3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the RBU Project Area as identified in the Interdisciplinary Team Analysis Record Checklist included in **Appendix B.** This chapter provides the baseline for comparison of impacts/consequences described in **Chapter 4**.

3.2 ELEMENTS OF THE HUMAN ENVIRONMENT AND OTHER RESOURCES BROUGHT FORWARD FOR ANALYSIS

3.2.1 AIR QUALITY

Regional air quality is influenced by a combination of factors including climate, meteorology, the magnitude and spatial distribution of local and regional air pollution sources, and the chemical properties of emitted pollutants. Within the lower atmosphere, regional and local-scale air masses interact with regional topography to influence atmospheric dispersion and transport of pollutants. The following sections summarize the climatic conditions and existing air quality within the RBU Project Area and surrounding region.

3.2.1.1 Climate

The RBU Project Area is within a semiarid mid-continental climate regime typified by dry windy conditions and limited precipitation. The Uinta Basin is bordered by the Wasatch Range to the west, which extends north and south through the middle of the State, and the Uinta Mountains to the north, which extend east and west through the northeast portion of the State. Elevation of the RBU Project Area ranges from 4,800 feet above mean sea-level (famsl) to 5,400 famsl.

The closest climate measurements to the primary compressor location TAP 5 were recorded at Ouray 4 NE, Utah (1955-2006). The Ouray 4 NE station is located 8 miles north of compressor TAP 5 at an elevation of 5,000 famsl (Western Regional Climate Center 2006). **Table 3-1** summarizes the mean temperature range, mean total precipitation, and mean total snowfall by month at that location.

Table 3-1. Temperature, Precipitation, and Snowfall at Ouray 4 NE, Utah (1955-2006)

Season	Month	Average Temperature Range (° Fahrenheit)	Average Total Precipitation (inches)	Average Total Snowfall (inches)
Spring	March	23.7 – 54.1	0.5	1.4
	April	33.4 – 65.8	0.7	0.6
	May	42.8 – 77.2	0.7	0.0
	Total Spring Average	*33.3 – 65.7*	*1.9*	*2.0*
Summer	June	50.2 – 87.6	0.5	0.0
	July	56.1 – 94.7	0.6	0.0
	August	53.9 – 91.6	0.6	0.0
	Total Summer Average	*53.4 – 91.3*	*1.7*	*0.0*

Season	Month	Average Temperature Range (° Fahrenheit)	Average Total Precipitation (inches)	Average Total Snowfall (inches)
Fall	September	43.9 – 81.1	0.8	0.0
	October	32.1 – 67.4	0.9	0.4
	November	20.6 – 47.6	0.5	1.8
	Total Fall Average	*32.2 – 65.4*	*2.2*	*2.2*
Winter	December	7.7 – 33.2	0.4	3.9
	January	2.8 – 29.2	0.4	4.3
	February	9.9 – 37.8	0.4	2.8
	Total Winter Average	*6.8 – 33.4*	*1.2*	*11.0*
Total Annual Average		***31.4 – 63.9***	***6.9***	***15.2***

Source: Western Regional Climate Center 2006. Data collected at Ouray 4 NE, Utah from 1955 to 2006.

Prevailing synoptic-scale westerly air masses originating from the Pacific Ocean are typically interrupted by the western mountain ranges before reaching the Uinta Basin. As a result, the lower elevations of the Uinta Basin receive a relatively low amount of precipitation. The higher elevations of the area generally receive a higher amount of precipitation. The annual mean precipitation at Ouray 4 NE is 6.9 inches, and ranges from a minimum of 3.0 inches recorded in 1958, to a maximum of 12.2 inches recorded in 1965. On average, February is the driest month with a monthly mean precipitation of 0.4 inches, and October is the wettest month with a monthly mean precipitation of 0.9 inches. The annual average snowfall is 15.2 inches. A maximum annual snowfall of 31.0 inches was recorded in 1984.

The surrounding area has an annual mean temperature of 46 °F. However, abundant sunshine and rapid nighttime cooling result in a wide daily range in temperature. Wide seasonal temperature variations typical of a mid-continental climate regime are also common. Average winter temperatures range from 7°F to 33°F, while average summer temperatures range from 53°F to 91°F. Recorded extreme temperatures are -43°F in 1979 and 108°F in 2001.

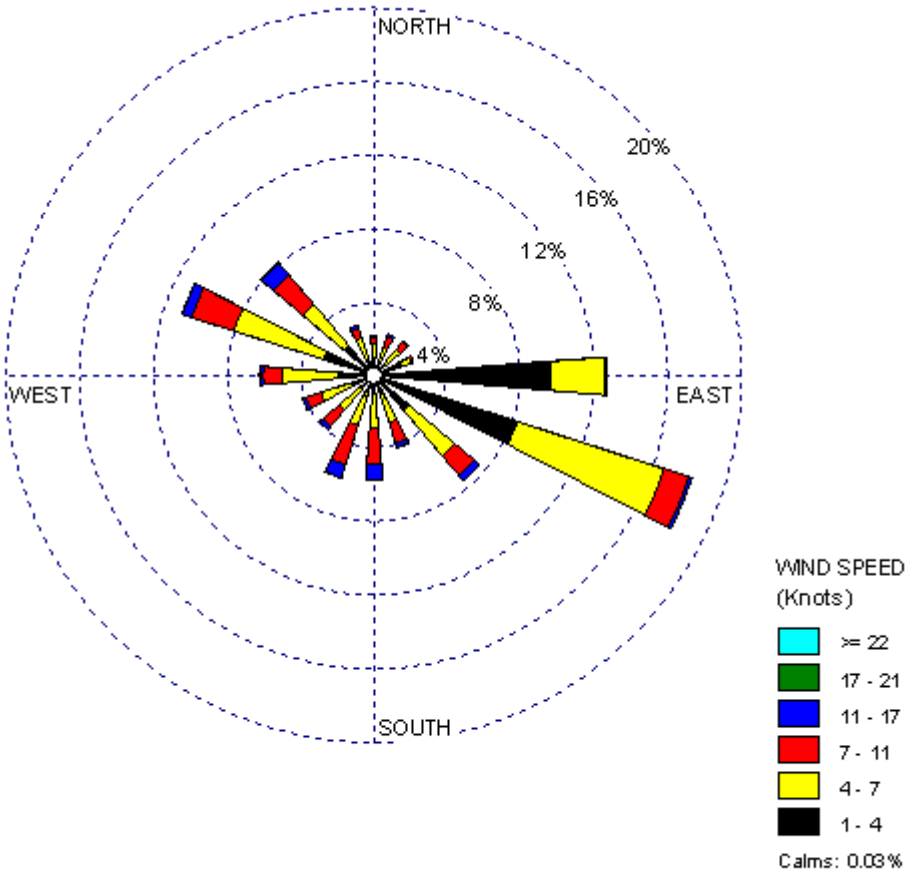
3.2.1.2 Winds and Atmospheric Stability

The transportation and dilution of air pollutants are primarily a function of wind speed and direction. As wind speed increases, the dispersion of emitted pollutants also increases, thereby reducing pollutant concentrations.

Wind data within the RBU Project Area have not been directly measured. Local terrain effects will influence the wind profiles specific to the RBU Project Area. However, representative wind speed and direction data has been developed for the West Tavaputs Draft EIS (BLM 2008) from a wind rose in Canyonlands National Park provided by the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMET). This data has been peer-reviewed by Federal land managers and has been deemed representative of the Uinta Basin for dispersion modeling purposes. **Figure 3.3-1** presents a wind rose depicting wind speed and direction for all five years of data. Note that the data represent the direction from which the wind is blowing (e.g., Wind Direction Origin). As shown, winds originate predominately from the east-southeast 16.7 percent of the time. The average measured wind speed is 6.4 mph. Winds are calm 0.03% of the time.

Figure 3.3-1

Wind Rose from AERMET Canyonlands National Park Data 1995-1999
Wind Speed and Direction



3.2.1.3 Air Quality Evaluation Criteria

Criteria Pollutants

National Ambient Air Quality Standards (NAAQS) 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 (PM) less than 10 or 2.5 microns in aerodynamic diameter (PM_{10} and $PM_{2.5}$). Existing air quality in the region is acceptable based on EPA standards for the protection of human health. The surrounding area is designated as an attainment area, meaning that the concentration of criteria pollutants in the ambient air is less than the NAAQS. Site-specific air quality monitoring data are not available for the RBU Project Area; however, estimated background criteria pollutant concentrations for the Uinta Basin (**Table 3-2**) are relatively low and consistent with a rural area having low levels of industrial development.

Note that the NAAQS has been recently revised to reflect changes to the PM_{10} and $PM_{2.5}$ standards. The changes reflect a tighter $PM_{2.5}$ 24-hour standard [lowered from 65 $\mu g/m^3$ (micrograms per cubic meter) to 35 $\mu g/m^3$] and elimination of the PM_{10} annual standard. These changes are illustrated in **Table 3-2**. Although the $PM_{2.5}$ standard has been lowered, the number of allowable exceedances has also been increased from one to seven (on average over three years).

Under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act (CAA), 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 growth. The PSD increments, as reported by the Utah Department of Environmental Quality (UDEQ), Division of Air Quality (UDAQ), for Class I and II areas are presented in **Table 3-2**. The closest Class I areas are Arches National Park (65 miles south) and Canyonlands National Park (85 miles south).

Table 3-2. Ambient Criteria Pollutant Concentrations in the Uinta Basin

Pollutant	Averaging Period(s)	Uinta Basin Background Concentration[a] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)
SO_2	Annual 24-hour 3-hour	5 10 20	80 365 1,300	2 5 25	20 91 512
NO_2	Annual	17	100	2.5	25
PM_{10}	24-hour	63	150	8	30
$PM_{2.5}$	Annual 24-hour	9 25	15 35	None None	None None
CO CO	8-hour 1-hour	1,111 1,111	10,000 40,000	None None	None None
O_3[b]	8-hour	105	157	None	None

Source: UDEQ-DAQ 2008

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 186 air pollutants as HAPs. Examples of listed HAPs associated with the oil and gas industry include formaldehyde, BTEX compounds (benzene, toluene, ethyl benzene, isomers of xylene), and normal-hexane (n-hexane).

The CAA requires the EPA to regulate emissions of toxic air pollutants from a published list of industrial sources referred to as "source categories." As required under the CAA, EPA has developed a list of source categories that must meet control technology requirements for these toxic air pollutants. Under Section 112(d) of the CAA, the EPA is required to develop regulations establishing national emission standards for hazardous air pollutants for all industries

that emit one or more of the pollutants in major source quantities. These standards are established to reflect the maximum degree of reduction in HAP emissions through application of maximum achievable control technology (MACT). Source categories for which MACT standards have been implemented include Oil and Natural Gas Production and Natural Gas Transmission and Storage.

There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health.

The State of Utah has adopted Toxic Screening Levels (TSLs) which are applied during the air permitting process to assist in the evaluation of HAPs released into the atmosphere (UDEQ-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" (ACGIH 2007). 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 UDEQ-UDAQ, TSLs are presented in **Table 3-3**.

Table 3-3. Utah Toxic Screening Levels (TSLs)

Pollutant and Averaging Time	TSLs ($\mu g/m^3$)
Formaldehyde (1-hour)	36.8
Acrolein (1-hour)	22.9
Benzene[a] (24-hour)	53.2
Toluene (24-hour)	2,512
Ethylbenzene (24-hour)	14,473
Xylenes (24-hour)	14,473
n-Hexane (24-hour)	5,875
1,3 Butadiene	147

[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.
Source: UDEQ-UDAQ 2008b

3.2.1.4 Existing Sources of Air Pollution

The Uinta Basin has seen recent oil and gas development on Federal, Tribal, State, and private lands. Fugitive dust is the most prominent air pollutant in the region, but is intermittent depending on winds and dust-causing activities. In addition to the Uinta Basin, other geographic areas of industrial and vehicular emissions in the region include the Green River area to the south, the Castle Valley area to the southwest, and the Bonanza Power Plant to the east.

Existing point and area sources of air pollution within the RBU Project Area and surrounding region include the following:

- Exhaust emissions, primarily CO, NO_2, and formaldehyde, from existing natural gas-fired compressor engines used in production 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), NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$;
- SO_2, NO_2, and fugitive dust emissions from coal-fired power plants and coal mining and processing;
- Fugitive dust (in the form of PM_{10} and $PM_{2.5}$) from vehicle traffic on unpaved roads, wind erosion in areas of soil disturbance, and road sanding during winter months; and
- Long-range transport of pollutants from distant sources contributing to regional haze.

