined experimentally. For measuring noise in ordinary environments, A-weighted correction factors are employed. The filter de-emphasizes the very low and very high frequencies of sound in a manner similar to the response of the human ear. Therefore, the A-weighted decibel (dBA) is a good correlation to a human’s subjective reaction to noise.

The dBA measurement is on a logarithmic scale. To the average human ear, the apparent increase in “loudness” doubles for every 10-dBA increase in noise. Taking a baseline noise level of 50 dBA in a daytime residential area, noise of 60 dBA would be twice as loud, 70 dBA would be four times as loud, and 80 dBA would be eight times as loud.

### 3.14.1 Regulatory Noise Standards

No noise standards have been established by the BLM, the BIA, Ute Indian Tribe, State of Utah, or Uintah County. In the absence of noise statutory limits, a noise level of 55 dBA has been established as a guideline for acceptable environmental noise. This noise level is used for a basis of evaluating noise effects when no other local, county, or State standard has been established. It is important to note that this noise level was defined by scientific consensus, was developed without concern for economic and technological feasibility, and contained a margin of safety to ensure its protective value of the public health and welfare. Furthermore, this noise level is directed at sensitive receptors (residences, schools, medical facilities, recreational areas) where people would be exposed to an average noise level over a specific period of time.

In this context, public health and welfare includes personal comfort and well-being, and the absence of mental anguish, disturbances, and annoyance as well as the absence of clinical symptoms such as hearing loss or demonstrable physiological injury. A 55-dBA noise level should not be misconstrued as a regulatory goal. Rather, the 55-dBA noise level should be recognized as a level below which there is no reason to suspect that the public health and welfare of the general population would be at risk from any of the identified effects of noise.

### 3.14.2 Common Noise Levels

The following presents a discussion of noise levels common to most people in small communities and rural areas. These levels are meant to represent the average noise levels over a given period (for example, a 24-hour interval or a yearly average) in various land use areas. Depending on the location and the quantity and type of noise sources, these levels can have a large variation but generally vary in the range of 3 to 5 dBA. For a comparison to a normal human activity, the noise level experienced during normal conversation of two people five feet apart is 60 dBA. **Table 3.14-1** shows examples of noise levels generated by commonly experienced sources and the relative strength of the “loudness” of noise levels compared to normal conversation.

**Table 3.14-1 Common Noise Levels**

| Noise Source | Average Noise (dBA) | "Loudness" (compared to normal conversation) | Range of Noise (dBA) |
|---|---|---|---|
| Flaring natural gas from a well | 100 | 16 | 95-105 |
| Ambulance siren at 100 feet | 100 | 16 | 95-105 |
| Motorcycle at 25 feet | 90 | 8 | 85-95 |
| On a typical construction site | 85 | 6 | 80-90 |
| Single truck passing at 25 feet | 80 | 4 | 75-85 |
| Compressor station at 50 feet | 75 | 3 | 70-80 |
| Urban shopping center | 70 | 2 | 65-75 |
| Single car passing at 25 feet | 65 | 1.5 | 60-70 |
| Average highway noise at 100 feet | 60 | 1 | 55-65 |
| Normal conversation 5 feet apart | 60 | 1 | 57-63 |
| Typical drilling rig from 1,320 feet away | 50 | 50% | 47 - 53 |
| Residential area during day | 50 | 50% | 47-53 |
| Recreational area | 45 | 37% | 40-50 |
| Residential area at night | 40 | 25% | 37-43 |
| Rural area during day | 40 | 25% | 37-43 |
| Rural area at night | 35 | 18% | 32-37 |
| Quiet whisper | 30 | 12% | 27-33 |
| Threshold of hearing | 20 | 6% | 17-23 |

Source: EPA (1974), Harris (1991)

### 3.14.3 Existing CWSA Noise Levels

Currently, gas and oil drilling and production activities are widespread within and near the CWSA. Noise effects to recreational users on the White River was specifically identified as an issue for the EIS. In May 2006, noise was measured 10 feet from the south bank of the White River at the mouth of Saddletree Draw. Noise was measured for 30 minutes and the average noise was 55.9 dBA with a maximum value of 58.2 dBA. Currently, gas and oil drilling and production activities are widespread within and near the CWSA, which affect ambient noise levels. The coal-fired Bonanza Power Plant is located just beyond the northeastern portion of the CWSA and contributes to ambient noise levels. Noise levels are also elevated near construction sites, drilling rigs, along access roads, and along State Highway 45 which is the major paved access to the CWSA.

