3.0 - AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents the potentially affected environment (i.e., the physical, biological, social, and economic values and resources) of the BPPA, and provides the baseline for comparison of impacts/consequences described in **Chapter 4**.

The BPPA is located about 40 miles south of Vernal, Utah in the Uinta Basin. The Project Area is characterized by low rolling hills and rock outcrops representative of the high desert plains. The vegetation in the Project Area is typical of the arid to semi-arid Uinta Basin floristic region, where precipitation and soil parent material are controlling factors for plant composition. Vegetation often appears sparse, especially in badland areas. Elevations within the BPPA average approximately 5,850 feet above mean sea level (amsl).

Resources considered in this EA include the environmental elements (listed in **Appendix A**), as well as other resources/issues of concern raised by the BLM and the public. The resources that are analyzed in detail in this chapter include Geology, Air Quality, Paleontology, Cultural Resources, Soils, Water Resources (including Floodplains), Vegetation (including Special Status Species and Invasive and Noxious Weed Species), Wildlife and Fisheries (including Special Status Species), Transportation, Livestock and Grazing, and Recreation. Other environmental elements were considered but dismissed from further analysis because either the alternatives would have no measurable effect on the resource or issue, or because applicant-committed measures, described in **Section 2.5**, would reduce the impacts of the alternatives to negligible levels. Dismissed issues are listed in the Interdisciplinary Team (IDT) Analysis Record Checklist, along with the rationale for dismissal. A copy of the IDT Checklist is included as **Appendix A**.

3.2 GEOLOGY AND MINERALS

3.2.1 GEOLOGIC SETTING

The BPPA is located within the Tavaputs Plateau Topographic District of the Uinta Basin. The Tavaputs Plateau consists of a series of broad, discontinuous plateaus underlain largely by sandstones (Clark 1957). The major topographic features within the Project Area include pediment slopes, sandy washes, low bluffs, cliffs, ledges and ridges.

Rock formations exposed within the Project Area consist of the Eocene Uinta and Green River formations, and Quaternary alluvium. The Uinta Formation is composed of red and multi-colored shale, mudstone, marlstone, siltstone, sandstone, and conglomerate (Rowley et al. 1985; Schlotthauer et al. 1981). The Green River Formation (Evacuation Creek Member) is comprised of gray marlstone, yellow-brown sandstone, and greenish-gray shale and siltstone, and is the largest lacustrine (lake) deposit in the world (Cashion 1973).

Deposits of Quaternary-aged alluvium are present along the major ephemeral washes within the BPPA, along the floodplains of Bitter Creek, and in alluvial fans. These alluvial deposits generally consist of unconsolidated, poorly-sorted sand and gravel, colluvial debris including landslide and pediment deposits, and eolian (wind-deposited) sands.

Strata underlying the southern portion of the Uinta Basin and Project Area have been gently folded at depth in association with the buried ancient Uncompahgre Uplift. This subtle folding of the rocks at depth has served to localize accumulations of natural gas in the rock formations of the area.

3.2.2 MINERAL RESOURCES

3.2.2.1 Petroleum

The Uinta Basin contains petroleum in several types of deposits, including conventional oil and gas, oil shale, bituminous sandstone and limestone (tar sands), and veins of Gilsonite, a black, brittle hydrocarbon resin that resembles tar or asphalt. The known veins of Gilsonite are located to the north and northeast of the BPPA; therefore, Gilsonite is not discussed further in this EA.

Oil and Gas

According to 2008 UDOGM data, there are currently over 7,000 active oil and gas wells in the Uinta Basin. Existing oil and gas fields near the Project Area include the Red Wash, Wonsits Valley, White River, Brennan Bottom, and Coyote Basin oil fields, and the Horseshoe Bend and Chapita Wells gas fields. Development of other large oil and gas fields is currently proposed or underway for other areas to the north, west, and northeast of the Project Area in the Greater Deadman Bench Region, the North Chapita Area, the Little Canyon/Hill Creek Area, the Bonanza and West Bonanza Areas, the Love Unit, the Southam Unit, and the West Tavaputs Plateau, among other areas.

Most of the historic oil and gas production from the Uinta Basin is from the Tertiary Wasatch and Green River formations, and the Cretaceous Mesaverde Group. The reservoir rocks in the Wasatch Formation consist of lake-margin fluvial and alluvial plain sediments deposited by the Eocene Lake Uintah. This formation contains many buried stream channels that trend in a north-northwest direction and significant accumulations of natural gas. The reservoir rocks of the Mesaverde Group are deltaic sandstone deposits. Gas production problems are possible due to the tight and thoroughly cemented sandstone beds that reduce the porosity and permeability of the reservoir rocks (BLM 2003).

Deeper formations that contain oil and gas accumulations within this portion of the Uinta Basin include the Cretaceous Dakota and Cedar Mountain formations and Mancos Shale; and the Jurassic Morrison, Entrada, and Wingate formations (Keighin and Hibpshman 1975; Wind River Resources Corporation 2004).

Tar Sands

Deposits of tar sands are located along the margins of the Uinta Basin (BLM 1984; BLM 2005a). The tar sand deposits contain heavy hydrocarbon residues such as bitumen (a general name for various solid and semi-solid hydrocarbons that are fusible and soluble in carbon bisulfide), tar, and degraded oils that have lost their volatile components. The bitumen fills the pore spaces in coarse sandstones or forms cement in loose, unconsolidated sands (Pruitt 1961). Certain tar sand deposits in the Uinta Basin have been divided into seven Special Tar Sand Areas (STSAs) by Congress pursuant to the Combined Hydrocarbon Leasing Act of 1981. There were four permitted tar sand mining operations in Uintah County as of October 2001 (BLM 2005a). The PR Spring STSA is located in the southern portion of the BPPA. The principal tar sand zones occur in the upper part of the Douglas Creek Member of the Green River Formation, which is present beneath the Project Area. In general, the depth to the tar sand zones range from 50 to 300 feet below surface (BLM 1984).

Oil Shale

Oil shale is a compact, sedimentary rock containing large quantities of organic matter that yields oil when distilled (BLM 2003). Oil occurs as kerogen within marlstones of the Parachute Creek Member of the Green River Formation, which is present beneath the BPPA. The Mahogany Oil Shale Zone is the most notable oil shale unit of the Green River Formation, and most likely to be mined at some point in the future. The Mahogany Zone varies in thickness throughout the Uinta Basin, and generally thickens toward the east (Cashion 1967). The Mahogany Zone outcrops to the south of the Project Area in T13S, R21E to R24E (BLM 1984).

Pursuant to the Combined Hydrocarbon Leasing Act of 1981, Congress designated certain areas within the Uinta Basin known to contain deposits of oil shale as Known Oil Shale Leasing Areas (KOSLA). The KOSLAs have been defined as deposits that contain a minimum oil shale yield of 25 gallons per ton, occupy a minimum Mahogany Zone thickness of 25 feet, and are located a maximum of 3,000 feet below the ground surface. KOSLAs are located in the western portion of the Project Area (BLM 1984).

3.2.2.2 Other Mineral Resources

Other mineral resources present in the southern Uinta Basin include sand and gravel, building stone, and coal. Sand and gravel deposits are located along sandy washes within the BPPA. There is currently no mining of these deposits.

The Uinta Basin produces some stone derived from the Green River Formation that is used as decorative building materials. Suitable stones are found in sandstone beds of the Parachute Creek Member of the Green River Formation, and cover the ground in some areas of the Uinta Basin where it is collected. The Buck Canyon collection area is located within the southwestern portion of the BPPA (BLM 1984).

Coal is present within the Cretaceous Frontier Sandstone and the Mesaverde Group. Coal deposits, if present beneath the Project Area, are located at depths (over 2,000 feet) that would prohibit surface mining. In addition, it has been reported that coal mining in the Uinta Basin has not occurred due to the lack of local demand and poor quality of the deposits (Pruitt 1961; BLM 1984).

3.3 AIR QUALITY AND CLIMATE

3.3.1 CLIMATE

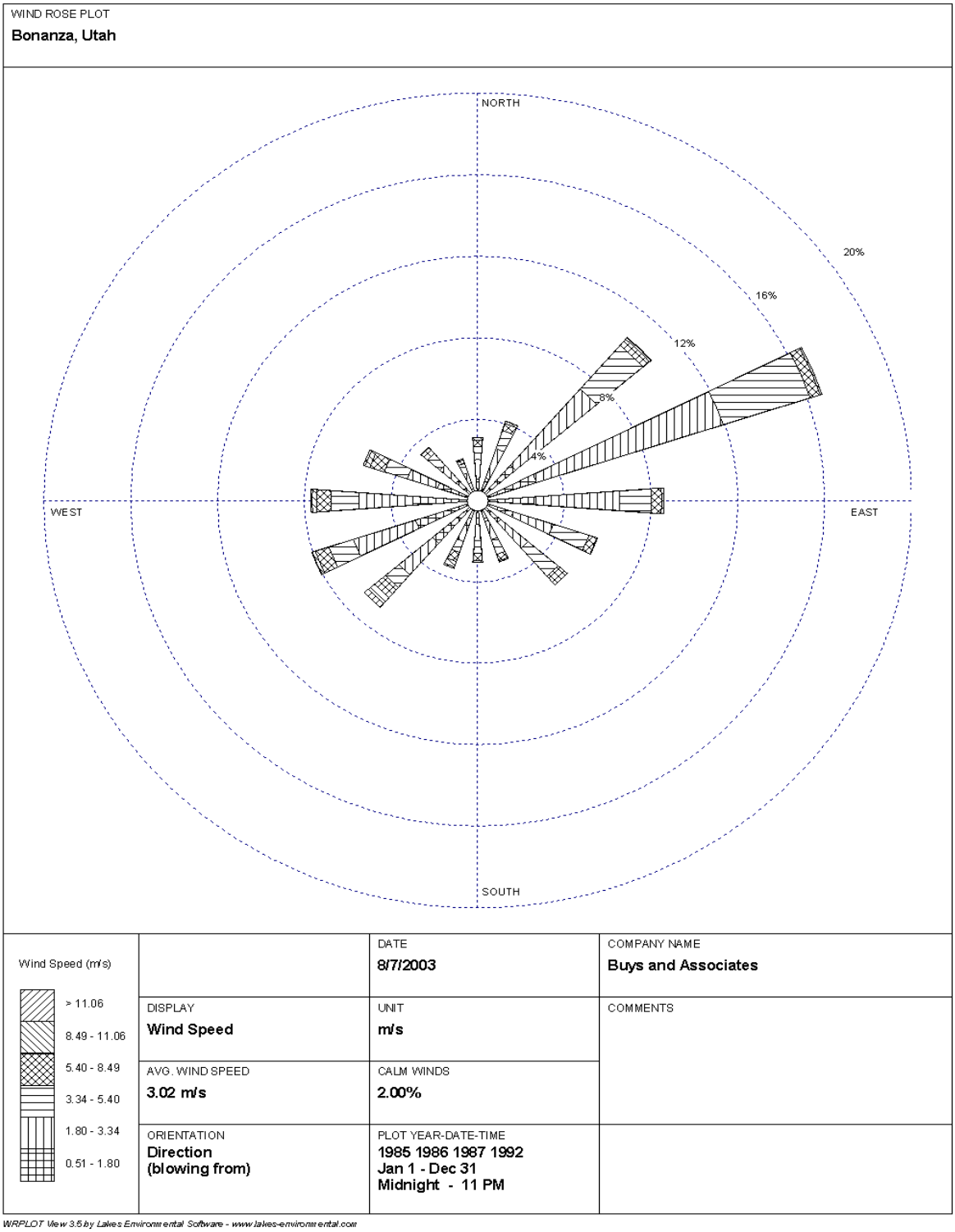
3.3.1.1 Winds and Atmospheric Stability

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

Wind data within the Project Area have not been directly measured. Local terrain effects will influence the wind profiles specific to the BPPA. However, representative wind speed and direction data for the Uinta Basin are available at the Bonanza Deseret Power Plant for the years 1985, 1986, 1987, and 1992 (UDEQ-DAQ 1998). **Figure 3.3-1** presents a wind rose depicting wind speed and direction for all 4 years of data. Note that the data represent the direction from which the wind is blowing (Wind Direction Origin). For example, winds blowing from the north would transport pollutants to the south. As shown, winds originate predominately from the east-northeast 16.7 percent of the time. The average measured wind speed is 3 meters per second.