3.2.2 CULTURAL RESOURCES

A Class I cultural resource inventory was conducted within the proposed RBU Project Area, on public lands administered by the BLM Vernal FO, the BIA, and SITLA. The objective of the inventory was to identify the extent of previous cultural resource investigations within the RBU Project Area and the number, locations, types, and significance of those previously documented cultural resources. The Class I data review is used to predict the type and potential site density of cultural resources and provides a basis for assessing the potential impact to archaeological sites in the event that lands are developed for oil and gas exploration.

The cultural resource inventory was conducted in compliance with Federal and State legislation including Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended), NEPA, the Archaeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, and the American Indian Religious Freedom Act of 1978. The NHPA sets forth national policy and procedures regarding "historic properties"—that is, regions, sites, buildings, structures, and objects included in or eligible for the NRHP. Section 106 of the NHPA requires Federal agencies to consider the effects of their undertakings on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

3.2.2.1 Cultural Background

The cultural-chronological sequence in the RBU Project Area includes the Archaic stage (7000 B.C. to A.D. 400), which can be further subdivided into Early, Middle, Late, and Terminal periods; the Formative stage (A.D. 700 to A.D. 1250) (Matson 1991), which is largely associated with the San Rafael Fremont in the RBU Project Area; the Protohistoric stage (A.D. 1200 to A.D. 1750), largely associated with Numic-speaking (Ute) peoples; and the historic period, which began with the arrival of Europeans in the eighteenth century.

3.2.2.2 Summary of Inventory Results

The Class I data-review resulted in the identification of 284 previous cultural resource inventories that have been conducted in the RBU Project Area. Most of the inventories were conducted prior to oil and gas development, including seismic lines, well pad, and pipeline corridor construction. Of the 284 previous inventories, 251 (88 percent) resulted in a finding of no cultural resources.

Thirty-three (12 percent) of these previous cultural resource inventories identified a total of 51 archaeological sites within the RBU Project Area (**Table 3-4**). Of the 51 known archaeological sites that are located within the RBU Project Area, 31 (61 percent) were evaluated to be eligible for listing on the NRHP, 18 (35 percent) were evaluated to be ineligible for listing on the NRHP, and 2 (0.04 percent) were not evaluated. These known archeological resources in the RBU Project Area are dominated by prehistoric sites (67 percent of the sites identified). Prehistoric site types within the RBU Project Area consist of lithic scatters, rock art, open camps, and rock shelters. Historic site types within the RBU Project Area consist of temporary camps, rock art, cairns, and Gilsonite mining sites.

Table 3-4. Known Archaeological Sites within the RBU Project Area

Site Number	Site Type	NRHP Assessment	State of Utah Project Number
42UN874	Dual Component, Prehistoric Rock Art, Lithic Scatter, Historic Artifact Scatter	Eligible	U-80-UB-0465b
42UN875	Temporary Camp	Not Eligible	U-80-AF-0505bi
42UN876	Temporary Camp	Not Eligible	U-80-AF-0505bi
42UN878	Lithic Scatter	Not Eligible	U-80-AF-0505bi
42UN897	Rock Shelter	Not Eligible	U-80-AF-0507b
42UN840	Rock panel	Eligible	U-81-UT-280
42UN1093	Chipping/rehafting station	Eligible	U-81-GC-501b
42UN994	Petroglyph panels	Not Evaluated	U-81-AF-0672b
42UN881	Rock Art	Eligible	U-85-SJ-0641bi
42UN1564	Rock Shelters, Lithic Scatter	Eligible	U-85-AF-664b
42UN842	Lithic scatter and rock art panel	Eligible	U-85-AF-664b
42UN1652	Open Camp	Eligible	U-87-WK-764b
42UN1777	Lithic Scatter	Eligible	Archaeological Evaluations in the Northern Colorado Plateau Cultural Area
42UN1863	Rock shelter/lithic scatter	Eligible	U-91-AF-146i
42UN1894	Open campsite	Eligible	U-91-54937
42UN1944	Open campsite	Eligible	U-91-54937
42UN1951	Lithic scatter	Eligible	U-91-54937
42UN1952	Open Occupation	Eligible	U-91-54937
42UN1960	Lithic Scatter	Eligible	U-92-AF-54b
42UN1961	Rock Shelter Occupation	Eligible	U-92-AF-54b
42UN1974	Open Occupation	Not Eligible	U-92-AF-82bi
42UN1979	Lithic Scatter	Eligible	U-92-54937
42UN1990	Open Occupation	Eligible	U-92-AF-192b
42UN2013	Lithic Scatter	Eligible	U-92-AF-226b
42UN2014	Lithic Scatter	Eligible	U-92-AF-226b
42UN2016	Lithic Scatter	Eligible	U-92-AF-226b
42UN2023	Cairn and low rock alignment	Not Evaluated	N/A
42UN2107	Rock Shelters and Lithic Scatter	Eligible	U-92-AF-326b
42UN2457	Dual Component, Prehistoric and Historic Rock Art	Eligible	U-97-AFO-250i

Site Number	Site Type	NRHP Assessment	State of Utah Project Number
42UN1571	Campsite	Eligible	U-00-AF-00-460b
42UN3190	Stone tool/debitage scatter	Not Eligible	U-03-AY-0198b
42UN3251	Stone Circle	Not Eligible	U-03-AY-0628i
42UN4529	Temporary ranch camp	Not Eligible	U-04-AY-884b
42UN4780	Rock cairn	Not Eligible	U-04-AY-896b
42UN4754	Rock cairn	Not Eligible	U-04-AY-956b
42UN5024	Gilsonite Mine	Not Eligible	U-04-AY-972bi
42UN4847	Gilsonite Mine	Eligible	U-04-AY-976bi
42UN4568	Cairn	Not Eligible	U-04-MQ-1424bi
42UN4569	Cairn	Not Eligible	U-04-MQ-1424bi
42UN4570	Cairns	Not Eligible	U-04-MQ-1424bi
42UN4571	Historic Rock Art	Eligible	U-04-MQ-1424bi
42UN4572	Historic Rock Art	Eligible	U-04-MQ-1424bi
42UN4573	Historic Rock Art	Not Eligible	U-04-MQ-1424bi
42UN4574	Gilsonite Mine Loading Ramp	Not Eligible	U-04-MQ-1424bi
42UN4575	Cairn	Not Eligible	U-04-MQ-1424bi
42UN4576	Lithic Scatter	Eligible	U-04-MQ-1424bi
42UN3218	Rock Art	Eligible	U-03-AY-0240i U-05-AY-536i
42UN3219	Rock Art	Eligible	U-05-AY-536i
42UN3241	Lithic scatter/campsite	Eligible	U-05-AY-0622bs
42UN3236	Lithic Scatter	Eligible	U-06-AY-1319b
42UN3240	Rock Cairn	Not Eligible	U-06-AY-1319b

Based on the results of the Class I data review, predictions about site density, location, type, and sensitivity within the RBU Project Area can be made only tentatively. Because inventories in the RBU Project Area have been done mostly in response to clearances required for individual projects, their findings may not be representative of the entire RBU Project Area. However, given the available information, it is anticipated that sites would most likely be associated with temporary use of the area during the prehistoric time period. The available documentation indicates that sensitive sites (eligible to the NRHP) having additional research potential may be common in the immediate study area.

3.2.3 FISH AND WILDLIFE INCLUDING SPECIAL STATUS SPECIES

The RBU Project Area supports a diversity of wildlife and wildlife habitats. Species occurrences typically depend on habitat availability, carrying capacities, and the degree of existing habitat disturbance. Although the RBU Project Area comprises approximately 16,719 acres, past oil and gas development has highly fragmented wildlife habitats in the area. Water resources are limited within the RBU Project Area and therefore provide the greatest habitat value for wildlife.

3.2.3.1 General Wildlife

Small mammals potentially found within the RBU Project Area and surrounding region include the cottontail rabbit (*Sylvilagus* spp.), black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis*

latrans), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale gracilis*), Townsend's big eared bat (*Corynorhinus townsendii*), and various species of rodents and bats. Bird species that may be present include numerous migratory birds and raptors. Herptiles potentially found in the region include the wandering garter snake (*Thamnophis elegans vagrans*), Great Basin gopher snake (*Pituophis catenifer deserticola*), milksnake (*Lampropeltis triangulum*), Great Basin spadefoot toad (*Scaphiopus intermontana*), western whiptail (*Cnemidophorus tigris*), sagebrush lizard (*Sceloporus graciosus*), and short-horned 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.

3.2.3.2 Big Game

Three resident big game species are known to occur in the RBU Project Area: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), and Rocky Mountain bighorn sheep (*Ovis canadensis*). The UDWR has identified various types of seasonal ranges (i.e., summer, winter, yearlong) within the RBU Project Area (**Figures 4, 5 and 6**). UDWR ranges are ranked according to their relative biological value and are defined below.

> *Crucial value* - habitat on which the local population of a wildlife species depends for survival because there are no alternative ranges or habitats available. Crucial value habitat is essential to the life history requirements of a wildlife species. Degradation or unavailability of crucial value habitat will lead to significant declines in carrying capacity and/or numbers of the wildlife species in question.
>
> *Substantial value* - habitat that is used by a wildlife species but is not crucial for population survival. Degradation or unavailability of substantial value habitat will not lead to significant declines in carrying capacity and/or numbers of the wildlife species in question.

<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 famsl. Pronghorn are typically less abundant in xeric habitats, preferring areas that average 12 to 15 inches of precipitation per year. Home ranges for pronghorn can vary between 400 and 5,600 acres, according to various factors that include season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movements do not exceed 6 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 (Fitzgerald et al 1994).

Pronghorn antelope occupy the majority of the RBU Project Area on a year-round basis. The UDWR has identified approximately 16,478 acres of the RBU Project Area as crucial value, year-long fawning pronghorn habitat (**Figure 4**). Pronghorn that occupy the RBU Project Area are considered to be a part of the Book Cliffs pronghorn herd unit (Herd Unit #10). Population estimates have shown that this herd falls below management population objectives established by

the UDWR. The target herd size is 450 pronghorn; the herd currently consists of 283 individuals (63% of the target size), of which 83 individuals occur on Wild Horse Bench (UNHP-UDWR 2007).

Although most leases in the RBU Project Area do not contain stipulations other than the standard lease terms at the time of issuance, one Federal lease, U-76500, contains a special notice to implement seasonal restrictions during the antelope kidding season (May 15 through June 20).

Mule Deer

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 often migrate from high mountainous areas in the summer to lower elevations in the winter to avoid deep snow (UNHP-UDWR 2007).

Mule deer occupy the Green River corridor, located west of the RBU Project Area, on a year-round basis. The UDWR has identified only a small area (approximately 149 acres) in the western portion of the RBU Project Area as year-long, crucial value fawning habitat (**Figure 5**). Mule deer numbers in the RBU Project Area are low and mainly occur along the Green River. Mule deer that occupy the RBU Project Area are part of the Book Cliffs mule deer herd unit (Herd Unit #10), which currently falls approximately 40 percent below the UDWR-population objective for this herd (UNHP-UDWR 2007).

Rocky Mountain Bighorn Sheep

The Rocky Mountain bighorn sheep is native to rugged mountainous areas of western North America. In Utah, a great 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 (Fitzgerald et al 1994; UNHP-UDWR 2007).

In the RBU Project Area, Rocky Mountain bighorn sheep intermittently occupy (both spatially and temporally) the Willow Creek and Green River corridors on a year-round basis. Bighorn sheep in this area are not native but instead were introduced onto the Ouray Indian Reservation. No management objectives exist for this Rocky Mountain bighorn sheep Tribal population (UNHP-UDWR 2007). The UDWR has identified approximately 6,806 acres of year-long, crucial value bighorn sheep habitat in the western and eastern portions of the RBU Project Area (**Figure 6**).

3.2.3.3 Migratory Birds

The Migratory Bird Treaty Act (MBTA) 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, Executive Order 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 may occupy the RBU Project Area, and the western portion of the RBU Project Area along the Green River has been designated by the Utah Steering Committee (USC) as a Bird Habitat Conservation Area (BHCA) (USC 2005). BHCAs are intended to display areas where bird habitat conservation projects may take place, predicated on concurrence, collaboration, and cooperation with all landowners involved; however, BHCAs have no official status (USC-IWJV 2005). The BHCA that occurs in the RBU Project Area is the Green River BHCA (BHCA #37), which includes the lowland riparian priority habitat type and extends from the town of Ouray, north of the RBU Project Area, south to the fork of the Colorado River. This section addresses migratory birds that may inhabit the RBU Project Area, including those species classified as Priority Species by Utah Partners-in-Flight. Priority Species are denoted by an asterisk (*). Utah 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. Migratory bird species that may utilize the RBU Project Area are listed below based on preferred habitats (i.e., nesting and foraging habitats) and vegetative communities present in the area. Those migratory bird species (including special status raptor species) that are Federally-listed are candidates for Federal listing under the ESA, or are State sensitive are addressed in **Section 3.2.3.5**. Non-special status raptor species are addressed in **Section 3.2.3.4**.