## 3.15 SOCIOECONOMIC RESOURCES

The following is a description of the demographics, local economy, community services, and local government fiscal conditions and revenues from oil and gas activities in and near the CWSA.

### 3.15.1 Demographics

Population centers within a reasonable commuting distance of the CWSA include Vernal, Naples, Ballard and the northern part of unincorporated Uintah County. In 2002, Uintah County as a whole had a population of 26,155, while the City of Vernal had a population of about 7,879, the City of Naples had a population of about 1,378, and the Town of Ballard to the west had a population of 581. The majority of Uintah County's population is located in unincorporated communities such as Maeser, Fort Duchesne, Whiterocks, Jensen, Randlett, and other rural areas. The population was estimated to be approximately 16,317 in 2002 (U.S. Bureau of the Census 2002). There are approximately 3,120 members of the Ute

Indian Tribe, approximately 85 percent of which reside on the Uintah and Ouray Indian Reservation. The vast majority of the population of Uintah County resides in communities along Highway 40 and to the north. The CWSA is located south of the more populated part of the county. In terms of racial composition, approximately 85.9 percent of Uintah County's population is Caucasian, 9.4 percent is Native American, and the remaining 4.7 percent is Hispanic/Latino and of other ethnicities (U.S. Bureau of the Census 2002).

Over the last 30 years, the communities in Uintah County have experienced varying degrees of population growth or decline in response to changes in the economy and in the energy industry in particular. From the 1970s through 1983 the population of Uintah County grew steadily, then declined gradually from 1983 through 1989, and finally began a trend of re-growth in the 1990s that continues today. This fluctuation has mirrored the price fluctuations and employment trends seen in the energy sector in the County. It is projected that this growth will continue into the future, with gradual population increases forecasted into the year 2020 (Utah Department of Workforce Services 2004).

### 3.15.2 Demographics of the Ute Indian Tribe

Approximately 21 percent of the CWSA occurs on lands owned by the Ute Indian Tribe or Tribal allottees. There are a total of 774.5 acres of Indian minerals subject to three different leases within the entire CWSA, all of which are located in T9S:R22E. There are no known Tribal members living within the CWSA.

The Uintah and Ouray Indian Reservation (Reservation) was established in 1861, and was confirmed and modified by subsequent Acts of Congress. The Reservation was officially opened and settled in 1905. Encompassing 4.5 million acres, the Reservation covers a large portion of Duchesne and Uintah Counties. According to the Tribe's Department of Vital Statistics, the enrolled membership of the Tribe is presently 3,120 members (Utah Department of Community and Economic Development, 2004a). The governing council of the Tribe is the elected Tribal Business Committee. Two representatives from each of the three Ute bands (Uintah, White River, and Uncompahgre) are elected to serve two-year terms on the Business Committee.

Approximately 85 percent of Ute Tribe members live on the Reservation. According to the Utah Division of Indian Affairs, there are 703 households on the Reservation. Of the families making up those households, 49 percent fall into the very low-income category and 21 percent are in the low-income category (Utah Department of Community and Economic Development 2004). Approximately 139 families on the Reservation are awaiting some sort of affordable housing.

### 3.15.3 Local Economy and Employment

Uintah County has experienced broad economic swings over the last 25 years. The local economy has historically been, and remains, heavily dependent on the oil and gas industry. Economic conditions in Uintah County continue to mirror the state of that industry in good times and bad. During the late 1970s to the early 1980s, the county experienced considerable economic growth associated with the energy boom. From 1983 to 1990, the decline of the local oil and gas industry and the regional energy bust resulted in high unemployment and severe economic hardship for many area residents. Since 1990, the economy of Uintah County has diversified to some extent and grown gradually as the oil and gas industry has benefited from rising energy prices and increased profitability. Education, health services, leisure, and hospitality industries have added to Uintah County's economic diversification in recent years (Utah Department of Workforce Services, 2004).