This page intentionally left blank.

Figure 3.3-1. Windrose for Bonanza, Utah.



This page intentionally left blank.

The degree of stability in the atmosphere is also important to the dispersion of emitted pollutants. During stable conditions, vertical movement in the atmosphere is limited and the dispersion of pollutants is inhibited. Temperature inversions can result in very stable conditions with virtually no vertical air motion, thereby restricting dispersion. Conversely, during convective conditions, upward and downward movement in the atmosphere prevails, and the vertical mixing of pollutants in the atmosphere is enhanced.

The potential for atmospheric dispersion is relatively high for the Project Area due to the frequency of strong winds. However, calm periods and nighttime cooling may enhance air stability, thereby inhibiting air pollutant transport and dilution. The region can experience frequent temperature inversions in winter when cold stable air masses settle into the valleys and snow cover and shorter days inhibit ground-level warming. Temperature inversions are less common during the summer months when daytime ground-level heating rapidly leads to inversion break-up and increased vertical mixing. The higher locations of the BPPA generally will remain warmer at night and are less prone to the temperature inversions common to the valleys and drainages.

Mixing height is defined as the thickness of the air mass above ground within which rising warm air from the surface mixes by convection and turbulence. Local atmospheric conditions, terrain configuration, and source location determine the degree to which pollutants are diluted in this mixed layer. Mixing heights vary diurnally, with local weather systems, and seasonally. For the region, the mean annual morning mixing height is estimated to be approximately 300 meters, and the mean annual afternoon mixing height is approximately 2,400 meters (Holzworth 1972).

3.3.2 AIR QUALITY

3.3.2.1 Existing Sources of Air Pollution

The Uinta Basin has seen substantial recent oil and gas development on Tribal, Federal, and private lands. Fugitive dust is the most prominent air pollutant in the region and in the proposed BPPA, and is intermittent depending on winds and dust-causing activities.

Existing point and area sources of air pollution within the BPPA and surrounding region include the following:

- Exhaust emissions from existing natural gas-fired compressor engines used in production of natural gas;
- Natural gas dehydrator still-vent emissions;
- Gasoline and diesel-fueled vehicle tailpipe emissions;
- Combustion and fugitive dust emissions from coal-fired power plants and coal mining and processing;
- Fugitive dust 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.

3.3.2.2 Regulatory Environment

Criteria Pollutants

National and Utah 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 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 U.S. Environmental Protection Agency (EPA) standards for the protection of human health. The Uinta Basin is designated as an "attainment area", meaning that the concentrations of criteria pollutants in the ambient air are less than the NAAQS. Site-specific air quality monitoring data are not available for the Project Area; however, background criteria pollutant concentrations for the Uinta Basin **(Table 3.3-1)** are relatively low and consistent with a rural area having low levels of industrial development (UDEQ-DAQ 2005).

Under the Prevention of Significant Deterioration (PSD) provisions of the Federal Clean Air Act (CAA), incremental increases of specific pollutant concentrations are limited above a legally defined baseline level. The area surrounding the BPPA is designated as PSD Class II. For Class II areas, incremental increases in ambient pollutant concentrations are allowed as a result of controlled growth. The PSD increments for Class II areas are presented in **Table 3.2-1**

Table 3.3-1. Ambient Criteria Pollutant Concentrations in the Uinta Basin

Pollutant	Averaging Period(s)	Uinta Basin Background Concentration[a] (µg/m^3)	NAAQS (µg/m^3)	PSD Class II Increments (µg/m^3)
SO_2	Annual 24-hour 3-hour	5 10 20	80 365 1,300	20 91 512
NO_2	Annual	5	100	25
PM_{10}	24-hour	28	150	30
$PM_{2.5}$	Annual 24-hour	9 25	15 35	None None
CO CO	8-hour 1-hour	1,111 1,111	10,000 40,000	None None
Ozone	8-hour	105	157	None

[a] Source: (UDEQ-DAQ 2007). Data represent UDAQ estimates for rural areas within the Uinta Basin.

The EPA has primary regulatory authority for implementing various environmental statutes established by Congress. EPA retains the authority for implementing the CAA and the permitting and operational compliance of air emission sources within the Indian Country airshed which encompasses the BPPA.

Hazardous Air Pollutants

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

There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health. However, in order to provide a basis for assessing HAP exposures, reference concentrations (RfC) for chronic inhalation exposure, and Reference Exposure Levels (REL) for acute inhalation exposures are applied as evaluation criteria. **Table 3.3-2** provides the RfCs and RELs. RfCs represent an estimate of the continuous (i.e., annual average) inhalation exposure rate to the human population (including sensitive subgroups such as children and the elderly) without an appreciable risk of harmful effects. The REL is the acute (i.e., 1-hour average) concentration at or below which no adverse health effects are expected. Both the RfC and REL guideline values are for non-cancer effects.

Table 3.3-2. HAP Reference Exposure Levels and Reference Concentrations

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

[a] EPA Air Toxics Database, Table 1 (EPA 2002)
[b] EPA Air Toxics Database, Table 2 (EPA 2002)
[c] Immediately Dangerous to Life or Health (IDLH)/10, EPA Air Toxics Database, Table 2 (EPA 2002) since no available REL

3.4 PALEONTOLOGY

The Potential Fossil Yield Classification System (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 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 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 are Pre-Cambrian 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 deposits, and sediments that exhibit significant physical and chemical changes (i.e., 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 a 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 a 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 Uinta Basin contains the most complete sequence of Upper Eocene deposits known in North America. Exploration of these deposits for vertebrate fossils began over 130 years ago. Collection and study of this vertebrate material has continued since and is still active today. The Uinta Formation has been the focus of most of that attention. The Green River Formation has also received much attention. The Uinta and Green River Formations are ranked as "Class 4a" formations according to the BLM's classification system.

The Project Area is situated in the Wagonhound Member of the Uinta Formation and the Evacuation Creek and Parachute Creek Members of the Green River Formation. The area is dominated by exposures of the formations mentioned above, with lesser areas covered in colluvium, alluvium, eolian sand, and poorly-developed soil.

A file search produced little if any documented fossil localities within the BPPA, largely due to the fact that little paleontological survey work has been performed in this area. However, formational sediments of the units that outcrop inside the BPPA have produced numerous vertebrate, invertebrate, plant, and trace fossils in other areas of the Uinta Basin.

3.5 CULTURAL RESOURCES

A Class 1 data review was conducted to identify the extent of previous cultural resource surveys within the Project Area. Record searches for this project were performed at the Utah State Historic Preservation Office (USHPO), Salt Lake City and the BLM VFO. Records retrieved from the BLM VFO were only acquired to supplement records from USHPO. Records examined included GIS file search results, and hard copy files at USHPO. Results of site locations and survey corridors were plotted onto 7.5 minute U.S. Geological Survey (USGS) maps, and tables were created to summarize findings.

Record searches resulted in the identification of numerous previous cultural resources studies within the BPPA beginning in the 1970s. The majority of these studies were conducted for oil and gas development. This involved well pads, access roads, pipeline corridors, power lines, and seismic line surveys.

A total of 33 sites have been documented in the BPPA. Historic site types include corrals, roads, cairns, trash scatters, temporary camps, mining prospect/claims, ditches, ranches, and graffiti. Prehistoric site types include campsites, lithic scatters, rock art panels, and lithic/ceramic scatter (MOAC 2006).

3.6 SOIL RESOURCES

3.6.1 SOIL-FORMING FACTORS, EROSION POTENTIAL, AND RECLAMATION POTENTIAL

The development of soils is governed by many factors, including climatic conditions (the amount and timing of precipitation, temperature, and wind), the parent material that the soil is derived from, topographic position (slope, elevation, and aspect), geomorphic processes, and vegetation type and cover. For evaluation of potential environmental impacts to soils, the key attributes are erosion potential and ease of reclamation after soil disturbance.

Soil mapping conducted by the National Resource Conservation Service (NRCS) under the U.S. Department of Agriculture (USDA) 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. These data include the slope and hydrologic group for erosion potential, and soil pH, salinity, clay content, and sodium-adsorption ratio for reclamation potential.

3.6.1.1 Erosion Potential

Erosion potential can vary widely among soil units within a given area, and is dependent 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. The estimate of erosion potential is based primarily on the percentage of clay, silt, sand, and organic matter present in the soil. Erosion hazards become substantial issues when protective vegetation is removed during and following activities such as access road and well pad construction. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. Soils with more fines are at greater risk of wind erosion, and soils with more gravel and/or stones have a lower risk of wind erosion.

3.6.1.2 Slope (%)

The erosion potential of a soil is directly related to the slopes on which it is found. Typically, soils found on steeper slopes have a higher erosion hazard than those found on gentler slopes. Soils occurring on slopes greater than 40 percent have poor reclamation potential based upon their high erosion rates.

3.6.1.3 Hydrologic Group

Hydrologic groups are used to estimate precipitation runoff where soils are not protected by vegetation. The groups (labeled A through D) are based on infiltration of water when soils are thoroughly wet. In general, the slower the rate of infiltration, the greater the amount of run-off. Group A soils have high

rates of infiltration when thoroughly wet. These consist mainly of deep, well-drained to excessively-drained soils or gravelly sands. Group B soils have moderate rates of infiltration. These consist chiefly of moderately deep or deep, moderately well drained or well-drained soils that have moderately fine texture to moderately coarse texture. Group C soils have a slow rate of infiltration. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture. Group D soils have a very slow rate of infiltration. These consist chiefly of clays that have high shrink-swell potential, soils that have a high water table, soils that have a claypan, and soils that are shallow over nearly impervious material.

3.6.1.4 Reclamation Potential

Reclamation potential is dependent on the soil structure, pH conditions, and soil salinity. Excessive salinity (salt content), acidity, or alkalinity can inhibit the growth of desirable vegetation.

3.6.1.5 Soil pH

Soil acidity or alkalinity (pH) is important for evaluation of reclamation potential because excessive acidity or alkalinity can inhibit plant growth. Soils with a pH lower than 4.5 or greater than 9.1 have a poor potential for reclamation based upon poor fertility and plant community stabilization.

3.6.1.6 Salinity

Salinity is a measure of the amount of soluble salts in the soil. It is evaluated by measuring the electrical conductivity of a water extract of the soil. The salinity of soils is determined by the quality of water that is applied to it and the frequency of water applications. Evaporation of water containing high concentrations of salts can lead to deposition of salts on the surface of the soil. The salts can be leached downward to depths of about 5 feet and inhibit plant growth, which can in turn negatively affect the ability of the soil to withstand erosion. Soils with salinity greater than 9 millimhos per centimeter (mmhos/cm) have a poor reclamation potential based upon poor fertility and plant community stabilization.

3.6.1.7 Clay Content

The amount and kind of clay present can affect the fertility and physical condition of the soil, including the ability of the soil to absorb cations and retain moisture. Clays influence shrink-swell potential, saturated hydraulic conductivity, plasticity, the ease of soil dispersion, and other soil properties. Soils with clay content greater than 60 percent have a “poor potential for reclamation” based upon poor fertility.