Badlands/Outcrops - Although these birds may forage in other vegetation communities, the following migratory birds may utilize the badland and rock outcrop areas in the RBU Project Area: canyon wren (*Catherpes mexicanus*), barn swallow (*Hirundo rustica*), cliff swallow (*Hirundo pyrrhonota),* common raven (*Corvus corax*), and rock wren (*Salpinctes obsoletus*).

Desert Shrub - The following migratory bird species may be associated with the desert shrub community, which is the largest vegetation community within the RBU Project Area: black-throated sparrow (*Amphispiza bilineata*), black-chinned hummingbird (*Archilochus alexandri*), common yellowthroat (*Geothlypis trichas*), Lewis's woodpecker (*Melanerpus lewis*), gray flycatcher (*Empidonax wrightii*), western kingbird (*Tyrannus verticalis*), green-tailed towhee (*Pipilo chlorurus*), northern mockingbird (*Mimus polyglottos*), and Say's phoebe (*Sayornis saya*). These birds may also utilize the sagebrush vegetation community.

Sagebrush - Although the following birds are often associated with the sagebrush vegetation community, they may also use the desert shrub vegetation community: Brewer's sparrow* (*Spizella breweri*), mountain bluebird (*Sialia currucoides*), sage sparrow* (*Amphispiza belli*), horned lark (*Eremophila alpestris*), sage thrasher (*Oreoscoptes montanus*), and vesper sparrow (*Pooecetes gramineus*).

3.2.3.4 Raptors

Some of the more common and visible birds within the RBU Project Area are the raptors, or birds of prey. The RBU Project Area provides diverse breeding and foraging habitats for raptors: desert shrub communities, rocky outcrops, and lower elevation shrublands. **Table 3-5** provides the raptor species with the potential to occur in the RBU Project Area, and a description of their typical nesting habitats.

Table 3-5. Raptor Species with the Potential to Occur in the RBU Project Area

Common Name	Scientific Name	Nesting Habitats
American Kestrel	*Falco sparverius*	Holes in tree cavities, cliff crevices
Bald Eagle	*Haliaeetus leucocephalus*	Large trees near rivers, lakes, marshes, or other wetland areas
Burrowing Owl	*Athene cuniculara*	Mammal burrows, typically prairie dog colonies
Cooper's Hawk	*Accipiter cooperii*	Woodland and riparian zones
Ferruginous Hawk	*Buteo regalis*	Trees and shrubs, cliffs, utility structures, and rock outcrops
Golden Eagle	*Aquila chrysaetos*	Cliff ledges and rock outcrops
Great-horned Owl	*Bubo virginianus*	Cliff ledges or nests of other species
Northern Harrier	*Circus cyameus*	Ground within thick vegetation
Peregrine Falcon	*Falco peregrinus*	Cliff ledges
Prairie Falcon	*Falco mexicanus*	Cliff ledges
Red-tailed Hawk	*Buteo jamaicensis*	Cliff ledges, rock outcrops, aspen, pinyon-juniper woodlands
Short-eared Owl	*Asio flammeus*	Typically a ground nester.
Swainson's Hawk	*Buteo swainsoni*	Nest in trees in or near open areas.
Turkey Vulture	*Cathartes aura*	Rock outcrops, caves, and tree cavities

In 2007, an aerial raptor survey was conducted for all areas occurring inside or within ½ mile of the RBU Project Area (B&A 2007). Thirteen raptor nests were found at the time of the survey. Of the observed nests, three were found to be active (two golden eagle nests and one great-horned owl nest). All active raptor nests were built on cliffs which faced the Green River. In addition to these nesting sites, other raptors may have established or could establish territories, nests, and/or roosting sites within the RBU Project Area. Nest sites could occur on rock outcrops, on taller shrubs, or in trees.

All raptor species and their nests are protected from take or disturbance under the MBTA of 1918 (16 U.S.C. 703 et seq.); however, because golden eagles, bald eagles, and burrowing owls are considered to be special status raptor species, they are discussed in further detail in **Section 3.2.3.5**.

3.2.3.5 Special Status Wildlife Species

This section discusses wildlife species that have a special-status designation, which includes:

- Species Federally-listed as threatened or endangered, proposed for Federal listing as threatened or endangered, or considered to be a candidate for Federal listing as threatened or endangered under the ESA;

- Species listed as sensitive by the UDWR, including both wildlife species of concern and species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing; and
- Species protected under certain specified regulations.

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

Special status wildlife species that have the potential to occur within the RBU Project Area or be affected by development activities within the RBU Project Area are discussed below. Refer to the "Summary of Potential Occurrence of Special Status Wildlife Species" (**Appendix D**) for an analysis of all special status species found in the Vernal FO area and their potential to occur in the RBU Project Area.

White-tailed Prairie Dog

The white-tailed prairie dog (WTPD) (*Cynomys leucurus*) is a UDWR Wildlife Species of Concern based on its importance to the black-footed ferret (*Mustela nigripes*). The black-footed-ferret is a Federally-endangered species, and the species' original distribution in North America closely corresponded to that of prairie dogs (Fitzgerald et al. 1994; Wilson and Ruff 1999).

WTPDs inhabit mountain valleys, semidesert grasslands, agricultural areas, and open shrublands in western North America (Fitzgerald et al. 1994). 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 poorly defined with most activity concentrated around feeding sites.

WTPD colonies have been observed along Wild Horse Bench; however, the exact numbers or locations of these colonies are unknown. No formal prairie dog colony surveys or burrow density estimates have been completed at this time.

Yellow-billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus*) is a candidate for listing under the ESA. This species is a neotropical migratory species that breeds in the U.S. and Canada and winters in South America (USFWS 2001). The cuckoo is a riparian obligate bird that feeds in cottonwood groves and nests in willow thickets. Nest sites have been correlated with large patches (greater than 10 hectares) of cottonwood-willow stands, dense understories, high local humidity, low local temperatures, and in proximity to slow or standing water. In Utah, this species nests in riparian areas and has been documented in cottonwood habitat along the Green River west of the RBU Project Area. Breeding has been confirmed in the Ouray National Wildlife Refuge located along the Green River approximately 13 miles upstream from the RBU Project Area (Howe and Hanberg 2000). Although the RBU Project Area does not support the necessary habitat elements to support the yellow-billed cuckoo, potential habitat for the species does occur immediately west of the RBU Project Area along the Green River.

Bald Eagle

Effective August 8, 2007, the USFWS delisted the bald eagle (*Haliaeetus leucocephalus*) in the lower 48 states from the Federal list of endangered and threatened wildlife (72 FR 37346). However, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the MBTA. In addition, the USFWS, in compliance with Section 4(g)(1) of the ESA, will monitor the status of the bald eagle over a 20-year period with sampling events held once every 5 years. The result of the post-delisting monitoring plan will be to determine if the population of bald eagles in the lower 48 states warrants expanded monitoring, additional research, and/or resumption of Federal protection under the ESA (USFWS Bald Eagle Monitoring Team 2007).

Although bald eagles have shown recovery across their range, the number of nesting pairs in Utah is low; to date there are only nine known bald eagle breeding pairs in the State of Utah (72 FR 37346). Although no bald eagle nesting sites exist within or near the RBU Project Area, known winter roost sites are located along the Green River, west of and outside the RBU Project Area. Wintering bald eagles concentrate at established roosting sites for the purpose of feeding and sheltering in close proximity to sufficient food sources. Specifically, three bald eagle roosting sites are located within ½ mile of the RBU Project Area boundary, however all three roosts are located immediately adjacent to the Green River, which is physically screened from project development by canyons walls. Winter roosting usually occurs from early November through late March, and bald eagles may use the RBU Project Area as foraging habitat during this period.

Golden Eagle

The golden eagle (*Aquila chrysaetos*) is protected under the MBTA and Bald and Golden Eagle Protection Act, based on the similarity of the juvenile bald eagle's physical appearance to that of the adult golden eagle. Populations of golden eagles in Utah are considered to be year-round residents. Golden eagles are quite common in Uintah County and the Vernal Planning Area. Throughout the summer, golden eagles are found in mountainous areas, canyons, shrublands, and grasslands. During the winter, they inhabit shrubsteppe vegetation, as well as wetlands, river systems, and estuaries. Golden eagle nests are constructed on cliffs or in large trees (UNHP-UDWR 2007).

In 2007, two active golden eagle nests were located along the western boundary of the RBU Project Area (B&A 2007). These nests were located on cliffs facing the Green River along the northwestern boundary of the RBU Project Area. Potential nesting and foraging habitat is found throughout the RBU Project Area, and therefore additional breeding golden eagles could establish territories/nests in the future.

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is a UDWR Wildlife Species of Concern because widespread losses of sagebrush habitat have caused a decline in population size and have limited species distribution within the State. Large fragments of sage-grouse habitat have been lost throughout Utah due to a variety of developments including intensive domestic livestock grazing, indiscriminate pesticide spraying, cropland conversion, wildfires, and the invasion of exotic species (i.e., smooth brome, crested wheatgrass) (UDWR 2002; UNHP-UDWR 2007). Today, sage-grouse are found in 26 of Utah's counties (including Uintah County) and are thought to only occupy 50 percent of their historic habitat. In Utah, sage-grouse inhabit sagebrush habitat of the Colorado Plateau and Great Basin geographic regions from 6,000-9,000 famsl. In Uintah

County, Utah, the largest populations of sage-grouse are on Diamond and Blue Mountains, with smaller populations scattered throughout the County (UDWR 2002).

Sage-grouse are a sagebrush-obligate, and rely almost exclusively on contiguous sagebrush ecosystems for leks, nesting sites, feeding sites, rearing sites, protection, and wintering grounds. Although sagebrush habitat occurs in the RBU Project Area, the area is small and does not overlap with the UDWR-designated brooding habitat. Approximately 4,706 acres of greater sage-grouse crucial value brooding habitat is found in the southwest portion of the RBU Project Area (**Figure 7**). The closest lek to the RBU Project Area is located 6.5 miles to the southwest. Although not high, the potential exists for sage-grouse to occur in the RBU Project Area.

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is a UDWR Wildlife Species of Concern. 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 2002). In the winter, burrowing owls migrate to Texas and parts of Mexico (USGS 2003). The species is associated with dry, open habitat that has short vegetation and contains an abundance of burrows (Johnsgard 2002). In Utah, prairie dog burrows are the most important source of burrowing owl nest sites. Burrowing owls' use of abandoned prairie dog towns is minimal: active prairie dog towns are the primary habitat for the owls.

Burrowing owl surveys have not been conducted in the RBU Project Area. However, as there are scattered prairie dog colonies in portions of the RBU Project Area, the burrowing owl has the potential to occur within the RBU Project Area.

Bonytail

The bonytail is a Federally-endangered fish species. Historically, the bonytail was a common species in the main river channels of the Colorado River systems. However, today the bonytail exists in very low numbers in its natural habitat (USFWS 1994). There are currently no self-sustaining populations of bonytail in the wild, and very few individuals have been caught throughout the Upper Colorado River Basin in Utah. A few individuals have been caught in the Green River in Hideout Canyon and Gray Canyon, and at the confluence of the Colorado River and the Green River. Releases of hatchery-reared bonytail into the Upper Basin have resulted in low survival, with no evidence of reproduction or recruitment. The bonytail is adapted to major rivers where it has been observed in pools and eddies. Flooded bottomland habitats are important growth and conditioning areas for bonytail, particularly as nursery habitats for young (USFWS 2002a).

In Utah, a total of 139 river miles and their associated 100-year floodplains have been designated by the USFWS as critical habitat for the bonytail in portions of the Green River and Colorado River. The closest designated critical habitat is located in the Green River approximately 20 miles downstream from the RBU Project Area (USFWS 2007a).

Colorado Pikeminnow

The Colorado pikeminnow is a Federally-endangered fish species. The Colorado pikeminnow (formerly known as the Colorado squawfish) is endemic to the Colorado River Basin where it has adapted to rivers with seasonally variable flow, high silt loads, and turbulence. In Utah, the Colorado pikeminnow was historically found in the Colorado, Green, Duchesne, San Juan, White,

and Dolores Rivers, and probably numerous smaller streams. Today, the species is most abundant in the Green River below the confluence with the Yampa River; the White River from Taylor Draw Dam near Rangely, Colorado, downstream to the confluence with the Green River; and the mainstem of the Colorado River from Palisade, Colorado, to Lake Powell. The Yampa River and Gray Canyon of the lower Green River hold the two principal spawning sites of this species (USFWS 2002b).