Major sources of employment in Uintah County include the mining and oil and gas industries; local, State, and Federal government; wholesale and retail trade; and services. **Table 3.15-1** provides a breakdown of non-farm sources of wage and salary employment by economic sector in Uintah County. As of March 2004, Uintah County was experiencing an unemployment rate of 5.3 percent, which was comparable to the State of Utah and United States as a whole at 5.0 and 5.6 percent unemployment, respectively (Utah Department of Workforce Services, 2004). Total non-farm, wage and salary employment in Uintah County was approximately 9,958 as of March 2004. Proprietorships and farm employment add roughly 4,500 to 5,000 more jobs to non-farm wage and salary employment to make total employment in Uintah County.

**Table 3.15-1 Non-farm Wage and Salary Employment in Uintah County by Industry, 2002**

| Industry Sector | Number of Jobs | Percent of Total |
|---|---|---|
| Mining, Oil and Gas | 1,612 | 16.2 |
| Construction | 503 | 5.0 |
| Manufacturing | 194 | 1.9 |
| Trade (Wholesale and Retail), Transportation and Utilities | 2,172 | 21.8 |
| Information Services | 120 | 1.2 |
| Professional Services[a] | 792 | 8.0 |
| Education and Health Services | 763 | 7.7 |
| Services[b] | 1,213 | 12.2 |
| Government | 2,589 | 26.0 |
| **Total** | **9,958** | **100.0** |

[a] Professional Services include finance, insurance, real estate, and other professional services.
[b] Services include leisure, hospitality, and other services.

Total personal income in Uintah County as of March 2004 was $502.7 million. Per capita income was about $19,374, which is lower than the State per capita income of $24,157.

The average monthly wage in Uintah County is higher than in other rural counties in Utah but lower than in counties along the Wasatch Front. The jobs available in the mining, oil and gas sector and the transportation and utilities sector are an important factor in raising wage levels in Uintah County.

Uintah County's average monthly wage of $2,201 ranks 11th in the State, and is about 88 percent of the State average of $2,510. Of the various employment sectors in the local economy, the mining (including oil and gas), transportation and utilities, and financial services sectors provide the highest wages in Uintah County, while the manufacturing, trade, education and health services sectors provide substantially lower wages. **Table 3.15-2** provides a summary of monthly wages paid by the various industries that make up the Uintah County economy.

**Table 3.15-2 Uintah County Average Monthly Wages by Economic Sector, 2002**

| Sector | Average Monthly Wage |
|---|---|
| Transportation & Utilities | $3,791 |
| Mining, Oil & Gas | $3,596 |
| Financial Services | $2,957 |
| Government | $2,278 |
| Construction | $1,873 |
| Professional & Business Services | $1,773 |
| Trade | $1,746 |
| Information Services | $1,688 |
| Other Services | $1,697 |
| Manufacturing | $1,549 |
| Education & Health Services | $1,510 |
| Leisure & Hospitality | $625 |

Source: Utah Department of Workforce Services, 2004.

### 3.15.4 Economy and Employment of the Ute Indian Tribe

Extraction of oil and gas, tar sands, oil shale and Gilsonite (naturally occurring asphalt) provide both jobs and royalty monies to Tribal members. On the surface of these lands are large areas of forest, fish and game preserves, farming and grazing lands, and water resources. The majority of cattle activity on Tribal/allotted land is owned and operated by the Ute Tribal Livestock enterprise.

Unemployment in the Tribe averages about 40 percent, and approximately 80 percent of employed members work for the Tribe. Average annual income of employed Tribal members is approximately $14,500.

Tribal surface in the CWSA is predominantly owned by the Ute Tribe and/or its allottees. There are a total of 774.5 acres of Indian minerals subject to three different leases within the entire CWSA, all of which are located in T9S:R22E. Royalties from minerals owned by the Ute Tribe are collected and distributed to Tribal members, shareholders of the Ute Distribution Corporation, and allottees. Royalty rates for Tribal/allotted minerals in the CWSA vary depending on the lease terms, and range from 12.5 percent to approximately 16.6 percent of the value of production.