3.6.1.8 Sodium-Adsorption Ratio (SAR)

Excessive sodium content is a special soil concern in portions of the Uinta Basin. Sodium contributes directly to the total salinity of a soil and may be toxic to sensitive crops and inhibit revegetation. The sodium hazard of soils is estimated by the sodium adsorption ratio (SAR), which is the proportion of sodium to calcium plus magnesium in the soil.

Continued use of water having a high SAR leads to a breakdown in the physical structure of the soil. The sodium replaces calcium and magnesium adsorbed on soil clay particles and causes soil dispersion. This dispersion results in the breakdown of soil aggregates and causes the soil to become hard and compact when dry and increasingly impervious to water penetration. SAR values of more than 12 have been recognized to cause poor re-vegetation.

3.6.2 PROJECT AREA SOILS

There are six soil complexes, three soil associations, and seven soil phases within the BPPA. The available information useful for evaluation of erosion and reclamation potential for these soils is summarized in **Appendix B**.

Most of the proposed facilities would be constructed on map units 31, 126, 179, 256, 257, and 266. The Bullpen-Mikim complex (map unit 31) occurs along Sand Wash on slopes of 2-25 percent. The Bullpen soils, which comprise 55 percent of the complex, are alkaline and sodic, with pH reported up to 11 and SAR values up to 25. Reclamation of the Bullpen soils may be difficult because of the high pH and SAR in some areas. The Mikim soils have a relatively high erosion potential (Kw = 0.32 – 0.55).

The Lanver-Walknolls association (map unit 126) covers a large area in the north-central portion of the Project Area on slopes of 2-25 percent, and a large percentage of the proposed facilities would be constructed on this soil association. The Lanver soils are developed on eolian deposits and have reported pH values up to 11 and SAR up to 30. This soil type comprises 50 percent of the map unit. Reclamation of the Lanver soils may be difficult because of the high pH and SAR in some areas. The Walknolls soils occur on slopes of 2-25 percent and are listed in Hydrologic Group D, which are soils with high runoff rates, implying high water erosion potential. However, the overall erosion potential (Kw) is relatively low for this soil type at 0.10 – 0.15. Based on the pH, clay content, SAR, and salinity, reclamation problems are not anticipated for the Walknolls soils.

The Pherson-Hickerson complex (map unit 179) is present along Bitter Creek and its tributaries. The Pherson soils occur on slopes of 2-8 percent and have a low erosion potential of 0.10 – 0.15. SAR has been reported up to 15 for this soil type, therefore, some areas may be slightly difficult to revegetate because of high sodium content. The Hickerson soils occur on slopes of 1-4 percent and have a moderate erosion potential (Kw) of 0.20 – 0.28. SAR has been reported up to 13 for these soils, slightly above the levels considered to be difficult to revegetate.

The Walknolls extremely channery sandy loam (map unit 256) covers areas adjacent to Sand Wash on 4-25 percent slopes. These soils are listed in Hydrologic Group D, which are soils with high runoff rates, implying high water erosion potential. However, the overall erosion potential (Kw) is low at 0.05 – 0.15. Reclamation problems are not anticipated for this soil type.

The Walknolls extremely channery sandy loam-Gilston association (map unit 257) covers large portions of the BPPA on 4-50 percent slopes. The Walknolls soils comprise 50 percent of this association on steeper slopes than for map unit 256, up to 50 percent. Runoff on these steeper slopes would be higher; however, the overall erosion potential (Kw) is still rated low for this unit at 0.05 – 0.15. The Gilston soils are alkaline (pH up to 11), saline (salinity up to 16.0), and sodic (SAR up to 55), which could make these soils difficult to reclaim.

The Walknolls-Uendal association (map unit 266) covers slopes adjacent to Bitter Creek and some ephemeral washes on 2-25 percent slopes. The Walknolls soils comprise 55 percent of this association. The Uendal soils are present on slopes of 4-8 percent and have a moderate erosion potential (Kw) of 0.15 – 0.32. Reclamation problems are not anticipated for the Uendal soils.

3.7 WATER RESOURCES

3.7.1 HYDROLOGIC SETTING

Streams can be classified as ephemeral, intermittent, or perennial. Ephemeral streams are those streams that flow only in direct response to a rainfall or runoff event and often have periods of no flow. The amount and timing of flow in ephemeral streams is dependent on the quantity and timing of precipitation, the watershed size, evaporation and transpiration rates, and the permeability of the surface materials. Intermittent streams receive some groundwater inflows in addition to direct surface runoff and contain flow at least part of the year in some portion of the stream. Perennial streams are streams and rivers that flow all year.

The southern Uinta Basin is drained by two perennial rivers: the Green River and the White River. The Green River originates in Wyoming along the Continental Divide and joins the Colorado River south of the BPPA. The White River originates in the mountains of Colorado, and drains the eastern portion of the Uinta Basin. These rivers receive runoff from several perennial streams and numerous ephemeral washes and intermittent streams. The largest of these streams near the BPPA are Hill Creek, Willow Creek, Bitter Creek, and Evacuation Creek.

Groundwater in the southern Uinta Basin occurs in a complex system of shallow unconfined, perched, and deeper confined aquifers. Water-bearing zones may be present in nearly all geologic formations beneath the Project Area, but the principal aquifers include unconsolidated alluvial deposits, sandstone layers within the Uinta Formation, two sandstone zones within the Green River Formation, and deeper water-bearing zones within the Wasatch Formation and the Mesaverde Group (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. The primary permeability of these aquifers is generally low; however, fractures, bedding planes, and faults produce relatively high secondary permeability (Schlotthauer et al. 1981).

3.7.2 SURFACE WATER

Figure 3.7-1 shows the surface water features in the BPPA. Sand Wash and its ephemeral tributaries drain the western portion of the area. The Sand Wash drainage is bounded on the east by East Bench and is separated from Willow Creek to the southwest by Seep Ridge. Bitter Creek and its ephemeral tributaries drain the eastern portion of the BPPA. This perennial creek is bordered by extensive floodplains and is incised into a canyon approximately 800 feet deep.

Sand Wash and Bitter Creek flow to the north and join the White River, which flows to the west into the Green River at Ouray. With the exception of Bitter Creek, all other streams in the Project Area are ephemeral and only flow in direct response to rainfall events.

3.7.2.1 Stream Classification

The Utah Water Quality Board classifies Utah surface water resources according to quality and degree of protection (UDEQ 2000). All streams and water bodies in Utah are assigned to one of five classes. Within the Project Area, all streams 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.

3.7.2.2 Surface Water Flow

Stream Flow

Four United States Geologic Service (USGS) gauging stations are located in or downgradient from the BPPA. **Table 3.7-1** presents summary flow data for the four stations.

Table 3.7-1. 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
Sand Wash near Ouray, Utah 09306870	0.00 (January, May, June, November, and December) to 0.19 (February)	20 (February 20, 1980)	0.034	October 1974 – September 1981
Sand Wash at Mouth near Ouray, Utah 09306872	0.00 (November and December) to 2.7 (March)	86 (March 29, 1979)	0.417	October 1976 – September 1981
Bitter Creek near Bonanza, Utah 09306800	3.7 (January) to 9.5 (May)	150 (September 5, 1982)	6.06	October 1970 – September 1989
Bitter Creek at Mouth near Bonanza, Utah 09306850	0.55 (December) to 5.3 (June)	139 (September 6, 1982)	1.92	October 1974 – October 1983

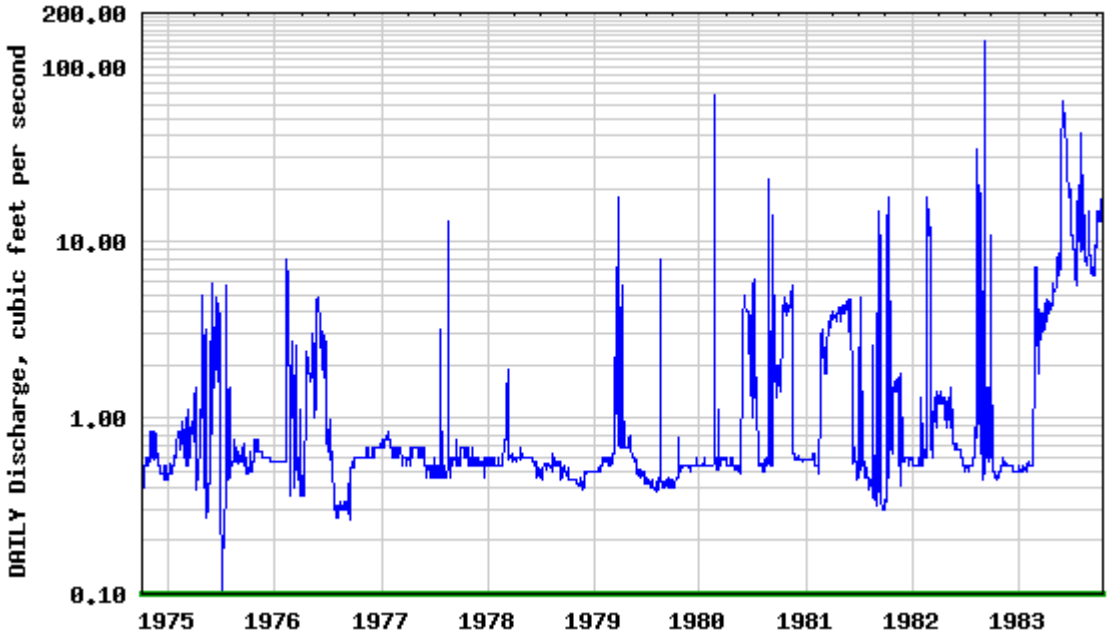
Source: USGS 2008

Flow was measured in Sand Wash from October 1974 to September 1981. Flow is only present following cloudburst storms and during the snowmelt period. For the upstream station on Sand Wash, zero flow was recorded approximately 97 percent of the time during the brief period of record. The peak daily flow of 20 cubic feet per second (cfs) occurred on February 20, 1980. Flow was only present during the months of February – April (from snowmelt) and July – September (from storms) at this station. At the mouth of Sand Wash, zero flow was recorded approximately 95 percent of the time. The peak daily flow over the period of record was 86 cfs on March 29, 1979.

Bitter Creek was monitored for flow from October 1970 to September 1989 at one or both of the gauging stations on this creek. Monthly mean flow at the upstream station ranges from 3.7 - 5.5 cfs during the period July through February, and from 7.9 - 9.5 cfs during March through June. The peak daily flow was 150 cfs on September 5, 1982. Ninety percent of all flows for the period of record were less than 16 cfs, and 50 percent of all flows were less than 2.4 cfs. Zero flow was recorded about 10.8 percent of the time. **Figure 3.7-2** shows the hydrograph for the period of record at Bitter Creek gauging station 09306850. Flows decrease at the lower station on Bitter Creek due to withdrawals for irrigation. The mean monthly flows at this station range from 0.55 cfs in December to 5.3 cfs in June. Ninety percent of all flows for the period of record were less than 4.2 cfs, and 50 percent of all flows were less than 0.6 cfs. There were no zero flows recorded at this station.

This page intentionally left blank.

Figure 3.7-2 Hydrograph for Bitter Creek, USGS Gauging Station 09306850



This page intentionally left blank.

In addition to the USGS gauging stations located on streams that drain the BPPA, the USGS has operated gauging stations on the White River and Green River. The USGS maintains a gauging station (09306500) on the White River just off Highway 45 near Watson, Utah, upstream of the Project Area. The White River is perennial with high flows occurring in spring responding to snow melt in the mountains of Colorado. In summer, high flows occur due to short duration, high intensity thunderstorms. Annual mean discharge at this station has ranged from 289 cfs in 2002 to 1,761 cfs in 1929. During this period, peak daily flows ranged from 500 to 4,600 cfs during the spring runoff and the mean daily flow was 695 cfs.