A total of 726 river miles in Utah have been designated by the USFWS as critical habitat for the Colorado pikeminnow. This critical habitat occurs in portions of the Green, Colorado, White, and San Juan Rivers and their respective 100-year floodplains, including portions of the Green River that flow west of the RBU Project Area (USFWS 2007a).

Humpback Chub

The humpback chub (*Gila cypha*) is a Federally-endangered fish species. In Utah, specimens of humpback chub have been reported from the upper Green River, Desolation Canyon on the Green River, the lower Yampa River, the White River, and the Colorado River above and below Glen Canyon Dam. Populations of adult humpback chub are found in boulder-strewn river canyons where they utilize a variety of habitats including pools, riffles, eddies, rocky runs, and travertine dams. The highest known concentrations of humpback chub are found in the Westwater Canyon and Grand Canyon reaches of the Colorado River. Humpback chub in the Desolation/Gray canyons of the Green River hold the third most abundant population of this species (USFWS 2002c).

In Utah, a total of 139 river miles and their associated 100-year floodplains have been designated by the USFWS as critical habitat for the humpback chub in portions of the Green River and Colorado River. The closest designated critical habitat is located in the Green River approximately 20 miles downstream from the RBU Project Area (USFWS 2007a).

Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) is a Federally-endangered fish species. In the Upper Colorado River Basin in Utah, the razorback sucker is currently found in the Green River, upper Colorado River, and San Juan River sub-basins. The fish are mostly aged adults with little or no recruitment, except in the middle Green River, where small numbers of juveniles and young adults indicate low recruitment levels. The largest population of razorback sucker in the Upper Colorado River Basin exists in low-gradient, flat-water reaches of the middle Green River between the Duchesne River and Yampa River (USFWS 2002d).

Adult razorback suckers occupy a variety of habitat types including impounded and riverine areas, eddies, backwaters, gravel pits, flooded bottoms, flooded mouths of tributary streams, slow runs, sandy riffles, and others. They typically move into flooded areas in early spring and begin spawning migrations to specific locations as they become reproductively active. Spawning occurs over rocky runs and gravel bars (USFWS 2002d).

A total of 688 river miles in Utah have been designated by the USFWS as critical habitat for the razorback sucker. This critical habitat occurs in portions of the Green, Colorado, Duchesne, White, and San Juan Rivers and their respective 100-year floodplains, including portions of the Green River that flow west of the RBU Project Area (USFWS 2007a).

Roundtail Chub

The roundtail chub is listed as a Utah State sensitive species and 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. The roundtail chub has been described as varying from sedentary to mobile, depending on life stage and habitat conditions (Sigler and Sigler 1996).

Roundtail chub populations occur in 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. In the Upper Colorado River Basin (New Mexico, Utah, Colorado and Wyoming), the species has been extirpated from about 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. Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

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, rivers, and tributaries in the Upper and Lower Colorado River Basin, including the Green River. Large adult bluehead suckers may inhabit stream environments as deep as 2 to 3 meters, although they most commonly feed in riffles and swift runs. 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 (Sigler and Sigler 1996).

Populations of this species 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 about 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. Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

Flannelmouth Sucker

The flannelmouth sucker is listed as 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 suckers spawn during March and April in the southern portions of Utah, and from May to June in northern Utah at higher elevations (Sigler and Sigler 1996).

Flannelmouth sucker populations can be found from the Green River from the Colorado River confluence upstream to the Flaming Gorge Reservoir, and the White River from Kenny Reservoir in Colorado to the Green River. Recent investigations of historical accounts and museum specimens 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 Green River in Wyoming and Utah (Flaming Gorge Reservoir) and the Colorado River in Glen Canyon, Utah (Lake Powell). Known distribution of this species includes portions of the Green River west of the RBU Project Area (UNHP-UDWR 2007).

3.2.4 LIVESTOCK GRAZING

The RBU Project Area contains portions of three grazing allotments: Green River AMP, Sand Wash, and Wild Horse Bench Allotments. These three allotments in the RBU Project Area are grazed by sheep or cattle during various grazing periods. **Figure 8** provides a map of the grazing allotments that occur in the RBU Project Area. Livestock grazing also occurs throughout portions of the RBU Project Area on Tribal lands. Formal allotments and grazing seasons have not been identified on Tribal or private lands.

An animal unit month (AUM) is defined as "the amount of dry forage required by one animal unit for one month based on a forage allowance of 26 pounds per day" (BLM 2008b). Between the three allotments, there are approximately 2,325 livestock AUMs on 10,123 acres of usable land allotted for grazing within the RBU Project Area.

All allotments have been placed in one of three management categories: Category M (Maintain Existing Resource Conditions), Category I (Improve Existing Resource Conditions), and Category C (Custodial Management). Designation of categories is dynamic and primarily based on resource potential, resource use conflicts, opportunity for positive economic return on public investments, and the present management situation (BLM 2008a). Details on each allotment, including management categories, within the RBU Project Area are summarized in **Table 3-6**.

Table 3-6. Grazing Allotment Information in the RBU Project Area

Allotment Name	Type	Management Status	Use Period	Permitted AUMs Active	Permitted AUMs Suspended	Total Permitted AUMs	Total Allotment Acres	Usable[1] Allotment Acres within the RBU Project Area	Permitted AUMs[2] within the RBU Project Area
Green River AMP Allotment	Cattle	Improve	6/01 - 10/15	437	117	554	10,090	102	6
Sand Wash Allotment	Cattle	Maintain	11/30 - 04/30	4,526	1,350	5,876	74,424	2,028	160
Wild Horse Bench Allotment	Sheep	Improve	11/16 - 4/15	2,462	-	2,462	9,115	7,993	2,159
					Total	**8,892**	**93,629**	**10,123**	**2,325**

Source: BLM 2007a
[1] Usable land is defined as land that has a slope lower than 40%.
[2] Allotment AUMs within the RBU Project Area were calculated using total permitted AUMs and total acreage for each grazing allotment.

3.2.5 PALEONTOLOGICAL RESOURCES

The Uinta Basin contains the most complete sequence of Upper Eocene rocks known in North America. Exploration of these deposits for vertebrate fossils began over 130 years ago and is still active today. Though not as plentiful or as well known, the Uinta Formation also has invertebrate fossils, plants, and trace fossils in the form of invertebrate burrows, bird and mammal tracks, and coprolites. The Green River Formation has also received attention, with vertebrate and invertebrate fossils having been discovered throughout the formation.

The Potential Fossil Yield Classification System, recently developed by the BLM (2007b), classifies geologic units based on the relative abundance of vertebrate fossils or scientifically-important invertebrate and plant fossils and their sensitivity to adverse impacts. This classification is applied to a geologic formation, member, or other distinguishable unit. This new 5-tier classification system recognizes that although significant fossil localities may occasionally occur in a geologic unit, a few widely spaced localities do not necessarily indicate a higher class. Instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment. The 5-tier classification system is as follows:

- **Class 1 – Very Low** – Geologic units that are not likely to contain recognizable fossil remains, including units consisting of volcanic or metamorphic rocks, or units that are PreCambrian in age or older.
- **Class 2 - Low** – Sedimentary geologic units that are not likely to contain vertebrate fossils or significant nonvertebrate fossils. Vertebrate or significant invertebrate or plant fossils are absent or very rare. These units include formations younger than 10,000 years before present, recent aeolian (windblown) deposits, and sediments that exhibit significant physical and chemical changes (e.g., diagenetic alteration).
- **Class 3 – Moderate or Unknown** – Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units with unknown fossil potential. These units are often marine in origin with sporadic occurrences of vertebrate fossils, or units where vertebrate or significant nonvertebrate fossils are known to occur intermittently. This class is subdivided into **Class 3a – Moderate Potential**, and **Class 3b – Unknown Potential**.
- **Class 4 – High** – Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically-significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources in many cases. This class is subdivided into **Class 4a** and **Class 4b**. **Class 4a** units are exposed with little or no soil or vegetative cover. Outcrop areas are extensive and exposed bedrock often covers areas larger than 2 acres**.** **Class 4b** units have a high potential but protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to bedrock.
- **Class 5 – Very High** – Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically-significant invertebrate or plant fossils. Surface-disturbing activities may affect paleontological resources in many cases. This class is subdivided into **Class 5a** and **Class 5b**. **Class 5a** units are exposed with little or no soil or vegetative cover. Outcrop areas are extensive and exposed bedrock often covers areas larger than 2 acres**.** These units are frequently the focus of illegal collecting activities. **Class 5b** units have a very high potential but protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts to bedrock.

Geologic units with a classification of Class 4 or higher often require a field survey by a qualified paleontologist to assess local conditions. Mitigation may be necessary prior to and during surface-disturbing activities.

The entire RBU Project Area is underlain by exposed bedrock of the Uinta and Green River formations. These geologic formations have documented occurrences of vertebrate and scientifically-important invertebrate and plant fossils. Soils are generally less than 50 centimeters deep, and bedrock outcroppings are found throughout the RBU Project Area. However, the occurrence of fossils in both formations is sporadic and unpredictable. Therefore, both of these units are classified as Class 4a (High) under the new classification system.

3.2.6 SOILS

The development of soils is governed by many factors, including climatic conditions (e.g., the amount and timing of precipitation, temperature, and wind), the parent material that the soil is derived from, topographic position (e.g., slope, elevation, and aspect), geomorphic processes, and time.

3.2.6.1 RBU Project Area Soil Types

The Soil Survey of Uintah Area, Utah – Parts of Daggett, Grand, and Uintah Counties, published by the U.S. Department of Agriculture (USDA) Soil Conservation Service, is the primary source of information concerning soils in the RBU Project Area (USDA-NRCS 2003). This survey has been supplemented by additional information available on the National Resource Conservation Service (NRCS) soils web site (USDA-NRCS 2007a). Soil information is not available for that portion of the RBU Project Area located on Tribal lands.

Soils in the RBU Project Area are developed on the sideslopes of canyons, benches, ridges, hills, alluvial fans, and floodplains. In addition, about 59 acres of the RBU Project Area are covered by bare rock outcrop. **Figure 9** illustrates the eight soil map units within the RBU Project Area and shows the relationship of these soil units with the proposed development locations. **Table 3-7** summarizes the soil textures, parent materials, landforms, slopes, depth class, runoff speed, and other factors of the soil map units in the RBU Project Area that are relevant to erosion and reclamation potential. Sixty-nine percent of the RBU Project Area is covered by just three soil types. Over 42 percent (7,111 acres) is covered by the Motto-Casmos complex that consists largely of clay loams. Another 19 percent (3,105 acres) is covered by the Motto-Rock Outcrop complex, which consists largely of similar soil types; and 8 percent (1,257 acres) is covered by the Cadrina extremely stony loam-rock outcrop complex. The five remaining soil types cover between 15 and 539 acres each. The soils on the Tribal surface are assumed to be similar in nature to the soils that occur in the rest of the RBU Project Area.