The Ute Tribe collects severance taxes based on production. This tax rate varies with fluctuating oil and gas prices, but over the past three years has averaged six to seven percent. The State of Utah also collects a severance tax on oil and gas minerals produced on Reservation lands. This State tax rate fluctuates between three and five percent of production revenue.

In addition to severance taxes on mineral production, Uintah County also collects two types of property taxes. The first type of property tax is based on the assessed value of the land. Since EOG is only leasing the subsurface minerals, and does not own the land where production would take place, property taxes would be assessed according to production. The second type of property tax collected is based on either the production of the wells or the depreciated value of the production equipment on the CWSA.

### 3.15.5 Community Services

On Federal CWSA lands, the BLM is responsible for law enforcement and fire response. On Tribal/allotted lands, Tribal police are responsible for law enforcement. In some cases, the Uintah County Sheriff may respond, depending on the nature of the crime or emergency that has occurred.

Medical services are provided by Ashley Valley Medical Center in Vernal. Ambulance service to the medical center is available and provided by Gold Cross Ambulance, a contract service provider. In situations requiring rapid evacuation of an injured worker or patient in distress, CareFlight helicopter service to St. Mary's Hospital in Grand Junction, Colorado is available.

Schools in Uintah County are operated by the Uintah County School District. Uintah River High School in Fort Duchesne is a licensed charter high school that specifically addresses Indian education.

### 3.15.6 Local Government Fiscal Conditions and Revenues from Oil and Gas Activities

Oil and gas operations contribute revenue to local, State, and Federal government entities through payment of various royalties and/or taxes. The following types of revenue are generated by oil and gas development.

<u>Property Tax Revenue</u>

Among the most important sources of revenue in Uintah County are property taxes levied on locally and centrally assessed property. This revenue source is used by the counties to fund a wide variety of services and community facilities. Given their generally high assessed value, oil and gas and other types of industrial operations often contribute a significant portion of a county's property tax base.

Approximately 57 percent of Uintah County's total assessed valuation is from centrally assessed properties, including oil and extraction operations, pipelines, mining operations, electric utilities, and telecommunications facilities. Approximately 38 percent of the County's locally assessed properties include residences, local businesses, farms, and other properties that are not centrally assessed. Personal property, including machinery and tools, office equipment and furniture, and medical equipment, account for the remaining 5 percent of locally assessed value. The total assessed value of oil and gas extraction operations in 2003 for Uintah County was $418,801,897, which amounts to about 26 percent of Uintah County's total assessed valuation of $1,593,779,187 (Uintah County Clerk Auditor's Office, 2004).

The Uintah County School District receives the largest portion of property tax revenue, followed by the Uintah County government, State-supported schools, the Uintah County Library, various local water districts, parks and recreation facilities, and the various local city and town governments. In total, approximately $16.6 million in property tax revenue was distributed to these entities in Uintah County in 2003 (Uintah County Clerk Auditor's Office, 2004).

In addition to ad valorem tax payments, Uintah County also collects payments-in-lieu of taxes (PILT) from the Federal government for public lands within the county. In 2003, Federal PILT taxes paid to Uintah County amounted to approximately $1.2 million.

Federal Mineral Lease Royalties

Federal mineral lease royalties are collected from oil and gas, gas plant products, Gilsonite, and phosphate extraction operations located on Federally administered public lands in Uintah County. At present, the Federal royalty rate for gas is based on a step scale that varies by production rate. Federal mineral leasing regulations require the return of 50 percent of royalties collected from these operations to the State of origin.

Of the State's share, 70 percent goes to the Permanent Community Impact Fund (PCIF), and 30 percent goes to the Mineral Bonus Account. The Mineral Bonus Account funds are then further distributed among several agencies and funds including the Utah DOT, Utah Department of Community and Economic Development (allocated to local county special service districts), the State Board of Education, the Utah Geological Survey, and the Water Research Laboratory at Utah State University (UC 59-21).