Two USGS gauging stations are also located on the Green River. These data are useful for characterizing the total annual runoff from the Uinta Basin. Mean monthly stream flows at USGS station 09307000 on the Green River at Ouray range from 1,925 cfs to 17,000 cfs, and peak in June. Mean monthly stream flows further downstream at the town of Green River (USGS station 09315000) range from a low of 2,301 cfs to a high of 18,620 cfs.

3.7.2.3 Surface Water Quality

Water quality refers to biological, chemical, and physical characteristics of a water sample. The sample results may then be compared to a standard defined for protection of drinking water, aquatic organisms, and other water uses. Important indicators of water quality include temperature, specific conductance (a measure of the ability of water to conduct electric current), and pH (a measure of the hydrogen ion activity). A pH less than seven indicates the water is acidic and a pH greater than seven indicates alkaline water. Chemical water quality is determined by the concentration of various chemical constituents in the water, including metals, ionic constituents such as chloride and bicarbonate, and total dissolved solids (TDS). For a more thorough discussion of water quality, see Fetter (1980).

Drinking Water Standards

The EPA has established primary and secondary drinking water standards (EPA 2003a) 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. 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 as general indicators of water quality. The secondary standards are for constituents that cause cosmetic effects (such as skin or tooth discoloration) or aesthetic affects (such as taste, odor, or color) in drinking water. The CWA delegated the administration of these standards to cooperating States and Tribes, so long as the State and Tribal standards were at least as stringent as the Federal standards. In the Project Area, the EPA has primacy.

Salinity and Sodium Hazards

Excessive salinity and sodium content is a special water quality concern in portions of the Uinta Basin. Sodium is part of the total salinity portion of water quality and may be a contributor to crop failure. The sodium hazard of irrigation water is estimated by the SAR, which is the proportion of sodium to calcium plus magnesium in the water.

Waters with SARs in the range 0 to 6 can generally be used on all soils with little problem of a sodium buildup. When SAR's range from 6 to 9, chances for soil permeability problems increase (Hergert and Knudsen 1997). Water with an SAR greater than 9 should not be used for irrigation, even if the total salt content is relatively low. Continued use of water having a high SAR leads to a breakdown in the physical structure of the soil. The sodium replaces calcium and magnesium adsorbed on the soil clays and causes

dispersion of soil particles. This dispersion results in breakdown of soil aggregates and causes the soil to become hard and compact when dry and increasingly impervious to water penetration.

Salinity and sodium hazard classes developed by the U.S. National Salinity Laboratory (1954) are presented in **Tables 3.7-2** and **3.7-3.**

Table 3.7-2. Salinity Hazard Classes

Salinity Hazard Class	Specific conductance (µS/cm at 25° C)	Characteristics
Low	0-250	Low salinity water can be used for irrigation on most soil with minimal likelihood that soil salinity will develop.
Medium	251-750	Medium salinity water can be used for irrigation if a moderate amount of drainage occurs.
High	751 – 2,250	High salinity water is not suitable for use on soil with restricted drainage. Even with adequate drainage, special management for salinity control may be required.
Very High	> 2,250	Very high salinity water is not suitable for irrigation under normal conditions

Source: U.S. National Salinity Laboratory 1954.
µS/cm – micro siemens per centimeter

Table 3.7-3. Sodium Hazard Classes

Sodium Hazard Class	SAR (at SC = 2,250)	Characteristics
Low	0 to 4	Low sodium water can be used for irrigation on most soil with minimal danger of harmful levels of exchangeable sodium.
Medium	4 to 9	Medium sodium water will present an appreciable sodium hazard in fine textured soil having high cation exchange capacity.
High	9 to 14	High sodium water may produce harmful levels of exchangeable sodium in most soils.
Very High	More than 14	Very high sodium water is generally unsatisfactory for irrigation purposes.

Source: U.S. National Salinity Laboratory 1954.

Project Area Surface Water Quality

The following section describes the chemical quality of surface waters in the BPPA, based on data collected by the USGS at the gauging stations located on Sand Wash and Bitter Creek and by the Utah Department of Environmental Quality (UDEQ) at two stations on Bitter Creek. Statistical summaries of water quality analyses for these monitoring locations are provided in **Tables D-1** through **D-6** in **Appendix C.**

Tables D-1 and **D-2** provide summaries of limited water quality sampling conducted at USGS stations 09306870 and 09306872 on Sand Wash. Three samples were collected at the upper station and one sample was collected at the lower station. Water in Sand Wash, when present, can be described as

sodium bicarbonate-sulfate-chloride type waters with low hardness, alkaline pH, and moderate SAR. Aluminum and iron exceeded standards for one sample each.

Tables D-3 and **D-4** provide summaries of water quality analyses for samples collected from USGS station 09306800 and UDEQ STORET station 4933810 on Bitter Creek near Seep Ridge. Water quality samples were collected at the USGS station from December 1971 – July 1988, and from the UDEQ station from May 1995 – May 2001. Waters in Bitter Creek are described as sodium-magnesium-calcium sulfate-bicarbonate type waters with very high to extreme hardness (380 – 4,700 micrograms per liter [mg/L] as $CaCO_3$). TDS is very high and ranged from 1,688 mg/L to 8,960 mg/L, and averaged 7,020 mg/L at the USGS station and 2,220 mg/L at the UDEQ station. The waters are generally alkaline with pH ranging from 7.40 to 8.60 units. Specific conductance ranged from 1,540 to 9,500 micro siemens per centimeter (uS/cm) at the USGS station, and from 996 to 3,194 uS/cm at the UDEQ station. These values are in the high to very high salinity classes and indicate that the waters are generally not suitable for irrigation. The SAR of the waters ranged from 4 to 9 and averaged 6.44. These are considered to be moderate values for SAR. Arsenic, copper, manganese, fluoride, sulfate, and ammonia exceeded standards for one or more samples each.

Tables D-5 and **D-6** provide summaries of water quality analyses for samples collected from USGS station 09306850 and UDEQ STORET station 4933770 on Bitter Creek near the confluence with the White River. Water quality samples were collected at the USGS station from October 1974 – August 1983, and from the UDEQ station in 1979, 1982, and 2001. Similar to waters upstream in Bitter Creek, waters in Bitter Creek near the confluence are also described as sodium-magnesium-calcium sulfate-bicarbonate type waters with very high to extreme hardness (750 – 3,500 mg/L as $CaCO_3$). TDS is very high and ranged from 3,834 mg/L to 15,900 mg/L, and averaged 14,000 mg/L at the USGS station and 6,590 mg/L at the UDEQ station. The waters are generally alkaline with pH ranging from 7.30 to 8.60 units. Specific conductance ranged from 3,450 to 18,900 uS/cm. These values are in the very high salinity class and indicate that the waters are generally not suitable for irrigation. Compared to the upstream stations on Bitter Creek, these waters contain similar amounts of calcium and magnesium, but much higher sodium. Accordingly, the SAR of the waters is higher and ranged from 8 to 33 and averaged 24.4. These are considered to be very high values for SAR. Aluminum, arsenic, manganese, selenium, fluoride, sulfate, ammonia, and nitrate-nitrite exceeded standards for one or more samples each.

Section 303(d) of the 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 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.

There are no streams listed on the State's Section 303(d) list within the Project Area.

3.7.3 GROUNDWATER

Three main aquifers are present in the BPPA. The principal aquifers include unconsolidated alluvial deposits along the major drainages (Sand Wash and Bitter Creek) and two sandstone layers within the Green River Formation (Holmes and Kimball 1987; Hood and Fields 1978; Schlotthauer et al. 1981).

Groundwater may also be present in the Uinta Formation as small, isolated, perched water zones in some areas. Deeper water-bearing zones may also be present in many geologic units beneath the Project Area, including the Navajo Sandstone, the Entrada Formation, the Morrison Formation, and the Mesaverde Group (Freethey and Cordy 1991). These deeper zones are generally too deep to be considered as useable aquifers, but may constitute a large water resource for the future.

The alluvial aquifers are recharged by direct precipitation, infiltration of streamflow, and leakage from consolidated-rock aquifers. Most of these aquifers consist of silt and clay, with minor amounts of sand and gravel. The hydraulic conductivity of these deposits ranges from about one to 25 feet per day. Recharge to the alluvial aquifers in the southern Uinta Basin has been estimated to be about 32,000 acre-feet per year (Holmes and Kimball 1987). Water from these aquifers is discharged by springs, evapotranspiration, wells, and subsurface flow into consolidated aquifers. In many of the streams in the southern Uinta Basin, evapotranspiration consumes most of the water in the stream channel (Price and Miller 1975). The amount of recoverable water in storage in the alluvial aquifers in the southern Uinta Basin is estimated to be about 200,000 acre-feet (Holmes and Kimball 1987).

The Green River Formation is often considered an aquiclude and generally prevents downward movement of groundwater; however, two zones within the formation are considered to be regional aquifers. Well yields from the Green River Formation range from about 0.5 to 220 gallons per minute (gpm) (Feltis 1968). The Bird's Nest Aquifer, which has been identified along Evacuation Creek to the east and therefore may be present beneath the BPPA, lies between the upper part of the Parachute Creek Member and the Mahogany Oil Shale Zone. The aquifer is about 90 to 205 feet thick, with an average thickness of about 115 feet.

The Douglas Creek Aquifer underlies much of the southern Uinta Basin and consists of beds of sandstone and limestone of the Douglas Creek Member (Middle Member) of the Green River Formation and some intertonguing sandstone beds of the Wasatch Formation (Holmes and Kimball 1987; Howells et al. 1987). This aquifer crops out in Desolation Canyon to the west of the Project Area and is generally about 500 feet thick.

Recharge to these aquifers is by precipitation that falls on the East and West Tavaputs plateaus, infiltration from streams that cross the outcrop areas, and leakage from the underlying Wasatch Formation (Hood 1976). In areas where irrigation occurs, irrigation water from canals and sprinkler systems also infiltrates and recharges the shallow groundwater systems.

Groundwater in shallow deposits generally flows toward and discharges into streams and major rivers. Discharge from the consolidated bedrock aquifers is from springs and seeps to the surface, from seepage into streambeds, by upward leakage into the overlying formations, and by downward leakage into underlying formations (Schlotthauer et al. 1981; RDG 2003).

3.7.3.1 Groundwater Quality

There is limited information concerning the quality of groundwater in the BPPA. Groundwater in unconsolidated alluvial aquifers in the southern Uinta Basin generally reflects the overall water quality of nearby streams, rivers, or recharge sources.

According to Hood (1976), the principal ions in groundwater within the Uinta and Green River formations are bicarbonate, carbonate, calcium, magnesium, and sodium. Away from outcrop areas, water quality generally is poorer and becomes much higher in dissolved solids with depth. TDS concentrations in the Uinta Formation are reported to range from 3,260 mg/L to 64,300 mg/L (Schlotthauer et al. 1981).

The Bird's Nest Aquifer generally produces water with TDS between 3,000 and 10,000 mg/L, but some water from the zone is unusable (TDS more than 10,000 mg/L). The TDS of water in the Douglas Creek aquifer is also generally between 3,000 and 10,000 mg/L.

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.

3.7.4 FLOODPLAINS

Identified 100-year floodplains found within the Project Area occur along Sand Wash, Buck Camp, and Bitter Creek and are shown on **Figure 3.7-1**. Under the VFO Approved RMP, no surface disturbance or occupancy is allowed within active floodplains (including Evacuation Creek and the White River). An exception to this management prescription may be authorized if there are no practical alternatives, impacts could be fully mitigated, or the action is designed to enhance the riparian resources (BLM 2008a).

3.8 VEGETATION

3.8.1 GENERAL VEGETATION, INCLUDING INVASIVE AND NOXIOUS WEED SPECIES

The predominant vegetation communities in the BPPA are briefly described below. **Table 3.8-1** quantifies the total acres of the Project Area by vegetation community relative to the corresponding vegetation communities within the VFO planning area as a whole. **Figure 3.8-1** graphically depicts the vegetation communities involved with the BPPA.