Table 3-7. Characteristics of Soil Units in the RBU Project Area

Map Complex Name and Number	Acreage in RBU Project Area	Soil Unit Name	Soil Texture	Parent Material	Landforms	Percent of Soil Unit	Slope	Depth Class	Drainage Class	Salinity Class	Sodium Class	RSMR[1]	Runoff Speed	Water Erosion Potential (Kw)
Badland-Rock outcrop complex (12)	59	Badland	--	Shale and siltstone of the Green River and Uinta Formations	Erosional remnants, hills, and ridges	50	1 to 75%	Very shallow	Somewhat excessively drained	Strongly saline	Strongly sodic	Poor	Very high	0.1
		Rock outcrop	--	Sandstone and shale bedrock	Cliffs, escarpments, ledges, erosional remnants	35	1 to 100%	Very shallow	--	--	--	--	Very high	0.1
Cadrina extremely stony loam-Rock outcrop complex (36)	1,257	Cadrina	Extremely stony loam	Slope alluvium and colluvium over residuum derived from shale and sandstone	Hills	65	25 to 50%	Shallow	Well drained	Very slightly saline	Slightly sodic	Poor	Very high	0.05
		Rock outcrop	--	--	Cliffs, escarpments, ledges, erosional remnants	20	25 to 50%	--	--	--	--	--	Very high	0.1
Cadrina-Badland-Rock outcrop complex (37)	539	Cadrina	Extremely channery loam	Slope alluvium and colluvium over residuum derived from shale and sandstone	Hills	65	25 to 50%	Shallow	Well drained	Very slightly saline	Slightly sodic	Poor	Very high	0.05
		Badland	--	--	Erosional remnants, hills, and ridges	20	25 to 50%	Shallow	Somewhat excessively drained	Strongly saline	Strongly sodic	Poor	Very high	0.1
		Rock outcrop	--	--	Cliffs, escarpments, ledges, erosional remnants	10	25 to 50%	--	--	--	--	--	Very high	0.1
Crustown-Motto	85	Crustown	Sand, loamy	Eolian deposits over residuum	Hills	50	2 to 8%	Shallow	Somewhat	Non-saline	Non-sodic	Poor	High	0.17

Map Complex Name and Number	Acreage in RBU Project Area	Soil Unit Name	Soil Texture	Parent Material	Landforms	Percent of Soil Unit	Slope	Depth Class	Drainage Class	Salinity Class	Sodium Class	RSMR[1]	Runoff Speed	Water Erosion Potential (Kw)
complex (62)			sand	derived from calcareous sandstone					excessively drained					
		Motto	Clay loam	Slope alluvium over residuum derived from shale and sandstone	Benches, hills	35	2 to 25%	Shallow	Well drained	Slightly saline	Strongly sodic	Poor	Very high	0.15
Casmos-Cadrina-Badland complex (42)	532	Casmos	Very channery loam, channery loam	Slope alluvium over residuum derived from sandstone, siltstone, and shaale	Hills	35	4 to 25%	Very shallow	Well drained	Very slightly saline	Slightly sodic	Poor	Very high	0.15
		Cadrina	Extremely channery loam	Slope alluvium over residuum derived from shale and sandstone	Hills	30	4 to 25%	Shallow	Well drained	Very slightly saline	Slightly sodic	Poor	Very high	0.05
		Badland	--	--	Erosional remnants, hills, and ridges	20	4 to 25%	Very shallow	Somewhat excessively drained	Strongly saline	Strongly sodic	Poor	Very high	0.1
Motto-Casmos complex (152)	7,111	Motto	Clay loam	Slope alluvium over residuum derived from shale and sandstone	Benches, hills	55	2 to 25%	Shallow	Well drained	Slightly saline	Strongly sodic	Poor	Very high	0.15
		Casmos	Channery loam	Slope alluvium over residuum derived from sandstone, siltstone and shale	Hills	30	4 to 25%	Very shallow	Well drained	Very slightly saline	Slightly sodic	Poor	Very high	0.15
Motto-Rock outcrop complex (154)	3,105	Motto	Very flaggy clay loam, clay loam, extremely	Slope alluvium over residuum derived from shale and sandstone	Benches, hills	75	2 to 25%	Shallow	Well drained	Slightly saline	Strongly sodic	Poor	Very high	0.15

Map Complex Name and Number	Acreage in RBU Project Area	Soil Unit Name	Soil Texture	Parent Material	Landforms	Percent of Soil Unit	Slope	Depth Class	Drainage Class	Salinity Class	Sodium Class	RSMR[1]	Runoff Speed	Water Erosion Potential (Kw)
			channery clay loam											
		Rock outcrop	--	--	Cliffs, escarpments, ledges, erosional remnants	10	2 to 25%	--	--	--	--	--	Very high	0.1
Turzo loam (242)	15	Turzo	Loam, silty clay loam	Alluvium derived from quartzite, sandstone, limestone and shale	Alluvial flats	85	0 to 4%	Deep	Well drained	Mod. saline	Mod. sodic	Fair	Medium	0.37

[1]Reclamation Source Material Rating
Sources: USDA-NRCS 2003

Many soils in the Uinta Basin possess characteristics typical of soils with a high potential to include biological soil crusts. Biological soil crusts (also know as cryptogamic, cryptobiotic, microbiotic, and microphytic soils) are composed of a symbiotic association of cyanobacteria, lichens, mosses, green algae, microfungi, and bacteria that form a rough carpet on the surface and a soil-binding matrix below. Biological soil crusts typically occur as brownish or black soil crusts that appear on the surface of sandy desert soils. Since biological soils crusts are highly adaptable, they occur in the full range of arid soil types from shallow to deep, heavy to light textures, and moist to drier conditions. No site-specific inventories have been completed to document the presence of biological soil crusts in the RBU Project Area. As such, it is assumed for the purpose of this EA that biological soils crusts may occur across the RBU Project Area.

3.2.6.2 Erosion and Reclamation Potential of RBU Project Area Soils

The key attributes used to evaluate potential environmental impacts to soils are erosion potential and ease of reclamation after soil disturbance. Soil mapping conducted by the NRCS typically provides information about each soil type within the mapped area that can be used to evaluate the erosion potential and reclamation potential of each soil unit (USDA-NRCS 2007a; USDA-NRCS 2007b).

Erosion Potential

Erosion potential can vary widely across soil units within a given area, and depends on the particle size distribution of the soil, the slopes on which it is found, and the amount and type of vegetative cover. The USDA-NRCS typically rates each of the soil units according to its water erosion potential (K_w). The erosion potential indicates the general susceptibility of a soil to sheet and rill erosion. The value of K_w ranges from 0.02 to 0.69. The higher the K_w value of a soil type, the more susceptible the soil type is to sheet and rill erosion. Erosion hazards become critical issues when protective vegetation is removed during and following activities such as well pad expansion. 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.

Most of the soil types within the RBU Project Area have erosion potentials of 0.15 or less, indicating moderate water erosion potential. Higher erosion potentials of 0.17 to 0.37 are given for the Crustown loamy sand (62) and Turzo loam (242). Soils on slopes greater than 40 percent and badland areas could be expected to have severe erosion potentials.

Reclamation Potential

Reclamation potential depends on soil structure, pH conditions, and soil salinity. Excessive salinity (salt content) or sodicity (sodium content) can inhibit the growth of desirable vegetation and therefore, successful reclamation.

The USDA has provided reclamation material source ratings for the soils in the RBU Project Area on the Web Soil Survey (USDA-NRCS 2007a). With the exception of the Turzo soils, all of the soils in the RBU Project Area are rated poor for reclamation potential based on the attributes of the primary soil type. The poor ratings are generally due to the shallow depth to bedrock, low organic matter content, high stone content, and excessive salinity or sodicity.

3.2.7 VEGETATION INCLUDING SPECIAL STATUS PLANT SPECIES AND INVASIVE OR NOXIOUS WEEDS

3.2.7.1 General Vegetation

The vegetation communities identified in this section are described using data obtained from the USDA-NRCS Soil Survey Geographic Database (USDA-NRCS 2007a), as well as the USDA-NRCS Field Office Technical Guides ecological site descriptions (USDA-NRCS 2007b). Elevation in the RBU Project Area ranges from approximately 4,800 to 5,400 famsl, and the rolling topography creates a conglomerate of changing slopes across the landscape. **Figure 10** provides a map of the vegetation communities that occur in the RBU Project Area. No vegetation information currently exists for Tribal lands in the RBU Project Area. However, it can be assumed that plant communities on Tribal lands would be similar to the adjacent State and Federal lands in the RBU Project Area. **Table 3-8** provides a breakdown of vegetation communities occurring within the RBU Project Area. A brief discussion of each of the communities follows.

Table 3-8. Vegetation Communities within the RBU Project Area

Vegetation Community	Estimated Acres	Percent of Total RBU Project Area
Desert Shrub (saltbush and shadscale)	11,336	67.8%
Sagebrush	1,234	7.4%
Badlands/Rock Outcrop	64	0.4%
Greasewood	18	0.1%
Unknown (Tribal land or unmapped areas)	4,067	24.3%
Total	**16,719**	

<u>Desert Shrub</u>

The desert shrub vegetative community tends to be variable in its composition and species dominance. Dominant species primarily include shadscale (*Atriplex confertifolia*), fourwing saltbush (*Artiplex canescens*), and mat saltbush (*Atriplex corrugata*). In its optimal growth, the canopy cover of this community is composed of shrubs (20 to 40%), grasses (10 to 30%), and few forbs (5%). Soils in this community group range from shallow clay loam to deep sands, which, along with soil chemistry, have set the pattern of shrub dominance and species composition on various sites (USDA-NRCS 2007a; USDA-NRCS 2007b). Other plant species that occur within the desert shrub vegetation community include: bud sagebrush (*Picrothamnus desertorum*), Torrey jointfir (*Ephedra torreyana*), Indian ricegrass (*Achnatherum hymenoides*), galleta (*Pleuraphis jamesii*), needle-and-thread grass (*Hesperostipa comata*), sand dropseed (*Sporobolus cryptandrus*), and scarlet globemallow (*Sphaeralcea coccinea*) (USDA-NRCS 2007a;, USDA-NRCS 2007b).

The desert shrub community is the most abundant community in the RBU Project Area and is found throughout the landscape (**Figure 10**). Mat saltbush is the dominant species in this community over the largest portion of the RBU Project Area (approximately 10,156 acres). The northern portion of the RBU Project Area is interspersed with shadscale-dominated desert shrub (approximately 1,097 acres). A small area of fourwing saltbush-dominated desert shrub community (approximately 83 acres) is located in the northeastern portion of the RBU Project Area.

Sagebrush

Sagebrush shrublands occur throughout Utah typically at elevations between 4,000 and 7,000 famsl. This community type is found most often on mountain flattops, plains, and valley bottoms, near drainages. The understory within the sagebrush community includes a variety of perennial grasses such as galleta, Salina wildrye (*Leymus salinus*), needle-and-thread grass, and Indian ricegrass. Other shrubs, including shadscale, and forbs, including broom snakeweed (*Gutierrezia sarothrae*) and longleaf phlox (*Phlox longifolia*), can also be found in this community (USDA-NRCS 2007a; USDA-NRCS 2007b). In the RBU Project Area, this community is dominated by black sagebrush (*Artemisia nova*) and is located in the southwest and southeast corners of the RBU Project Area (approximately 1,234 acres).

Badlands/Rock Outcrop

Badlands and rock outcrops occur in all vegetation communities in the Uinta Basin. These areas are generally devoid of vegetation due to clay soils and steep slopes; however some plants may be found in small areas where water may accumulate or where the texture of alluviated material is more desirable for plant growth (USDA-NRCS 2007a; USDA-NRCS 2007b). In the RBU Project Area, small areas (approximately 64 acres) of rock outcrops and badlands occur in the northwest portion and may occur along Willow Creek in the eastern portion of the RBU Project Area.

Black Greasewood

Black greasewood (*Sacrobatus vermiculatus*) communities are usually elevated above and outside any active riparian zones associated with perennial drainages, and are closely associated with highly saline soils. Plant species that grow in greasewood communities include: bottlebrush squirreltail (*Elymus elymoides*), alkali sacaton (*Sporobolus airoides*), galleta, Indian rice grass, slender seepweed (*Suaeda calceoliformis*), scarlet globemallow, shadscale, and bud sagebrush (USDA-NRCS 2007a; USDA-NRCS 2007b). The community occurs in the RBU Project Area along Willow Creek and near the Green River (approximately 18 acres).

3.2.7.2 Invasive and Noxious Weeds

The spread of invasive plants and noxious weeds is a concern in areas proposed for surface development activities. 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 listed as noxious, but are not native to this area.

The most common locations for weeds include existing disturbance areas such as roadsides, well pads, pipeline ROWs, adjacent washes, and areas where grazing has removed native species. Roads may be the first points of entry for exotic species into a new landscape, and the road can serve as a corridor for plants moving farther into the landscape (Forman and Alexander 1998; Gelbard and Belnap 2003). Invasion by exotic species may have significant biological and ecological effects if weeds are able to displace natives or disrupt the structure and function of an ecosystem.

Table 3-9 summarizes those weeds designated and published as noxious for the State of Utah, under the Commissioner of Agriculture, Section 4-17-3, Utah Noxious Weed Act. In addition,

the Vernal FO has added black henbane (*Hyoscyamus niger*) and houndstongue (*Cynoglossum officinale*) as two other problematic weed species that may occur in the RBU Project Area.

Table 3-9. Uintah County and State of Utah Noxious Weeds

Common Name	Scientific Name
Bermuda grass	*Cynodon dactylon*
Canada thistle	*Cirsium arvense*
Diffuse knapweed	*Centaurea diffusa*
Dyer's woad	*Isatis tinctoria*
Field bindweed	*Convolvulus arvensis*
Hoary cress	*Cardaria draba*
Johnsongrass	*Sorghum halepense*
Leafy spurge	*Euphorbia esula*
Medusahead	*Taeniatherum caput-medusae*
Musk thistle	*Carduus nutans*
Perennial pepperweed	*Lepidium latifolium*
Perennial sorghum	*Sorghum halepense & Sorghum almum*
Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Elymns repens*
Russian knapweed	*Centaurea repens*
Russian olive	*Elaeagnus angustifolia*
Saltcedar	*Tamarix ramosissima*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaurea stoebe*
Squarrose knapweed	*Centaurea rigata*
Yellow starthistle	*Centaurea solstitialis*

The most problematic noxious weeds in this area of Uintah County are saltcedar (*Tamarix ramosissima)* and hoary cress (*Cardaria draba)*. The most common invasive species (not listed on the noxious weed list for the area) in the RBU Project Area are Russian thistle (*Salsola iberica*), halogeton (*Halogeton glomeratus*), and cheatgrass (*Bromus tectorum*).