In 2001, total Federal mineral lease royalties generated by operations in Uintah County amounted to approximately $35.6 million, about $3.2 million of it was returned directly to the County which then went to the county recreation and transportation special service districts (U.S. Minerals Management Service, 2002). The PCIF provides numerous grants and loans to the County and other local municipal governments for the funding of various infrastructure projects. From 1999 to 2003, the PCIF provided a total of $25.1 million to Uintah County, the Cities of Vernal and Naples, the Town of Ballard, and other water and special service districts for street improvements, water and sewer infrastructure, municipal buildings, and other facilities (Utah Department of Community and Economic Development 2004a).

Sales and Use Tax Revenue

Sales taxes are paid by oil and gas operations when purchases of equipment, materials, or supplies are made in the local area. Examples of purchases that generate sales tax revenue include gravel, pipe, fuel, and other supplies purchased locally. Like property tax revenue, sales and use tax revenues are used by local cities and counties to fund a wide variety of important local services and community facilities.

Currently, the sales and use tax rate in Uintah County is 6.5 percent (4.75 percent State, 1.75 percent county/local). In 2003, taxable sales in Uintah County yielded tax revenues of approximately $2.2 million (Uintah County Clerk Auditor's Office, 2004).

Severance Tax

Severance Tax is a tax on production and is currently a split rate. For example, the first $13.00 per barrel of oil is taxed at 3 percent; everything over that is taxed at 5 percent. The first $1.50 per thousand standard cubic feet (Mscf) of gas is taxed at 3 percent; everything over that is taxed at 5 percent. This is a State of Utah tax and is charged by and paid to the state tax commission and is put into the general fund.

## 3.16 ENVIRONMENTAL JUSTICE

In 1994, President Clinton signed EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The EO, and the accompanying Presidential Memorandum, is designed to focus Federal attention on low-income communities and minority populations that have historically suffered disproportionately from the effects of pollution and environmental risks. Executive Order 12898 has three goals:

1) To focus Federal agency attention on the environment and human health conditions in minority populations and low-income communities.

2) To foster non-discrimination in Federal programs that significantly affect human health and the environment.

3) To provide minority populations and low-income communities greater access to information on, and opportunities for public participation in, issues relating to human health and the environment.

The Presidential Memorandum that accompanied the EO identifies four specific actions to be addressed in NEPA-related documents.

1) Each Federal agency should assess the human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian Tribes, when such analysis is required by NEPA.

2) Mitigation measures addressed in environmental assessments (EAs), EISs, or a Record of Decision (ROD), should identify significant and adverse environmental effects of proposed Federal actions on minority populations and low-income communities.

3) Each Federal agency must provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving accessibility of public meetings, official documents, and public notices.

4) Review of NEPA compliance (such as EPA's review under Section 309 of the Clean Air Act) must ensure that the agencies have fully analyzed environmental effects on minority populations and low-income communities, including human health, social, and economic effects.

The *Environmental Justice Guidance under the National Environmental Policy Act* document, written by the Council on Environmental Quality (CEQ) (1997), provides an overview of many of the factors that should be considered when identifying the existence of minority populations and low-income communities, as well as those factors associated with disproportionately high and adverse effects, including cumulative impacts and indirect impacts. The guidelines of this document were applied in this EIS in order to identify minority populations and low-income communities in Uintah County and the Uintah and Ouray Indian Reservation.

The CEQ guidance document recommends that low-income communities be identified with annual statistical thresholds from the Bureau of the Census' Current Population Reports, Series P-60, on Income and Poverty. The CEQ guidance document defines a community as a "group of individuals living in geographic proximity to one another or a set of individuals (such as migrant workers or Native Americans) where either type of group experiences common conditions of environmental exposure."

According to the U.S. Census Bureau, the 2003 poverty threshold definition for a four-person family was $18,810 (U.S. Census Bureau 2004). Average annual per capita income of a Ute Tribe family is $14,500 (Utah Department of Community and Economic Development 2004b). This figure is below the poverty threshold, and well below Utah's statewide per capita income of $24,157 (Utah Department of Community and Economic

Development 2004b). Under the guidelines set forth in the *Environmental Justice Guidance under the National Environmental Policy Act*, the Ute Indian Tribe constitutes both a minority population and a low-income community.