Table 3.8-1. Vegetation Communities Involved with the Big Pack Project Area

Vegetation Community	Acres within Project Area	Percent of Project Area
Badlands/Rock Outcrop[1]	1,282	4
Black Sagebrush[2]	5,976	18
Greasewood	1,437	4
Wyoming Sagebrush	10,875	32
Pinyon-Juniper Woodlands	14,729	42
Total	**34,470**	**100**

[1] This type is scattered throughout the Vernal Field Area intermingled in all vegetation community types. It is characterized as having very little vegetation cover.
[2] Includes a small inclusion of desert shrub.
[3] Includes both the black sagebrush and Wyoming sagebrush communities to more accurately correspond to BLM Field Area data.

The vegetation communities, which occur in the Project Area and are discussed in detail below, are described using data obtained from the USDA-NRCS Soil Survey Geographic Database (USDA-NRCS 2007). A discussion of invasive and noxious weed species also follows in detail below.

3.8.1.1 Badlands/Rock Outcrop

Badlands are areas of little or no topsoil accumulations and low vegetation production, such that land management options are very limited. Rock outcrop areas lack topsoil and are generally devoid of vegetation cover. This classification comprises about 4 percent of the Project Area, and is associated with ridgetops and eroded walls of ephemeral drainages north of Sand Wash. Badlands and rock outcrops occur throughout all the vegetation communities of the Project Area, running generally in a north to south

direction. Due to the lack of adequate topsoil development in this community, the opportunity for successful reclamation following disturbance is minimal.

3.8.1.2 Black Sagebrush

This mature community is associated with the shaley, shallow loam soils, and accounts for about 22 percent of the Project Area. It includes a very small area of the desert shrub community (less than 100 acres) in the southwest corner of the BPPA, near the head of Buck Canyon. Black sagebrush (*Artemisia tridentata nova*) may also occur as a dominant understory plant in the pinyon-juniper woodlands. Other dominant community species include: bluebunch wheatgrass (*Elymus spicatus*), western wheatgrass (*Elymus smithii*), junegrass (*Koeleria macrantha*), and at the higher elevations, blue gramma (*Bouteloua gracilis*). Forb species occurring in this community include: phlox (*Phlox* spp.), mustards (*Brassica* spp.), Indian paintbrush (*Castilleja chromosa*), and sego lily (*Calochortus nuttallii*). Many of these forb species also are important forage species for sage-grouse (Edwards et al. 1995). Due to the shallow soils and little topsoil associated with this community, there is low potential for successful reclamation following disturbance.

3.8.1.3 Greasewood

The greasewood (*Sarcobatus vermiculatus)* community is limited to highly saline alluvium and substrate soils associated with the ephemeral drainages and water catchment areas throughout the BPPA. Specifically, this inclusion is associated with about 1,400 acres in lower Bitter Creek and several side drainages located in the north and east portions of the BPPA. A smaller inclusion is associated with the Sand Wash drainage in the southwest quadrant of the BPPA. Greasewood is an important spring browse species for grazing animals, even though potentially poisonous due to oxalate salts of sodium and potassium and oxalic acid (Welsh et al. 1993). Vegetation species in the greasewood stands include saltgrass (*Distichlis spicata*, var., *stricta*), tamarisk (*Tamarix ramosissima*, a County-listed noxious plant species), and perennial pepperweed (*Lepidium latifolium,* a State of Utah-listed noxious plant species). Due to the high salinity associated with soils supporting greasewood, successful reclamation is possible with management-acceptable salt-tolerant plant species and continual follow-up monitoring, and subsequent treatment to control greasewood.

3.8.1.4 Wyoming Big Sagebrush

The Wyoming sagebrush vegetation community accounts for about 32 percent of the Project Area. This community is associated with moderately deep sandy-loam to gravelly-loam soils associated with the Green River and Uinta formations. The largest contiguous area of sagebrush in the BPPA is associated with the southern portion of East Bench. Other Wyoming sagebrush sites include the moderately-deep alluvial soils in higher elevation drainages, including Sand Wash, in the Project Area's south-southwest portion. The majority of this community can be characterized as mature to old age stands of sagebrush. Dominate understory vegetation include a variety of perennial grasses such as Sandburg bluegrass (*Poa secunda*), needle-and-thread grass (*Stipa comata*), Indian ricegrass (*Stipa hymendoides*), western wheatgrass (*Agropyron smithii*), galleta grass (*Hilaria jamesii*), and localized populations of cheatgrass (*Bromus tectorum*). Numerous shrub and forb species are included in this community, including fleabanes (*Erigeron* spp.), milkvetch (*Astragalus* spp.), desert buckwheat (*Eriogonum* spp.), rabbitbrush (*Chrysothamnus* spp.), winterfat (*Ceratoides lanata*), and Mormon tea (*Ephedra* spp.) This community provides habitat for numerous upland and avian wildlife species. Potential for successful reclamation following disturbance is moderate, depending on topsoil depth and texture and total annual precipitation.

3.8.1.5 Pinyon-Juniper Woodlands

This community comprises about 42 percent of the Project Area, generally associated with the shallow, stony hillsides and ridges located throughout the southern two-thirds of the BPPA. Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) occur on almost all slopes and aspects within the community. At lower elevations, pinyon decreases and Utah juniper dominates the overstory. Associated understory species include black sage (*Artemisia tridentata nova*), birchleaf mountain mahogany (*Cercocarpus montanus*), desert buckwheat species (*Eriogonium species*), Mormon tea (*Ephedra species*), and bull grass (*Elymus salina*). This community provides important habitat, including thermal cover, for numerous upland and avian wildlife species. Potential for successful reclamation in this community is low to moderate, depending on depth of topsoil and total annual precipitation.

3.8.1.6 Invasive and Noxious Weed Species

Invasive weed establishment is moderate within the Project Area. The most common weed locations include existing disturbed areas such as well pads, roadsides, pipeline ROWs, adjacent washes, and areas where grazing has removed native species. Roads facilitate biological invasion, where disturbed roadside habitats are invaded by exotic invasive plant and animal species, and weeds are dispersed by wind, water, vehicles, and other human activities.

The most common invasive species in the Project Area are Russian thistle (*Salsola iberica*) and halogeton (*Halogeton glomeratus*). African mustard (*Malcolmia africana*), a newly emerging weed species, may also be present in the Project Area. Salt cedar (*Tamarix ramosissima*), cheatgrass (*Bromus tectorum*), and Russian olive (*Elaeagnus angustifolia*) are Uintah County listed noxious weeds that occur in the Project Area along drainages, ponds, and sites where water collects along roads.

3.8.2 WETLANDS AND RIPARIAN ZONES

Wetlands and riparian zones within the Project Area are too small to be mapped separately by the existing vegetation data created by the NRCS or GAP data. However, there are approximately 4 miles of BLM-mapped wetlands and riparian zones within the BPPA. These wetlands and riparian zones occur in a linear stretch along Bitter Creek in the northeastern portion of the Project Area. Utah BLM policy for riparian resources encourages avoidance of surface disturbance unless: the disturbance can be fully mitigated, there is no other reasonable alternative, or the short-term disturbance would enhance riparian values. Likewise, the VFO Approved RMP prohibits new surface-disturbing activities within active floodplains, wetlands, public water reserves, or 100 meters of riparian areas. An exception to this restriction could be authorized by the AO if there are no practical alternatives, impacts could be fully mitigated, or the action is designed to enhance riparian resources (BLM 2008a).

3.8.3 SPECIAL STATUS PLANT SPECIES

The BLM has a special status plant species list for BLM-administered public lands within the State of Utah, which includes Federally-listed species, those proposed for listing as threatened or endangered, candidate species, and Bureau sensitive plant species. Of the 23 special status plant species that occur on BLM-administered public lands in the Uinta Basin, only the Graham's beardtongue (also known as [aka] Graham's penstemon) (*Penstemon grahamii*) has the potential to occur within the BPPA. 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 BLM VFO planning area and their potential to occur in the BPPA.

3.8.3.1 Graham's Beardtongue

Graham's beardtongue is currently protected as a BLM sensitive species and is endemic to the Uinta Basin in Carbon, Duchesne, and Uintah Counties, Utah, and immediately adjacent to Uintah County in Rio Blanco County, Colorado (Welsh et al. 1993). A member of the figwort family, Graham's beardtongue grows on semi-barren knolls, ridges, and steep slopes in a mix of fragmented white shale and silty clay soils of the Green River Formation, Evacuation Creek and Lower Parachute Members. As the Evacuation Creek Member underlies about 60 percent of the Project Area, potential habitat for the species occurs within the Project Area. BLM data show that approximately 292 acres of habitat for this species occurs in the southern portion of the BPPA

3.9 WILDLIFE AND FISHERIES

The BPPA supports a diversity of wildlife and wildlife habitats. Species' occurrences are typically dependent on habitat availability, relative carrying capacity, and the degree of existing habitat disturbance. The BPPA supports approximately 34,471 acres of wildlife habitat encompassing large, fairly contiguous upland habitats, dissected by incised drainages and canyons. Water resources are limited within the greater BPPA and therefore provide the greatest habitat value for wildlife. For a more detailed description of habitat types in the BPPA, refer to **Section 3.8**. Current land uses within the BPPA include mineral resource extraction, livestock grazing, hunting, and recreational tourism.

3.9.1 GENERAL WILDLIFE

Small mammals potentially found within the BPPA 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*), and various species of rodents and bats, such as the Townsend's big-eared bat (*Corynorhinus townsendii*) and the big free-tailed bat (*Nyctinomops macrotis*). 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*), 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 widespread distributions within the Uinta Basin. Consequently, the relationships of most of these species to the proposed development are not discussed in the same depth as those species that are threatened, endangered, candidate, sensitive, of special economic interest, or are otherwise of high interest or unique value.

3.9.2 BIG GAME

Four big game species are found within the BPPA: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*). The UDWR has identified various types of seasonal ranges (e.g., year-long, fawning, winter) in the BPPA (**Figures 3.9-1** through **3.9-4**). UDWR ranges are ranked according to their relative biological value and are defined in detail below. Under the VFO ROD and Approved RMP, the BLM has committed to managing big game ranges as defined by the UDWR (BLM 2008a).

- *Crucial*: 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*: 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.

3.9.2.1 Pronghorn Antelope

Pronghorn antelope are common in Utah, where they primarily occur in desert, grassland, and sagebrush habitats. Pronghorn are diurnal and are often found in small groups (UDWR-UNHP 2008). Home ranges for pronghorn can vary between 400 and 5,600 acres, according to factors including season, habitat quality, population characteristics, and local livestock occurrence. Typically, daily movements do not exceed 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 much of the BPPA on a year-round basis. Approximately 7,657 acres of UDWR-designated year-long crucial range, which also serves as fawning habitat, exists in the northern portion of the BPPA and an additional 4,245 acres of UDWR-designated substantial year-long habitat is found in the southern portion of the BPPA (**Figure 3.9-1**). Pronghorn that occupy the BPPA are considered to be a part of the Book Cliffs (Herd Unit #10) pronghorn herd unit. 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 contained 152 individuals (approximately 34 percent of the target size) as of the 2005 annual aerial trend county survey (UDWR 2005a).

3.9.2.2 Mule Deer

Mule deer are common State-wide in Utah, where they can be found in many habitat types. Typical habitats include short grass and mixed-grass prairies, sagebrush and other shrublands, coniferous forests, and forested and shrubby riparian areas. Mule deer usually are migratory, spending the warmer months at higher elevations. During this time, mule deer prefer foraging on succulent re-growth of forbs and on new twigs of trees and shrubs. As summer progresses and herbaceous plants mature and dry, their diet shifts toward woody browse. This diet continues as mule deer are driven down to foothill areas during the winter (Wilson and Ruff 1999).