3.2.7.3 Special Status Plant Species

This section discusses plant species that have Federal and/or State special-status designations, which 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. 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 jeopardize a Federally-listed threatened or endangered species. It is BLM's current policy that USFWS candidate species are also managed to prevent future Federal listing as threatened or endangered.

Based on examination of USFWS, Utah Natural Heritage Program (UNHP), and BLM data, two Federally-listed plant species are known to occur or have potential to occur within the RBU Project Area: the Uinta Basin hookless cactus (*Sclerocactus wetlandicus*) and the clay reed-mustard (*Schoenocrambe argillacea*). Refer to the "Summary of Potential Occurrences of

Special Status Plant Species" (**Appendix D**) for an analysis of all special status plant species potentially occurring in the Vernal FO area and their potential to occur in the RBU Project Area.

Uinta Basin Hookless Cactus

The Uinta Basin hookless cactus (*Sclerocactus glaucus*) was listed as threatened under the ESA in 1979. Recently, *S. glaucus* has been reclassified and three species, which were collectively recognized as S. *glaucus* during the time of its listing, are now recognized separately: *S. glaucus*, *S. brevispinus*, *and S. wetlandicus*. Of these three species, *S. wetlandicus* has the potential to occur in the RBU Project Area and is analyzed in this EA.

Habitat for the Uinta Basin hookless cactus generally consists of gravelly or rocky surfaces on river terrace deposits and lower mesa slopes (USFWS 1990), as well as gravel littered draws that are underlain by clay or silty clay soils. More recently this species has also been found on the Green River formation in the Uinta Basin. The species occurs on varying exposures, but is more abundant on south-facing exposures, slopes to about 30 percent grade, and where terrace deposits break from level tops to steeper side slopes. The Uinta Basin hookless cactus is found at an elevation range of 4,500 to 5,900 famsl within the desert scrub vegetation community (USFWS 1990). Due to this species' showy purple flowers, it is very popular to collectors and theft of individual cacti is a major concern.

Habitat for the Uinta Basin hookless cactus has been identified by the Vernal FO near the Green River just outside the RBU Project Area. Although the BLM has not defined potential habitat for this species within the RBU Project Area, the geological formations and soils associated with this species do occur in the western portion of the RBU Project Area. Therefore, the Uinta Basin hookless cactus has the potential to occur on benches along the Green River in the western portion of the RBU Project Area.

Clay Reed-Mustard

The clay reed-mustard (*Schoenocrambe argillacea*) is a Federally-threatened perennial herbaceous plant that is endemic to the Uinta Basin in Uintah County, Utah. The clay reed-mustard typically grows on steep, north-facing slopes with fine textured soil overlain with sandstone talus derived from the zone of contact between the Green River and Uinta Formations. The species has also been documented below the rocky contact zone of the Uinta Formation and the Evacuation Creek Member at elevations ranging from 4,700 to 5,800 famsl (UNHP-UDWR 2007). Clay reed-mustard is associated with the mixed desert shrub community. Dominating shrub species associated with clay reed-mustard populations include Utah serviceberry (*Amelanchier utahensis*), black sagebrush, Castle Valley clover (*Atriplex gardneri cuneata*), shadscale, and green rabbitbrush (*Chrysothamnus viscidiflorus*) (UNHP-UDWR 2007).

Known populations of clay reed-mustard occur in the central portion of Uintah County, with portions of several populations extending onto the Uintah and Ouray Indian Reservation. The BLM Vernal FO identified habitat in the southeastern portion of the RBU Project Area. In addition, the geological formation and soils associated with this species are found in the western portion of the RBU Project Area, and therefore additional clay-reed mustard have the potential to occur in these areas.

3.2.8 WATER RESOURCES

Water resources within the RBU Project Area include perennial surface water flows in Willow Creek; intermittent flows in ephemeral tributaries to Willow Creek, Hill Creek, and the Green River; and alluvial and bedrock groundwater.

3.2.8.1 Surface Water

Figure 11 shows the surface water features in the vicinity of the RBU Project Area. The RBU Project Area is drained by Willow Creek and ephemeral tributaries of Willow Creek and the Green River. A small portion of the RBU Project Area also drains to Hill Creek, just above the confluence with Willow Creek. With the exception of Willow Creek, other streams in the RBU Project Area are ephemeral and only flow in direct response to rainfall events.

All streams and water bodies in Utah are assigned to classes according to quality and degree of protection (UDEQ 2000). All streams within the RBU Project Area are classified as Class 2B, 3A, and 4. Class 2B streams are protected for secondary contact recreation such as boating, wading, or similar uses. Class 3A streams are protected for cold water species of game fish and other cold water aquatic life. Class 4 streams are protected for agricultural uses including irrigation of crops and stock watering.

<u>Surface Water Flow</u>

Stream flow data is available for the Green River, Willow Creek, and Hill Creek. One gauging station is located upstream from the RBU Project Area on the Green River near Ouray, and one station is located downstream on the Green River at Green River, Utah (**Figure 11**). The stations on the Green River provide data concerning the total surface water runoff from the Uinta Basin.

Willow Creek receives flow from Hill Creek immediately south of the RBU Project Area boundary. Two U.S. Geological Survey (USGS) surface water gauging stations are located on Willow Creek, including one within the RBU Project Area. This station on Willow Creek was only monitored until 1983, but these data are still useful for determining flow conditions for this stream. Two other gauging stations are located on Hill Creek, including one near the confluence with Willow Creek just south of the RBU Project Area boundary that was monitored until 1981.

Table 3-10 presents summary flow data for the downstream stations on Willow Creek and Hill Creek and the two Green River stations. Mean monthly stream flows on the Green River at Ouray range from 1,925 cubic feet per second (cfs) to 17,000 cfs, and peak in June. Mean monthly stream flows further downstream on the Green River range from a low of 2,301 cfs to a high of 18,620 cfs.

Monthly stream flows near the mouth of Hill Creek are variable during the fall and winter months, ranging from 0.67 cfs to 3.78 cfs. The variable flows at this location are due to withdrawals of water from this creek for irrigation upstream from the RBU Project Area. Flows increase during the summer due to contributions from snowmelt and reach a maximum of 16.7 cfs in May.

Mean monthly stream flows at Willow Creek station 09308000, within the RBU Project Area, range from 10.4 cfs to 23.2 cfs during the late summer through winter months and from 35 cfs to 66.5 cfs during the spring snowmelt. Flow is also occasionally measured at UDEQ station 4933500, downstream from the RBU Project Area.

Table 3-10. Stream Flow Data for USGS Gauging Stations

USGS Gauging Station Name and Number	Range of Monthly Mean Discharge (cfs)	Peak Daily Discharge (cfs)	Mean Annual Discharge (cfs)	Period of Record
Willow Creek near Ouray, Utah 09308000	10.4 (September) to 66.5 (May)	500 (August 27, 1952)	25.6	July 1947 – September 1983
Hill Creek Mouth near Ouray, Utah 09307900	0.67 (September) to 16.7 (May)	88 (May 26, 1979)	5.40	October 1974 – September 1981
Green River near Ouray, Utah 09307000	1,925 (January) to 17,000 (June)	14,100 (June 11, 1952)	5,614	October 1947 – September 1966
Green River at Green River, Utah 09315000	2,301 (January) to 18,620 (June)	66,700 (June 27, 1917)	6,132	October 1894 – September 2004

Source: USGS 2008

Surface Water Quality

The water quality characteristics of surface waters in the vicinity of the RBU Project Area reflect the chemical nature of precipitation and the geologic strata over which the water flows. This section describes the chemical quality of these waters, based on data collected by the USGS at Willow Creek station 09307900 located within the RBU Project Area, and by the UDEQ at station 4933500 downstream of the RBU Project Area.

Water Quality Standards

The U.S. Environmental Protection Agency (EPA) has established primary and secondary drinking water standards for approximately 90 water contaminants as required by the Safe Drinking Water Act, as amended in 1996, and Clean Water Act (CWA) of 1987, as amended (EPA 2003). These regulations specify maximum contaminant levels (MCLs) and secondary standards for specific contaminants. The MCLs are health-based. Although these MCLs legally apply only to public drinking water supplies, they are also useful for evaluating environmental water quality problems. The secondary standards are for constituents that cause cosmetic effects (such as skin or tooth discoloration) or esthetic effects (such as taste, odor, or color) in drinking water. The CWA delegated the administration of these standards to cooperating States and Tribes, as long as the State and Tribal standards were at least as stringent as the Federal standards. Most states, including Utah, now have primacy for the administration of the CWA (on all except Tribal lands) and have also adopted State water-quality standards (UDEQ 2000). The Utah standards include a series of aquatic water quality standards that are protective of aquatic organisms and fisheries, in addition to drinking water standards.

Willow Creek Surface Water Quality

Table 3-11 provides a summary of the data collected by the USGS on Willow Creek at station 09307900. The waters in Willow Creek are described as calcium-magnesium-sodium bicarbonate-sulfate type waters with high to very high hardness (330 to 580 mg/L as $CaCO_3$). TDS ranges from 520 to 1,100 milligrams per liter (mg/L), and averages 747 mg/L, in excess of the secondary standard of 500 mg/L. The average concentration of sulfate exceeds the secondary standard of 250 mg/L. Arsenic and copper exceed the aquatic standards for one or more samples

from this site, and manganese is high (550 ug/L to 1,400 ug/L) and exceeds the secondary standard of 50 micrograms per liter (ug/L) for all samples.

Table 3-11. Summary of Water Quality Analyses for Willow Creek near Mouth, USGS Gauging Station 09307900

Parameters	Standards		Summary Statistics		
	Drinking Water	Aquatic Biota[3]	No. of Samples	Range	Mean
General Water Quality Indicators					
Temperature (°C)			39	0 – 25.5	8.45
Specific Conductance (uS/cm)			21	780 – 2,020	1140
Dissolved Oxygen (mg/L)		Min 6.5	20	7.0 – 11.2	9.51
pH (standard units)	6.5-8.5[2]	6.5-9.0	19	7.8 – 8.5	8.17
Total Hardness (mg/L)			16	330 – 580	431
Sodium Adsorption Ratio			16	1 – 3	2.13
Total Dissolved Solids (mg/L)	500[2]	1,200	12	**520 – 1,110**	**747**
Total Suspended Solids (mg/L)		90	25	29 – **25,000**	**3410**
Ionic Constituents					
Calcium (mg/L)			16	52 – 91	66.9
Magnesium (mg/L)			16	40 – 91	64.2
Sodium (mg/L)			16	50 – 170	99.9
Potassium (mg/L)			16	2.6 – 6	3.88
Chloride (mg/L)	250[2]		16	7.8 – 22	15.1
Sulfate (mg/L)	250[2]		16	140 – **460**	**271**
Fluoride (mg/L)	4[1], 2[2]	1.2 - 2.4[4]	16	0.3 – 0.8	0.56
Ammonia (mg/L)		0.11 – 2.49[4]	13	<0.01 – 0.04	0.013
Silica (mg/L)			16	15 – 19	16.0
Bicarbonate (mg/L)			13	345 – 525	415
Nitrite & Nitrate (mg/L)	10[1]	4	15	0.01 – 0.36	0.11
Trace Metals					
Aluminum (ug/L)	50 - 200[2]	750	14	<1 – 2	1.04
Arsenic (ug/L)	10[1]	190	14	7 - **19**	**12.2**
Barium (ug/L)	2,000[1]	1,000	5	<60 – 100	61.0
Boron (ug/L)			15	200 – 1,600	732
Copper (ug/L)	1,300[1], 1,000[2]	12	13	10 - **650**	**85.0**
Iron (ug/L)	300[2]	1,000	3	<10 – 10	6.67
Manganese (ug/L)	50[2]		13	**550 – 1,400**	**1,030**
Selenium (ug/L)	50[1]	5	6	0.01 – 0.05	0.03
Strontium (ug/L)			10	<10 - 20	13.5
Zinc (ug/L)	5,000[2]		14	<10 - 330	57.1

All samples are dissolved (filtered) unless otherwise noted.
Average values calculated using one-half the detection limit for non-detect values.
Bold values exceed standards.
[1]Federal Drinking Quality Standards Primary MCL.
[2]Federal Drinking Quality Standards Secondary MCL.
[3]Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code). EPA is in the process of revising the national criteria for aluminum for aquatic life and expects to complete this process in 2007.
[4]Value is dependant on temperature and pH.
Source: USGS 2008

The 1974 Colorado River Basin Salinity Control Act, Public Law 93-320, authorized the construction, operation, and maintenance of works in the Colorado River Basin to control the salinity of water delivered to Mexico. In 1994, Public Law 98-569 amended the Colorado River Basin Salinity Control Act and directed the Secretary to develop a comprehensive program for

minimizing salt contributions from lands administered by the BLM. BLM´s program is designed to provide the best management of the basic resource base and minimize increased salinity in the Colorado River System. Specific conductance at the Willow Creek station ranges from 780 to 2,020 microsiemens per centimeter (uS/cm) with an average of 1,140 uS/cm. These values are generally in the high salinity class and indicate that the waters can be used for irrigation only with special management practices. The Sodium Adsorption Ratio (SAR) ranges from one to three and averages 2.13. These are considered to be safe values for SAR (Hergert and Knudsen 1997).