Mule deer are not evenly distributed within the crucial winter range designated by the UDWR. The winter range located between Seep Ridge Road and Atchee Ridge Road, south of the Kings Well Road, supports a large percentage of the wintering deer within this herd unit (Karpowitz 1984). The primary drainages within this deer crucial winter range provide high-quality forage and cover to support the greatest number of deer (Karpowitz 1984). Deer winter ranges that typically exhibit higher use often include pinyon-juniper woodlands intersected by long drainages and open areas containing fourwing saltbush, Wyoming big sagebrush, winterfat, and native grasses. The lower vegetation limit of the deer winter range is described as the lower end of the pinyon-juniper belt (Karpowitz 1984).

Mule deer occupy much of the BPPA during the winter. The UDWR has identified approximately 10,057 acres of crucial winter mule deer range and 16,729 acres of substantial winter mule deer range within the BPPA (**Figure 3.9-2**). Seasonal restrictions in the Vernal ROD and Approved RMP would apply to portions of mule deer habitat in the BPPA. Specifically, no activities that would result in adverse impacts to deer would be allowed in crucial deer winter habitat from December 1 through April 30, and no more

than 10 percent of such habitat would be subject to surface disturbance and remain un-reclaimed at any given time (BLM 2008a). Mule deer that occupy the BPPA are part of the Book Cliffs (Herd Unit #10) mule deer herd unit, which currently falls below the UDWR-population objective for this herd. The target herd size is 15,000 deer; the herd contained 9,700 individuals (approximately 65 percent of the target size) as of 2005 winter population estimates (UDWR 2005b). Although this population estimate shows the herd below management objectives, it should be noted that the herd steadily increased in size from 7,100 individuals in 2002 to 9,700 individuals in 2005 (UDWR 2005b). Based on survey data within crucial winter range, deer tend to concentrate in the area south of East Bench during this period (Hansberg and Olsen 2002).

3.9.2.3 Elk

Elk are common in most mountainous regions of Utah, where they can be found in mountain meadows and forests during the summer and in foothills and valley grasslands during the winter. Like other members of the deer family, this species relies on a combination of browse, grasses, and forbs, depending on their availability throughout the year.

The UDWR has identified the majority of the BPPA (approximately 28,596 acres) as substantial winter elk range. In addition, approximately 93 acres have been identified as UDWR-designated crucial winter elk range in the southwest corner of the BPPA (**Figure 3.9-3**). Seasonal restrictions in the Vernal ROD and Approved RMP would apply to portions of elk habitat in the BPPA. Specifically, no activities that would result in adverse impacts to elk would be allowed in crucial elk winter habitat from December 1 through April 30 (BLM 2008a). Elk that occupy the BPPA are part of the Book Cliffs (Herd Unit #10) elk herd unit, which currently falls below the UDWR-population objective for this herd. The target herd size is 7,500 elk; the herd contained 2,525 individuals (approximately 34 percent of the target size) as of 2005 winter population estimates (UDWR 2005b). The herd steadily declined in size from 3,200 individuals in 2002 to 2,525 individuals in 2005 (UDWR 2005b). Based on survey data within crucial winter range, elk tend to concentrate in the area south of East Bench during this period (Hansberg and Olsen 2002).

3.9.2.4 Rocky Mountain Bighorn Sheep

Rocky Mountain bighorn sheep are native to rugged mountainous areas of western North America. In Utah, a great deal of effort has gone into re-establishing Rocky Mountain bighorn sheep, and the species can now be found in a number of mountain ranges. Rocky Mountain bighorn sheep prefer steep, rocky slopes, and may migrate from higher elevations to lower valleys in the winter. Their diet consists of a wide variety of plants which vary with the season.

The UDWR has identified approximately 4,947 acres of crucial year-long Rocky Mountain bighorn sheep range within the BPPA along Sand Wash and Bitter Creek (**Figure 3.9-4**).

3.9.3 RAPTORS

Some of the more common and visible birds within the BPPA include raptors, or birds of prey. The BPPA provides diverse breeding and foraging habitat for raptors: cool desert shrub communities, rocky outcrops, and riparian zones. **Table 3.9-1** identifies raptor species with the potential to occur in the BPPA, and a description of typical nesting habitats.

Table 3.9-1. Raptor Species with the Potential to Occur in the BPPA		
Common Name	**Scientific Name**	**Nesting Habitats**
American Kestrel	*Falco sparverius*	Tree cavities, cliff crevices
Bald Eagle	*Haliaeetus leucocephalus*	Large trees near rivers, lakes, marshes, or other wetland areas
Burrowing Owl	*Athene cuniculara*	Prairie dog colonies
Cooper's Hawk	*Accipiter cooperii*	Woodland areas and riparian zones
Ferruginous Hawk	*Buteo regalis*	Ground, pinyon-juniper woodlands, balanced pinnacles
Golden Eagle	*Aquila chrysaetos*	Cliff ledges and rock outcrops
Great-horned Owl	*Bubo virginianus*	Cliff ledges or nests of other species
Long-eared Owl	*Asio otus*	Coniferous and deciduous forests, and shrublands
Northern Harrier	*Circus cyaneus*	Ground nester within thick vegetation
Prairie Falcon	*Falco mexicanus*	Cliff ledges
Red-tailed Hawk	*Buteo jamaicensis*	Cliff ledges, rock outcrops, aspen, pinyon-juniper woodlands, etc.
Short-eared Owl	*Asio flammeus*	Ground nester
Swainson's Hawk	*Buteo swainsoni*	Solitary trees or bushes
Turkey Vulture	*Cathartes aura*	Rock outcrops, caves, and tree cavities
Western Screech Owl	*Megascops kennicottii*	Almost exclusively in tree cavities

All raptor species and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (MBTA) (16 USC, 703 et seq.), as amended. However, as bald eagles (*Haliaeetus leucocephalus*), burrowing owls (*Athene cuniculara*), ferruginous hawks (*Buteo regalis*), golden eagles (*Aquila chrysaetos*), and short-eared owls (*Asio flammeus*) are considered to be special status wildlife species, they are discussed in further detail in **Section 3.9.5**.

Results from a raptor nest inventory and review of BLM records indicate that various raptor species occupy the BPPA. In June 2006, Buys & Associates, Inc. conducted a raptor nest inventory that identified two active golden eagle nests within the BPPA (B&A 2006). Further review of BLM records identified two golden eagle nests, five red-tailed hawk nests, and eight unknown raptor nests throughout the BPPA, primarily located along Bitter Creek and various area washes/drainages. Based on numerous factors including habitat types, local resident species, and known raptor phenology, additional breeding raptors may have established or could establish territories/nests within or near the BPPA. Nest sites could occur on rock outcrops, on taller shrubs, or in trees.

3.9.4 MIGRATORY BIRDS

The MBTA, as amended, was implemented for the protection of migratory birds. Unless permitted by regulations, the MBTA makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In

addition, 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 occupy the BPPA. Those migratory bird species that are Federally listed under the ESA of 1973, as amended, are sensitive, or otherwise are of unique value or interest are addressed in **Section 3.9.5**. This section addresses migratory birds that may inhabit the BPPA, including those species classified as Priority Species by Utah Partners in Flight. Priority Species are denoted by an asterisk (*****). Potential migratory bird species are addressed according to habitat types present in the BPPA.

3.9.4.1 Sagebrush Community

Migratory bird species commonly associated with sagebrush/desert shrub habitat include: the black-chinned sparrow (*Spizella atrogularis*), black-throated sparrow (*Amphispiza bilineata*), Brewer's sparrow* (*Spizella breweri*), gray flycatcher (*Empidonax wrightii*), green-tailed towhee (*Pipilo chlorurus*), horned lark (*Eremophila alpestris*), lark bunting (*Calamospiza melanocorys*), lark sparrow (*Chondestes grammacus*), loggerhead shrike (*Lanius ludovicianus*), gray vireo (*Vireo vicinior*), mountain bluebird (*Sialia currucoides*), northern mockingbird (*Mimus polyglottos*), sage sparrow* (*Amphispiza belli*), sage thrasher (*Oreoscoptes montanus*), Say's phoebe (*Sayornis saya*), vesper sparrow (*Pooecetes gramineus*), and western meadowlark (*Sturnella neglecta*) (Parrish et al. 2002).

3.9.4.2 Pinyon-Juniper Woodlands

Migratory bird species commonly associated with juniper and pinyon-juniper habitats include: the ash-throated flycatcher (*Myiarchus cinerascens*), black-chinned hummingbird (*Archilochus alexandri*), black-throated gray warbler* (*Dendroica nigrescens*), blue-gray gnatcatcher (*Polioptila caerulea*), juniper titmouse (*Parus inornatus*), common nighthawk (*Chordeiles minor*), pinyon jay (*Gymnorhinus cyanocephalus*), common poorwill (*Phalaenoptilus nuttallii*), Clark's nuthatch (*Nucifraga columbiana*) gray flycatcher, loggerhead shrike, Scott's oriole (*Icterus parisorum*), Virginia's warbler* (*Vermivora virginiae*), and western bluebird (*Sialia mexicana*) (Parrish et al. 2002).

3.9.4.3 Riparian Habitat

Migratory bird species commonly associated with lowland riparian habitat include: the American goldfinch (*Carduelis tristis*), American robin (*Turdus migratorius*), bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), belted kingfisher (*Ceryle alcyon*), blue-gray gnatcatcher (*Polioptila caerulea*), broad-tailed hummingbird* (*Selasphorus platycercus*), Bullock's oriole (*Icterus bullockii*), Cassin's kingbird, cedar waxwing (*Bombycilla cedrorum*), cliff swallow (*Hirundo pyrrhonota*), common grackle (*Quiscalus quiscula*), common nighthawk, common poorwill, double-crested cormorant (*Phalacrocorax auritus*), gray catbird (*Dumetella carolinensis*), house wren (*Troglodytes aedon*), lark sparrow, Lazuli bunting (*Passerina amoena*), lesser goldfinch (*Carduelis psaltria*), lesser nighthawk (*Chordeiles acutipennis*), Lucy's warbler* (*Vermivora luciae*), MacGillivray's warbler (*Oporornis tolmiei*), north rough-winged swallow (*Stelgidopteryx serripennis*), northern flicker (*Colaptes auratus*), phainopepla (*Phainopepla nitens*), song sparrow (*Melospiza melodia*), spotted sandpiper (*Actitis macularia*), spotted towhee (*Pipilo maculates*), warbling vireo (*Vireo gilvus*), western kingbird (*Tyrannus verticalis*), western wood-pewee (*Contopus sordidulus*), willow flycatcher (*Empidonax traillii*), yellow warbler (*Dendroica petechia*), and yellow-breasted chat (*Icteria virens*) (Parrish et al. 2002).

3.9.5 SPECIAL STATUS WILDLIFE AND FISH SPECIES

This section discusses wildlife and fish 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 (UDWR-UNHP 2007); and
- Species protected under certain specified regulations.

In accordance with Section 7(a)(2) of the ESA, the BLM must ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or adversely modify designated critical habitat. The BLM also has a commitment to ensure that actions requiring its authorization or approval are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under provisions of the ESA or other provisions of this policy (BLM 2008c).

Several special status species have the potential to occur within the BPPA or be affected by development activities within the BPPA. A brief description of each of the special status wildlife and fish species with the potential to occur in the BPPA is presented in the sections that follow. Special status species that do not have the potential to occur in the BPPA are not addressed in this section (refer to **Appendix D**).

3.9.5.1 Special Status Mammal Species

White-tailed Prairie Dog

The white-tailed prairie dog (*Cynomys leucurus*) is a State of Utah wildlife species of concern due to declining population size within the State. In northeastern Utah, the species occurs in areas around Flaming Gorge/Manila, Diamond Mountain, and the Uinta Basin.

White-tailed prairie-dogs inhabit mountain valleys, semidesert grasslands, agricultural areas, and open shrublands in western North America (Fitzgerald et al. 1994; Hall 1981). They are distributed in relatively large, sparsely populated complexes and live in loosely knit family groups or "clans" (Tileston and Lechleitner 1966). Clan boundaries are ill-defined with most activity concentrated around feeding sites.

Review of UDWR data showed that approximately 92 acres of white-tailed prairie dog colonies have been documented within the BPPA. These colonies are located in the southern portion of the BPPA, adjacent to and south of East Bench Road. Other small, sporadic colonies likely exist within the BPPA in open shrubland or grassland areas. Management decisions in the Vernal ROD and Approved RMP specify that the BLM, in cooperation with UDWR, will maintain and enhance white-tailed prairie dog and other foraging habitat to provide primary food sources for the ferruginous hawk (BLM 2008a).

Spotted Bat

The spotted bat (*Euderma maculatum*) is a State of Utah wildlife species of concern. This species is broadly distributed throughout eastern and southern Utah. Within Utah, the majority of records are from deep, narrow, rocky canyons, particularly those bound by precipitous cliff faces. Crevices in cliff walls

are the primary roosting sites. Individuals forage over open sagebrush steppe, desert scrub, or montane meadow habitat, sometimes considerable distances from roosting habitat. Based on echolocation calls, foraging spotted bats tend to be sparsely dispersed, but population sizes and trends are not known (Bosworth 2003). As potential cliff roosting and foraging habitat exists throughout the BPPA, the spotted bat has the potential to utilize the BPPA.

3.9.5.2 Special Status Bird Species

Bald Eagle

Under the authority of the ESA, the USFWS delisted the bald eagle (*Haliaeetus leucocephalus*) in the lower 48 States from the Federal list of endangered and threatened species, effective August 8, 2007 (72 FR 37346). However, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the MBTA. The bald eagle is also classified by the State of Utah as a wildlife species of concern. In addition, the USFWS, in cooperation with the States and 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 (USFWS 2007). 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 2007).

The USFWS attributes the recovery of the bald eagle in part to the reduction in levels of persistent organochlorine pesticides (such as DDT) occurring in the environment and habitat protection and management. Based on a reduction in threats to the bald eagle, the population in the lower 48 States has increased from approximately 487 breeding pairs in 1963, to an estimated 9,789 breeding pairs in 2007 (72 FR 37346). Although bald eagles have shown recovery across their range, the number of nesting pairs in Utah is low. No bald eagle nests have been documented within the BPPA.

Bald eagle wintering habitat is typically associated with food source concentrations. These areas include major rivers that remain unfrozen whereby fish and waterfowl are available, and near ungulate winter ranges that provide carrion. Mid-winter bald eagle surveys are conducted annually throughout the State of Utah. The BLM VFO has aerially surveyed the Green River corridor from the Colorado State line down to the Sand Wash boat ramp as part of their mid-winter bald eagle count for 20 years. Bald eagles are often seen along the Green River, usually from early November through late March. The closest bald eagle roosting site to the BPPA is located approximately 20 miles west of the BPPA. Although no roosting sites exist within the BPPA, potential bald eagle foraging habitat is present within the BPPA and north of the BPPA along the White River. Although unlikely based upon distance, bald eagles could forage in the BPPA for small mammals and carrion.

Golden Eagle

The golden eagle (*Aquila chrysaetos*) is protected under the Bald and Golden Eagle Protection Act, based upon the similarity of the juvenile bald eagle's physical appearance to that of the adult golden eagle. Throughout the summer, golden eagles are found in mountainous areas, canyons, shrubland and grassland. During the winter, they inhabit shrubsteppe vegetation, as well as wetlands, river systems and estuaries.

In June 2006, Buy & Associates, Inc. identified two active golden eagle nests within the BPPA. One nest contained three juveniles approximately 5-weeks old, while the other contained two juveniles approximately 3-9 weeks old (B&A 2006). Given the habitat type and local resident species, additional breeding golden eagles may have established or could establish territories/nests within or near the BPPA. Nest sites could potentially occur on cliff ledges and rock outcrops.

Ferruginous Hawk

The ferruginous hawk (*Bueto regalis*) is a State of Utah wildlife species of concern. Throughout their range, ferruginous hawks have been found nesting on a wide variety of substrates (Evans 1982). Within Utah, ferruginous hawks nest on junipers, pinyon pines, cottonwoods, on the ground, low hills and knolls, low cliffs, and artificial structures (Smith and Murphy 1978). Generally, this species nests where visibility is extensive and this, in part, may contribute to the species' relatively high sensitivity to human disturbance (Suter and Joness 1981).

Ferruginous hawk stick nests are typically located on rock outcrops, promontory points, and low cliffs elevated from the surrounding terrain, as well as in isolated junipers. Although no ferruginous hawk nests have been documented within the BPPA, potential foraging and nesting habitat are found throughout the BPPA. Thus, the ferruginous hawk could occur in portions of the BPPA where suitable pinyon-juniper woodlands or rock outcrops are present.

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is an important upland game bird found in the Uinta Basin. In Utah, the greater sage-grouse is identified by the State of Utah as a wildlife species of concern. The BLM has a commitment to manage for the preservation and enhancement of sage-grouse habitat (BLM 2005b).

As its name implies, the species is restricted to abundant sagebrush habitats and is considered a sagebrush obligate (Braun et al. 1976). Sagebrush habitats across the range of sage-grouse may vary considerably, and the specific components used by the species can vary due to biotic and abiotic factors. Large, woody pieces of sagebrush including big sagebrush, silver sagebrush, and threetip sagebrush (*A. tripartite*) are used by sage-grouse throughout the year in all seasonal habitats. Other species of sagebrush, such as low sagebrush (*A. arbuscula*) and black sagebrush (*A. nova*), provide important seasonal habitat components during the spring and winter months. During the winter, sagebrush accounts for 100 percent of the diet for this species; however, during the spring and summer, other foraging habitats used by sage-grouse may include riparian, upland meadows, and sagebrush grasslands (CDOW 2007). Females and their chicks remain dependent on herbaceous plants (e.g., alfalfa, clover) and insects into the early fall (CDOW 2007). Sage-grouse have also been documented using a variety of human-modified habitats, such as irrigated and non-irrigated croplands and pasturelands. Disturbed areas such as roads, plowed fields, gravel pits, and stock ponds have been used as lek sites. The value of these modified habitats to sage-grouse depends on the usefulness of the habitat and the juxtaposition of the modified habitat in relationship to adjacent sagebrush habitats (Connelly et al. 2004). Sagebrush-dominated shrublands, including Wyoming big sagebrush and black sagebrush stands, occur throughout the BPPA. The UDWR has identified various sage-grouse habitats and documented lek sites within these sagebrush stands. Reported use by sage-grouse are discussed in further detail below.

Leks are traditional courtship display and mating areas attended by sage-grouse in or adjacent to sagebrush dominated nesting habitats. Leks are often situated in relatively open areas with less herbaceous cover and shrub cover than surrounding areas. Leks may be natural openings within sagebrush communities or openings created by human disturbances, including dry stream channels, edges of stock ponds, ridges, grassy meadows, burned areas, gravel pits, sheep bedding grounds, plowed fields, and roads (Connelly et al. 2004).

Three leks (East Bench, East Bench Northeast [NE], and East Bench 16) have been identified in the northern portion of the BPPA, and a fourth lek (Sand Wash Rim) has also been identified approximately 0.6-mile northwest of the BPPA. Sage-grouse were last observed occupying the East Bench lek, the

oldest lek in the BPPA, in 2004. The UDWR believes that sage-grouse moved from East Bench to East Bench NE, which they occupied for about 3 years before also disappearing from that lek. Although unoccupied in recent years, East Bench and East Bench NE cannot be classified as inactive until 10 years have passed. The third active lek in the BPPA, East Bench 16, contains dense Wyoming sagebrush and poor soil content. UDWR records show no males attended East Bench 16 in 2008, 5 males attended in 2007, and 10 males (a maximum for this lek) attended in 2005 (UDWR 2008). Sand Wash Rim, located northwest of the BPPA, is considered the most active lek in the area, albeit outside of the BPPA. UDWR records show 8 males attended Sand Wash Rim lek in 2008, 17 males attended in 2007, and 19 males attended in 2006 (UDWR 2008). These declines in lek attendance are not unique, as similar declines have been observed by the UDWR across the State. Seasonal and spatial restrictions in the Vernal ROD and Approved RMP could apply to sage-grouse leks in and near the BPPA. Specifically, no surface-disturbing activities within 0.25 miles of active sage-grouse leks would be allowed year-round; no permanent facilities or structures would be allowed within 2 miles when possible; no surface-disturbing activities within 2 miles of sage-grouse leks would be allowed from March 1 through June 15; and within 0.5 miles of known active leks, the best available technology would be used to reduce noise (e.g., installation of multi-cylinder pumps, hospital sound-reducing mufflers, and placement of exhaust systems) (BLM 2008a)

Currently, the greatest threat to sage-grouse in the BPPA is predation by coyotes and ravens. Lek initiation in the East Bench 16 population has typically been earlier than other sage-grouse populations in the Uinta Basin, usually around mid-February (UDWR 2008). In 2007, following strutting, radio-collared sage-grouse (hens and males) stayed on East Bench until the eggs hatched and early brood-rearing was completed. Most males were then tracked moving from East Bench, to Agency Draw, to summer grounds along Willow Creek; however, some males summered in Agency Draw. Hens were also tracked moving from East Bench to summer grounds along Willow Creek. After the summer, reverse movements were respectively made by hens and males back to winter habitat on East Bench (UDWR 2008).

Sage-grouse nesting habitat is often a broad area within or adjacent to winter range or between summer and winter range. Productive nesting habitat includes sagebrush with horizontal and vertical structural diversity. The understory of productive nesting habitat typically includes native grasses and forbs that provide a food source of insects, concealment of the nest and hen, and herbaceous forage for pre-laying and nesting hens (Connelly et al. 2004). Most hens typically nest within 2 miles (or 3.2 kilometers) of a lek (Braun et al. 1977). In 2007, the UDWR tracked a radio-collared hen nesting with 0.5 mile of the Sand Wash Rim lek (UDWR 2008). In 2008, the UDWR tracked one radio-collared hen nesting in the same location as the previous year, while another hen moved about 20 miles out to Tribal grounds (UDWR 2008).

Early brood-rearing habitat generally occurs relatively close to nest sites, but movements of individual broods may be highly variable. Early brood-rearing habitats may be relatively open stands of sagebrush when compared to optimum nesting habitat. High plant species richness with abundant forbs and insects characterize brood areas. Insects, especially ants and beetles, are an important food component of early brood-rearing mesic sites. Sage-grouse broods occupy a variety of habitats during the summer including sagebrush, relatively small burned areas within sagebrush, wet meadows, farmland, and other irrigated areas adjacent to sagebrush habitats (Connelly et al. 2004). Brooding habitats exists throughout the entire BPPA (approximately 34,471 acres) within sagebrush communities (i.e., Wyoming big sagebrush and black sagebrush). Further, UDWR data also indicate that sage-grouse winter habitat overlaps with a portion of this brooding habitat. Specifically, approximately 8,936 acres in the northwest corner (top of East Bench) of the BPPA are considered sage-grouse winter habitat.

Short-eared Owl

The short-eared owl (*Asio flammeus*) is classified by the State of Utah as a wildlife species of concern. Habitat loss is the primary factor associated with short-eared owl population decline. In northern and central Utah, this owl species typically occurs in open desert and semi-desert habitats, particularly near wetland vegetation. Limited habitat for the short-eared owl exists within the BPPA, in association with intermittent drainages containing greasewood and sagebrush, which are suitable for nesting habitat. Although, no short-eared owl nests have been documented in the BPPA, given the availably of potential habitat in area drainages, short-eared owls could occur there. Management decisions in the Vernal ROD and Approved RMP specify that the BLM, in cooperation with UDWR, will maintain short-eared owl nesting habitat and maintain/enhance prey-base habitat (BLM 2008a).