The Utah Division of Environmental Quality (UDEQ) also monitors and assesses Willow Creek on a regular basis to determine if the stream is supporting beneficial uses. Water quality data have been, and are currently being, collected from Willow Creek at UDEQ station 4933500 located downstream of the RBU Project Area near Ouray, Utah (**Figure 11**). **Table 3-12** presents a summary of water quality data from this station.

Water quality results recorded at this station are similar to those from the USGS gauging station on Willow Creek. The field-measured pH ranges from 7.64 to 8.91 with an average of 8.48, slightly higher than the average of 8.17 reported for the USGS station. TDS ranges from 410 mg/L to 1,950 mg/L with an average of 911 mg/L, and total suspended solids (TSS) concentrations range from 14.4 to 6,560 mg/L with an average of 1,050 mg/L. These values are lower than those reported by the USGS, but may be more representative of typical conditions in Willow Creek because the high extremes recorded at the USGS station are absent from the UDEQ data.

The UDEQ also analyzed several trace metals that have not been reported by the USGS. The EPA STORET database where the UDEQ data are available reports non-detect values simply as "Not Detected." Calculation of any central tendency (mean or median) using non-detect values requires that the instrument detection limit is known for each parameter and individual analysis. Non-detect values cannot be assumed to be zero. Therefore, for parameters with non-detect values in the database, a mean cannot be calculated accurately and is not provided here. For these parameters, the range of detected concentrations is provided without a calculated mean.

Aluminum was detected in 2 of 11 samples at concentrations up to 5,940 ug/L, above the aquatic standard. Arsenic was detected in all 11 samples at an average concentration of 11.3 ug/L, which is slightly above the MCL. Single detected concentrations of cadmium, copper, and lead, and the maximum concentration of manganese, also exceed standards. Iron ranges up to 3,420 ug/L and averages 435 ug/L, above the secondary drinking water standard of 300 ug/L.

Table 3-12. Summary of Water Quality Analysis for Willow Creek, UDEQ Station 4933500

Parameters	Standards		Summary Statistics			
	Drinking Water	Aquatic Biota[3]	No. of Samples	No. of Detects	Range of Detects	Mean
General Water Quality Indicators						
Alkalinity as $CaCO_3$ (mg/L)			44	44	190 – 576	345
Dissolved Oxygen (mg/L)		>6.5	42	42	**5.1** – 13.03	9.25
pH	6.5 to 8.5[2]	6.5 to 9.0	84	84	7.64 – **8.91**	8.48
Specific Conductance (umhos/cm)			88	88	368 – 2,753	1,300
Temperature (^oC)			44	44	-0.26 – 24.7	11.3

Parameters	Standards		Summary Statistics			
	Drinking Water	Aquatic Biota[3]	No. of Samples	No. of Detects	Range of Detects	Mean
Total Dissolved Solids (mg/L)	500[2]	1,200	44	44	410 – **1,950**	**911**
Total Hardness (mg/L)			24	24	260 – 531	415
Total Suspended Solids (mg/L)		90	44	44	14.4 – **6,560**	**1,050**
Ionic Constituents						
Bicarbonate (mg/L)			24	24	288 – 576	429
Calcium (mg/L)			43	43	35 – 127	67.4
Chloride (mg/L)	250[2]		34	34	7 – 199	24.3
Magnesium (mg/L)			44	44	29.6 – 96.1	58.6
Ammonia as N, total (mg/L)		0.11 to 0.49[4]	43	21	0.05 – **0.23**	NC
Nitrite + Nitrate, total (mg/L)	10(1[5])	4	8	3	0.04 – 0.5	NC
Phosphorus, total (mg/L)		0.05	44	44	0.04 – **3.57**	**0.52**
Potassium (mg/L)			44	44	2 – 7.75	3.19
Sodium (mg/L)			44	44	46.4 - 458	161
Sulfate (mg/L)	250[2]		44	44	123 – **1,120**	**377**
Trace Metals						
Aluminum (ug/L)	50 to 200[2]	750	11	2	30.6 **– 5,940**	NC
Arsenic (ug/L)	10[1]	190	11	11	2.32 – **30.8**	**11.3**
Barium (ug/L)	2,000[1]	1,000	10	10	38.6 – 399	125
Boron (ug/L)			3	3	266 – 471	337
Cadmium (ug/L)	5	250	12	1	**62**	NC
Chromium (ug/L)	100[1]	74	11	2	6.42 – 7.53	NC
Copper (ug/L)	1300[1], 1000[2]	9	11	1	**13.5**	NC
Iron (ug/L)	300[2]	1,000	10	10	29.6 – **3,420**	**435**
Lead (ug/L)	15[1]	2.5	11	1	**4.49**	NC
Manganese (ug/L)	50[2]		11	5	5.3 – **153**	NC
Selenium (ug/L)	50[1]	5	11	4	1.1 – 2.9	NC
Silver (ug/L)	100[2]	1.6	11	0	--	NC
Zinc (ug/L)	5,000[2]	120	11	1	42.3	NC

All samples are dissolved (filtered) unless otherwise noted.
Bold values exceed standards.
NC = Mean not calculated due to undefined non-detect values in database.
[1]Federal Drinking Quality Standards Primary MCL.
[2]Federal Drinking Quality Standards Secondary MCL.
[3]Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code). EPA is in the process of revising the national criteria for aluminum for aquatic life and expects to complete this process in 2007.
[4]Value is dependant on temperature and pH.
[5]Federal Drinking Water Quality Standard is 1 mg/L for Nitrite and 10 mg/L for Nitrate.
Source: EPA 2008

Section 303(d) of the Federal CWA outlines a water protection program that is intended to clean up waters that remain polluted even after the application of technology-based limitations. A State's 303(d) list identifies water bodies where water quality standards are violated by one or more pollutants. The program requires the states to:

- Identify waters that are and will remain in violation of State water quality standards after the application of technology-based controls;
- Prioritize these waters, taking into account the severity of their pollution; and
- Develop Total Maximum Daily Loads (TMDLs) that will allow polluted water bodies to meet water quality standards, accounting for seasonal variations and a margin of safety.

Willow Creek is listed on the Utah 2004 list of 303(d) impaired water bodies for TDS (UDEQ 2004). The majority of the elevated TDS in Willow Creek is due to erosion of the naturally saline geologic formations in the area, including the slightly to moderately saline Uinta Formation. Other potential sources of TDS in the watershed include irrigation return flows, erosion of unpaved road surfaces, and oil and gas activities.

3.2.8.2 Groundwater

The principal aquifers in the RBU Project Area include unconsolidated alluvial deposits along Willow Creek, sandstone layers within the Uinta Formation, and two deeper sandstone zones within the Green River Formation (Hood and Fields 1978; Schlotthauer et al. 1981). The alluvial aquifers are usually unconfined whereas the consolidated aquifers are generally unconfined near outcrops and confined down dip.

Unconsolidated materials present in the valley fill along Willow Creek form the principal aquifer in the RBU Project Area. These deposits range in thickness from about 50 to 70 feet within the stream channels to about 200 feet near the mouths of major canyons. These alluvial aquifers can produce significant quantities of water (up to 1,000 gpm) from the floodplain deposits of the Green and White Rivers but generally produce lower quantities from deposits located along the ephemeral or intermittent streams (Hood and Fields 1978; Schlotthauer et al. 1981). Other small areas of saturated alluvium may exist along the larger unnamed ephemeral streams in the area. Unconsolidated deposits of alluvium and gravel on mesa tops and ridges may also locally contain some groundwater.

The Uinta Formation covers the majority of the RBU Project Area and contains water-bearing zones within confined sandstone layers surrounded by fine-grained siltstones and mudstones. Two zones within the Green River Formation are considered to be regional aquifers. The Birds Nest Aquifer, which may be present beneath the RBU Project Area, lies between the upper part of the Parachute Creek Member and the Mahogany Oil Shale Zone. The Douglas Creek Member of the Green River Formation also produces water to some wells from fine- to medium-grained sandstone beds (Howells et al. 1987). 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.

3.2.8.3 Floodplains

Mapped 100-year floodplains are located along Willow Creek to the north of the RBU Project Area, along the Green River, and the lower reaches of a series of unnamed ephemeral washes in the center of the RBU Project Area, as shown on **Figure 11**. These floodplains are generally

located on benches above the current stream channels that were formed by deposition of sediment carried by runoff from the adjacent ridges and canyon walls during storm and snowmelt events. These floodplains support riparian vegetation in some areas, and are underlain by alluvial groundwater aquifers

Currently, floodplains are protected by Executive Order 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. The most recent data available regarding 100-year floodplains in the RBU Project Area are from a 1977 U.S. Department of Housing and Urban Development and Federal Emergency Management Agency survey, which inventoried public and State lands in Uintah County.

3.2.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Entities of interest for the socioeconomic analysis include Uintah and Duchesne Counties, the Ute Tribe, and the State of Utah. It should be noted that although all project-related development would occur in Uintah County, Uintah and Duchesne Counties share a common boundary and are linked by a transportation network that integrates the labor force and support services that serve the oil and gas industry in the Uinta Basin. As such, the study area for this project was established to encompass the effects of the project on the economy, population, and housing throughout both counties.

3.2.9.1 Uintah and Duchesne Counties

Population and Housing

The Demographic and Economic Analysis (DEA) section of the Governor's Office of Planning and Budget in Utah is responsible for managing, analyzing, and disseminating economic, demographic, and fiscal data. The DEA estimates population levels and characteristics as well as projects long-term economic and demographic trends. The DEA supplies the population and housing data for the 2008 Economic Report to the Governor.

Table 3-13 below summarizes key demographic statistics as provided by the DEA. The current (2008) combined population for Uintah and Duchesne Counties is approximately 49,196 persons. There are an estimated 15,570 housing units in the study area and the employed labor force is 31,404 persons. Based on this information, the ratio of employees to the overall population is one employee for every 1.5 persons.

Table 3-13. Demographic Characteristics of the Study Area, 2008

County	Population	Housing Units	Employment	Individuals per Household
Uintah County	29,621	5,528	20,584	2.92
Duchesne County	16,575	10,042	10,820	2.95
Total	**46,196**	**15,570**	**31,404**	**2.93***

*Weighted average of persons per household in both counties.
Source: GOPB 2008.

Table 3-14 shows the numeric change in demographic characteristics from 2001 to 2007 and the corresponding Average Annual Rate of Change (AARC). As shown, employment over the last 7 years has been increasing much faster than the overall growth in population and housing units.

Table 3-14. Demographic Trends, 2001-2007, Uintah and Duchesne Counties

Demographic Trend	2001	2007	AARC (Percent)
Employment	22,170	29,976	5.2
Population	40,695	44,969	1.7
Housing Units	13,251	15,141	2.2

Source: GOPB 2008.

The DEA also provides demographic forecasts. **Table 3-15** shows that employment growth is estimated to drastically slow within the next 8 years, while population and housing unit growth will remain roughly equivalent to the rate of change from 2001 to 2007.

Table 3-15. Demographic Trends, 2008-2015, Uintah and Duchesne Counties

Demographic Trends	2008	2015	AARC (Percent)
Employment	31,404	32,835	0.6
Population	46,196	54,135	2.3
Housing Units	15,570	18,296	2.3

Source: GOPB 2008.

In terms of racial composition, in 2006, approximately 89 percent of Uintah County's population was White and nine percent was Native American. In terms of ethnicity, four percent were of Hispanic origin (GOPB 2008). The racial composition of Duchesne County was as follows: 93 percent White and five percent Native American. Again, four percent were of Hispanic origin.

Local Economy and Employment

In Uintah and Duchesne counties, the top three employment sectors in 2006 were government; natural resource and mining; and transportation, trade, and utilities. **Table 3-16** provides a breakdown of nonagricultural sources of employment by economic sector.