Burrowing Owl

The burrowing owl (*Athene cunicularia*) is classified by the State of Utah as a 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 1988). The species is associated with dry, open habitat that has short vegetation and contains an abundance of burrows (Thomsen 1971; Wedgwood 1978; Haug and Oliphant 1990). In Utah, prairie dog burrows are the most common of burrowing owl nest sites, with active prairie dog towns being the primary habitat for the owls (Butts 1973). As the range and abundance of these burrowing mammals have decreased, so too has the abundance of burrowing owls. No burrowing owl nests have been documented within the BPPA; however, burrowing owls have the potential to occur there if prairie dog colonies are present. Management decisions in the Vernal ROD and Approved RMP specify that the BLM, in cooperation with UDWR, will maintain burrowing owl nesting habitat and maintain/enhance prey-base habitat (BLM 2008a).

Sage Sparrow (Amphispiza belli)

The sage sparrow is a Utah PIF Priority Species. The sage sparrow is a small, opportunistic feeder that occurs locally throughout Utah during the spring and summer months (UDWR-UNHP 2008). The sage sparrow is an obligate shrubsteppe species, which nests primarily in taller shrubs, but also in grasses and occasionally on the ground under shrubs (Parrish et al. 2002). Given abundant sagebrush habitat within the BPPA, the sage sparrow has potential to occur throughout the BPPA within sagebrush communities (i.e., Wyoming big sagebrush and black sagebrush).

3.9.5.3 Special Status Fish Species

Endangered Colorado River Fish

The USFWS has identified four Federally-endangered fish species, historically associated with the Upper Colorado River Basin: humpback chub (*Gila cypha*), bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), and razorback sucker (*Xyrauchen texanus*). Critical habitat has been designated for the Colorado pikeminnow and razorback sucker in portions of the White River and its respective 100-year floodplain (59 CFR 13374). The BPPA is located approximately 5 miles upstream from critical habitat for the Colorado pikeminnow in the White River. Further downstream from the BPPA, critical habitats have been designated for the razorback sucker, humpback chub, and bonytail in the Green River (59 CFR 13374; USFWS 2008).

Bitter Creek, a perennial stream, its associated 100-year floodplain, and several ephemeral drainages, including Sand Wash and Buck Camp, are present within the BPPA. While these streams and drainages do not support populations of the above-listed species, USFWS-designated critical habitat for the

endangered Colorado River fish occurs downstream of the BPPA in the White and Green Rivers. A brief discussion of each species follows below.

Colorado Pikeminnow

The Colorado pikeminnow (*Ptychocheilus lucius*) is Federally-listed endangered species found in the Upper Colorado River Basin. The habitat of this species is characterized by swift flowing muddy rivers with quiet, warm backwaters. The species spawns during the spring and summer over riffle areas with gravel or cobble substrate (Sigler and Sigler 1996).

Colorado pikeminnow were historically found in the mainstream Colorado River and its tributaries from Wyoming to the Gulf of California. Currently, wild populations of pikeminnow persist only in the upper Colorado River Basin, including the Green River. The highest densities of the Colorado pikeminnow occur in the White River.

Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) is a Federally-listed endangered species found in the Upper Colorado River Basin. Razorbacks are found in deep, clear to turbid waters of large rivers and some reservoirs over mud, sand or gravel.

Historically, the razorback sucker inhabited the Colorado River and its tributaries from Wyoming to the Gulf of California. The current distribution of razorback suckers in the Upper Colorado River Basin is confined to small groups of fish in several widely distributed locations. Most of these fish occur in the lower Yampa River and the Green River from the mouth of the Yampa River downstream to its confluence with the Duchesne River. Small populations may also occur in the lower Green River, the Colorado River at Grand Valley, and in the San Juan River upstream from Lake Powell.

Humpback Chub

The humpback chub (*Gila cypha*) is a Federally-listed endangered species found in the Upper Colorado River Basin. The humpback prefers deep, fast-moving, turbid waters often associated with large boulders and steep cliffs. Spawning occurs between April and July during high flows from snowmelt (Sigler and Sigler 1996).

Historically, the humpback chub inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White, and Little Colorado Rivers. Today, populations currently exist near the Colorado/Utah border in Westwater Canyon in Utah and at Black Rocks, in Colorado. Smaller numbers have been found in the Yampa and Green Rivers in Dinosaur National Monument, Desolation and Gray Canyons on the Green River in Utah, Cataract Canyon on the Colorado River in Utah, and the Colorado River in Arizona.

Bonytail

The bonytail (*Gila elegans*) is a Federally-listed endangered species found in the Upper Colorado River Basin. This fish typically inhabits large, fast-flowing waterways of the Colorado River system. However, its distribution and habitat status is largely unknown. The fish spawn in the spring and summer over gravel substrate. Although reproduction in the wild is rare, bonytail are raised in fish hatcheries, with the juveniles released into the wild when they are large enough to survive in the altered Colorado River system environment (Sigler and Sigler 1996).

Bonytail once were common in portions of the Upper and Lower Colorado River Basins. The bonytail is now the rarest of the endangered fish species in the Colorado River basin. Upstream of Lake Powell, this fish is nearly extinct, and in the last decade only a handful have been captured on the Yampa River in Dinosaur National Monument, on the Green River at Desolation and Gray Canyons, and on the Colorado River at the Colorado/Utah border.

Sensitive Colorado River Fish

Three additional fish species that are endemic to the Colorado River Basin have also been affected by flow alterations, habitat loss or alteration, and the introduction of non-native fish: roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*). These species are classified by the State of Utah as conservation agreement species due to their declining populations within the State.

Bitter Creek, a perennial stream, its associated 100-year floodplain, and several ephemeral drainages including Sand Wash and Buck Camp are present within the BPPA. While these streams and drainages do not support populations of the above-listed species, habitat for the sensitive Colorado River fish species occurs downstream of the BPPA in the White and Green Rivers.

3.9.5.4 Special Status Reptile Species

Utah Milk Snake

The Utah milk snake (*Lampropeltis triangulum*) is designated by the BLM as a sensitive species. Its habitat ranges from high plateaus to the southern part of the Wasatch Mountains and east through the Uinta Mountains and the Uinta Basin. Habitats include open forests, mountain shrub assemblages, and sagebrush-dominated habitats, often where the understory vegetation contains a well-developed grass component. No studies have produced population size estimates, nor have changes in distribution or abundance been documented. Habitat suitability may also be affected by livestock grazing and other land use activities that result in the alteration of habitat structure, particularly the removal or reduction of understory vegetation (Bosworth 2003). As habitat for the Utah milk snake exists throughout the BPPA, the species may be present in the BPPA in shrubland-dominated areas and open woodland habitats.

3.10 TRANSPORTATION

From the town of Vernal, the BPPA would be accessed by traveling south on Highway 88 toward the town of Ouray. Near the confluence of the Green and White Rivers, Highway 88 turns into Seep Ridge Road. Seep Ridge Road (2810) provides access to the southwest corner of the BPPA. From Seep Ridge Road, the East Bench Road (4130) would be the primary access route within the BPPA.

As an alternative access route to the BPPA, vehicles may travel Highway 45 southeast to the Glen Bench Road (3260). From Glen Bench Road, Bitter Creek Road (4120) would provide vehicle access to the northeast corner of the BPPA.

Use of State highways is monitored by the Utah Department of Transportation (UDOT 2004). The latest traffic volume data are from 2004. County roads within the Project Area are monitored by the Uintah County Roads Department. The most recent data available are from 2005. All traffic data are expressed as average daily traffic (ADT). The ADT on the roads providing access to the Project Area are listed in **Table 5.10-1** below.

Table 5.10-1. Average Daily Traffic to the Project Area	
Road Name and Location	**AADT**
State Highway 45 (South Bound to Power Plant)	1,195
Highway 88 (Southbound at Myton)	1,180
Glen Bench Road (South Bound from Highway 45)	1,198
Seep Ridge Road (South Bound @ Cattle Guard)	569

Source: UDOT. 2004. Traffic on Utah Highways.
Uintah County Roads Department. 2005.

In addition to Seep Ridge, East Bench, Glen Bench, and Bitter Creek roads, Buck Camp Canyon, Bates Knolls, Hells Edge, East Sand Wash, and Izentrouble Wash would also provide access within the BPPA.

The existing transportation system within the BPPA consists of approximately 72 miles of unpaved road that service existing oil and gas operations, grazing allotments, and provide access to dispersed recreational uses.

Additional information regarding transportation within the Big Pack Project Area can be found in **Appendix F, Transportation Plan.**

3.11 LIVESTOCK AND GRAZING

The BPPA contains portions of three BLM rangeland allotments: Olsen AMP, Sand Wash, and Sunday School Canyon. The Olsen AMP is grazed by sheep. Sand Wash and Sunday School Canyon allotments are grazed by cattle.

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 2008a). Approximately 14.5 acres are required to support one AUM in the Olsen AMP allotment, 16.4 acres are required in the Sand Wash allotment, and 14.1 acres are required in the Sunday School Canyon allotment.

On the three allotments within the boundaries of the BPPA, there are approximately 21,380 total acres of land with slopes less than 40 percent that are allotted for grazing by the BLM. **Table 3.11-1** lists total allotment information, as well as actual usable acreage within the Project Area boundary. There are a total of 1,901 usable AUMs within the BPPA.

Table 3.11-1. Grazing Allotments in the Big Pack Project Area						
Name	**Type**	**Grazing Period**	**Total Allotment Acreage**	**Total Allotment Aums**	**Usable* Acreage In Project Area**	**Usable* Aums In Project Area**
Olsen Amp	Sheep	11/1-6/15	134,306	9,268	20,159	1,391
Sand Wash	Cattle	11/30-4/30	74,424	4,526	11	1
Sunday School Canyon	Cattle	11/1-4/30	51,597	3,667	1,210	86
TOTAL			**260,327**	**17,461**	**21,380**	**1,478**

* Usable acreage on slopes less than or equal to 40 percent slope, and on BLM lands only.

3.12 RECREATION

The BPPA is located primarily on public lands administered by the BLM. Private and State lands are also scattered throughout the area. Within the Project Area, visitors are provided with extensive open areas where they can participate in dispersed activities in an unrestricted setting. Portions of the BPPA, primarily east of the Bates Knolls Road, provide visitors with opportunities for primitive and unconfined recreation. The existing landscape in this area could appropriately be characterized as remote, and as an area where human intrusions are substantially unnoticed. Within the majority of the project area, the network of roads, along with existing oil and gas facilities and associated development in the area, reduce the primitive character of the area for visitors seeking solitude and relatively pristine landscapes. Accordingly, recreational use of the area consists primarily of hunting and limited off-highway vehicle (OHV) use where permitted. In addition to dispersed recreational use, the Second Nature Wilderness Program uses the area for some of their activities annually during the November to May timeframe.

Primary access to the BPPA is via East Bench Road which bisects the Project Area from north to south. A considerable network of unpaved roads also traverses the area, providing ample access for recreational users.

Big game hunting takes place in the fall and winter. The area is a Limited Entry hunting area for elk and deer. Limited hunting of small game also occurs. In the spring, antler collection is a popular activity by recreationists on foot, horseback, and ATV.

The entire Project Area is designated as “limited” to OHV use to protect resource values including important wildlife habitat. Areas designated as “limited” restrict OHV use to designated trails and travel routes or during certain seasons (BLM 2008a).

Overall, the Project Area receives relatively modest recreational use relative to other prominent recreation areas in the region such as Dinosaur National Monument, the Flaming Gorge National Recreation Area, and Fantasy Canyon.

This page intentionally left blank.