Table 3-16. Sources of Employment by Sector, 2006

Employment Sector	Uintah County		Duchesne County	
	Jobs	% Total	Jobs	% Total
Natural Resources and Mining	3,251	24.5	981	14.9
Construction	834	6.3	645	9.8
Manufacturing	226	1.7	152	2.3
Trade, Transportation, and Utilities	2,855	21.5	1,444	21.9
Information Services	143	1.1	172	2.6
Financial Activity	532	4.0	170	2.6
Professional and Business	660	5.0	165	2.5
Education and Health	871	6.6	466	7.1
Leisure and Hospitality	941	7.1	654	9.9
Other Services	361	2.7	189	2.9
Government	2,616	19.7	1,749	26.5
Total	**13,290**	**100.0**	**6,587**	**100.0**

Source: GOPB 2008.

Annual data from the Utah Governor's Office of Planning and Budget (GOPB) shows that for 2006 the unemployment rate in Uintah County (2.5 percent) was less than the statewide average of 2.9 percent. In Duchesne County, unemployment was equal to the State average.

In 2006, the per capita income in Uintah County ($28,024) and Duchesne County ($28,457) were lower than the State of Utah average ($29,769), and the national average ($36,629). It should be noted that Utah is unique when comparing personal income and median household income. Although Utah has a very low per capita personal income, the State's median household income is ranked tenth highest in the nation. This is due to the fact that Utah has the largest household size in the nation, and per capita figures are diluted by a larger number of children. As such, median household figures provide a more accurate measure of family income. In 2006, Utah's $55,179 median household income was 115 percent of the national average of $48,201 (GOPB 2008). Although there are no median household income statistics available for Uintah and Duchesne Counties, based on the information presented above, it can be assumed that the median household income is competitive with the national average.

Due to the level of oil and gas development occurring within the Uinta Basin, the average per capita income in Uintah and Duchesne Counties has steadily increased in recent years. Between 2003 and 2006, both counties' per capita incomes increased by approximately ten percent annually (GOPB 2008).

As shown by comparing **Table 3-16** and **Table 3-17**, payroll from natural resources and mining comprises a high percent of the total wages in Uintah and Duchesne Counties relative to the total employment within the sector.

Table 3-17. Non-Agricultural Payroll Wages by Employment Sector, 2006

Employment Sector	Uintah County		Duchesne County	
	Wages (millions)	% of Total	Wages (Millions)	% of Total
Natural Resources and Mining	209.4	40.2	61.9	27.2
Construction	27.0	5.2	22.2	9.8
Manufacturing	5.7	1.1	5.1	2.2
Trade, Transportation, and Utilities	106.3	20.4	48.5	21.3
Information Services	3.6	0.7	5.8	2.5
Financial Activity	25.8	4.9	4.2	1.9
Professional and Business	20.4	3.9	6.1	2.7
Education and Health	20.1	3.9	14.0	6.2
Leisure and Hospitality	9.3	1.8	4.9	2.2
Other Services	10.1	1.9	4.9	2.1
Government	83.2	16.0	49.8	21.9
Total	**520.9**	**100.0**	**227.4**	**100.0**

Source: GOPB 2008.

Local Government Fiscal Conditions and Revenues from Oil and Gas Activities

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

Federal Mineral Lease Royalties

Federal mineral lease royalties are collected from oil and gas extraction operations located on Federally-held minerals. At present, the Federal royalty rate is 12.5 percent of the total production rate. Federal mineral leasing regulations require that 50 percent of royalties collected from mineral lease royalties are returned to the State of origin.

State Mineral Lease Royalties

Similar to Federal mineral royalties, the State of Utah receives mineral lease royalties at a rate of approximately 12.5 percent for all oil and gas development on State lands. Within the RBU Project Area all State lands are managed by the SITLA. The SITLA is an independent agency that manages lands granted to the State of Utah by the United States predominantly for the purpose of supporting public schools and academic institutions. Within the State of Utah, the largest source trust land revenue is oil and gas.

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.

Since July of 1997, the Utah sales and use tax rate has been 4.75 percent. In addition to the State sales tax, all counties, cities, and towns are entitled to impose an additional one percent.

Severance Tax

Severance tax is a tax levied by the State on oil and gas produced, saved, sold or transported from the field where it was produced. These taxes are paid on crude oil, condensate, unprocessed gas, residue gas, and natural gas liquids. Currently, within the State of Utah, severance taxes are collected at a split rate. For example, the first $13.00 per barrel of oil is taxed at three percent; everything over that is taxed at five percent. The first $1.50 per thousand cubic feet (mcf) of gas is taxed at three percent; everything over that is taxed at five percent.

Oil and mining severance tax is one of Utah's eight major miscellaneous tax revenue sources (sales, income, corporate franchise, insurance, beer, cigarette, tobacco, oil and mining severance taxes). In 2007, the State of Utah collected $65,420,873 (Utah State Tax Commission 2007). Severance taxes are paid to the Utah State Tax Commission and deposited into the State's general tax fund. Because taxes are paid directly to the State of Utah, collection information is not available on a per county basis. However, due to the prevalence of oil and gas activity within the Uinta Basin, it can be assumed that the majority of severance tax collected originates in Uintah County.

Conservation Tax

A conservation tax is collected by the Utah State Tax Commission at a rate of two-tenths of one percent (0.002) of the value of oil and gas produced, sold, or transported from any oil and gas field in Utah. Revenue generated from the conservation tax is paid to the Utah State Tax

Commission and deposited into the State's general tax fund. During 2007, the State of Utah collected approximately $4,747,883 from conservation fees (Utah State Tax Commission 2007).

3.2.9.2 Ute Indian Tribe

Demographics of the Ute Indian Tribe

The Uintah and Ouray Indian Reservation, which was established in 1861, is Utah's largest Reservation and is the home of the Northern Ute (e.g., White River, Uintah, and Uncompahgre bands). The population of the Uintah and Ouray Indian Reservation is approximately 19,182; however, only 2,780 residents are American Indian (U.S. Census Bureau 2000a). Approximately 69 percent of those with Tribal membership (4,002 individuals) currently live on the Reservation or on off-Reservation trust land (U.S. Census Bureau 2000b).

Today the Uintah and Ouray Indian Reservation is approximately one-fourth its original size of four-million acres. In a series of land takings by the U.S. Government, the reservation was gradually reduced piece by piece in the early 1900's. Legal disputes over land ownership and water, which have continued over the last century, have resulted in the expansion of the Reservation to its current size. Today the Uintah and Ouray Reservation, which is slightly less than one-million acres, comprises one-fourth of the Uinta Basin, and includes portions of four Utah Counties. Mineral resources are the Tribe's greatest economic asset.

Local Economy and Employment

While revenues from mineral extraction provide substantial revenue for the Tribe, the local economy is sustained by a variety of industries. Major sources of employment include education, health, and social services; public administration; retail trade; and arts, entertainment, recreation, accommodation, and food services. **Table 3-18** provides a breakdown of sources of employment by industry. Approximately one-third of the Tribe's working class is employed by the government. According to the U.S. Census Bureau, in 2000, only 4.1 percent of the Tribe worked in the agriculture, forestry, mining, and fishing and hunting industries (U.S. Census Bureau 2000c).

Table 3-18. Ute Tribe Sources of Employment by Industry

Employment Sector	Number of Jobs	Percent of Total
Agriculture, Forestry, Mining, and Fishing and Hunting	66	4.1
Construction	146	9.2
Manufacturing	154	9.7
Wholesale Trade	47	2.9
Retail Trade	176	11.0
Transportation, Warehousing, and Utilities	88	5.5
Information	44	2.8
Finance, Insurance, Real-estate and Rental and Leasing	55	3.5
Professional, Scientific, Management, and Administrative Services	76	4.8
Education, Health, and Social Services	297	18.6
Arts, Entertainment, Recreation, Accommodation, and Food Services	171	10.7
Other Services	56	3.5

Employment Sector	Number of Jobs	Percent of Total
Public Administration	218	13.7
Total	**1,594**	**100.0**

Source: U.S. Census Bureau 2000c.

According to the 2000 U.S. Census Bureau, the unemployment rate for Tribal members was 15.3 percent, which is substantially higher than the average unemployment rate in Uintah and Duchesne Counties, which were 2.5 and 2.9 percent respectively (U.S Census Bureau 2000c; U.S. Census Bureau 2000e).[6]

In 2000, the per capita income of Tribal members was approximately $12,499, which is equivalent to $16,369 in 2006 dollars. According to the 2000 Census, 1,272 Tribal members (approximately 32 percent) lived below the poverty level (U.S. Census Bureau 2000c). Poverty thresholds in the United States are determined by a combination of factors such as age, income, and family size. The Census Bureau's 2006 weighted average poverty threshold for an individual was $10,294 (U.S. Census Bureau 2006).

In terms of employment, under Ordinance No. 92-07, the Ute Tribe established a Contracting Preference Ordinance. This Ordinance, passed in 1992, requires enterprises doing business within the Reservation to employ, to the greatest extent possible, qualified Tribal members and Tribally-owned subcontractors.

Ute Tribal Fiscal Conditions and Revenues from Oil and Gas Activities

Revenue generated through mineral extraction is an important source of income for Tribal members. Within the Uintah and Ouray Indian Reservation, there exists a complex mix of surface and mineral ownership; however, within the RBU Project Area, mineral ownership generally mirrors surface ownership. In areas where the Tribe has mineral ownership, lease royalties are collected. The mineral lease rate on Tribal minerals is typically between 12.5 and 18 percent of the gross value of the resource being sold. Due to confidentiality reasons, the exact mineral lease rate on Tribal lands is undisclosed.

In addition to collecting mineral lease royalties, the Tribe charges a severance tax on all oil and gas that is produced, transported, or sold. Severance taxes are collected at a rate between four and eight percent of the gross value of the resource being sold.

In areas where surface and mineral ownership are held in split estate, the Tribe collects revenue by entering into surface use agreements. Surface use agreements provide compensation for the disturbance and/or the loss of income (e.g., agricultural land and crop production lost as a result of oil and gas development). Revenue from surface use agreements in the RBU Project Area are negotiated with the Tribe on a case-by-case basis.

3.2.9.3 Split-Estate

Many of the lands within the RBU Project Area contain split-estate ownership. Split-estate ownership means that the individual or entity owning the surface rights does not own the sub-surface mineral rights. Split-estates allow holders of mineral rights to pursue resource extraction

[6] Unemployment rate =100 x (number of unemployed/total civilian labor force).

operations on land where the surface may be owned or managed by other individuals or agencies. In split-estate situations, mineral rights take precedence over surface rights associated with the property.

Of the 4,075 acres of Tribal land within the RBU Project Area, only 520 acres of sub-surface minerals are owned by the Ute Tribe. Of the remainder, 240 acres are owned by State of Utah, and 3,315 acres are Federally-owned. Mineral ownership is considered proprietary data by the Ute Tribe; therefore, only surface ownership is included on figures in this EA.

Of the approximately 12,002 acres of Federal Lands within the RBU Project Area, approximately 11,362 acres of minerals are owned by the Federal government. The remaining 640 acres are owned by the State of Utah.

All minerals under State lands within the RBU Project Area are owned by the State of Utah.

3.2.9.4 Environmental Justice

Environmental Justice is the principle defined by Executive Order 12898 and implemented by agency directives that low-income, minority and Tribal groups should not have to experience a disproportionate share of any negative effects resulting from a plan or project.

The BLM standard for identifying a low-income population is the poverty level used by the U.S. Census Bureau. The standard for identifying minorities is either: (1) the minority of the population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected areas is "meaningfully greater" than the minority population percentage in the general population or other appropriate unit of geographic analysis. For environmental justice compliance, the relevant minority population is the total minority population comprising all persons of a minority race plus persons of Hispanic origin. **Table 3-19** shows the minority and poverty levels in communities within the study area.

Table 3-19. Poverty and Minority Population Characteristics of Selected Communities in the Study Area

Area of Concern	Percent of Total Population in Poverty	Minority Race or Hispanic as a Percent of Total Population	Percent American Indian
Duchesne City	12.4	3.8	0.7
Roosevelt	22.1	11.7	8.1
Duchesne County	**16.8**	**8.8**	**5.4**
Vernal	14.8	6.8	2.3
Uintah County	**14.5**	**12.6**	**9.4**
Fort Duchesne CDP	54.6	90.9	90.2
Randlett CDP	54.5	95.0	93.3
White Rocks CDP	70.9	93.8	93.8
Uintah and Ouray Reservation	**20.2**	**17.5**	**14.5**

CDP = Census Designated Place.
Source: U.S. Census Bureau 2000d

As shown in **Table 3-19**, the communities with a poverty rate of over 50 percent in the study area include Fort Duchesne, Randlett and White Rocks, which are located on the Uintah and Ouray Indian Reservation. The table also shows that these same communities are also minority communities. Communities elsewhere in Duchesne and Uintah Counties would not be considered environmental justice communities.