

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Chapter 3 discusses the affected environment (i.e., the physical, biological, social, and economic values and resources) within the Tumbleweed II Project Area. This chapter provides a baseline for comparison of the potential impacts/consequences of the alternatives.

3.2 RESOURCES/ISSUES CARRIED FORWARD FOR ANALYSIS

Those resources or issues that occur within the Tumbleweed II Project Area and/or could potentially be affected by the alternatives have been carried forward for discussion in this chapter and as appropriate, carried forward for analysis in Chapter 4. These include soils; water resources; vegetation resources (including Threatened and endangered and special status species); rangeland and wild horse management; fish and wildlife including special status species; and air quality.

Resources or issues that were eliminated from detailed analysis are presented in **Appendix A** (i.e., those elements assigned a “no impact” or “not present” determination). These resources were dismissed from detailed analysis because either the alternatives would have no measurable effect on the resource, because the Proposed Action and ACEPM (**Sections 2.1**) would mitigate potential impacts of the alternatives to negligible levels, or because the resource is not present within the Tumbleweed II Project Area.

3.2.1 SOILS

According to Natural Resource Conservation Service (NRCS) (USDA-NRCS 2004) maps for Uintah County, nine soil series occur in the Tumbleweed II Project Area (see **Figure 3-1 – Appendix E**). However, only two of these associations, the Winterridge-Moonset association and the Towave-Gompers-Rock outcrop association, have the potential to be impacted by proposed development.

The Winterridge-Moonset association has the potential to be strongly alkaline (pH>8.5) and has moderate to high potential for reclamation. Approximately 2,647 acres of this association occurs on hills and plateaus with 1 to 8 percent slopes in the 7,655 acre Tumbleweed II Project Area. Soils in this association typically are 10 to 20 inches deep, well drained, and derived from alluvium. Textures range from loam to bedrock, and potential water and wind erosion is moderate to very high. Typical vegetation includes sagebrush (*Artemisia* spp.), western wheatgrass (*Pascopyrum smithii*), Indian ricegrass (*Achnatherum hymenoides*), muttongrass (*Poa fendleriana*), needle-and-thread (*Hesperostipa comata*), and saltbush (*Atriplex* spp.).

The Winterridge-Moonset association possesses characteristics typical of soils with a high potential to include biological soil crusts. Biological soil crusts (also known as cryptogamic, cryptobiotic, microbiotic, and microphytic soils) are composed of a symbiotic association of cyanobacteria, lichens, mosses, green algae, microfungi, and bacteria that form a rough carpet on the surface and a soil-binding matrix below (Belnap et al. 2001). Biological soil crusts typically occur as brownish or black soil crusts that appear on the surface of sandy desert soils. Since biological soil crusts are highly adaptable, they occur in the full range of arid soil types from shallow to deep, heavy to light textures, and moist to drier conditions. No site-specific inventories have been completed to document the presence of biological soil crusts in the Tumbleweed II Project Area. As the Winterridge-Moonset association occurs throughout the Tumbleweed II Project Area, it is assumed for the purposes of this EA that biological soil crusts may occur wherever this association is present.

Approximately 3,093 acres of the Towave-Gompers-Rock outcrop association occurs in the 7,655 acre Tumbleweed II Project Area primarily on very steep slopes (45 to 80 percent) surrounding Willow Creek and Upper Bottom Canyon. Typical vegetation includes Douglas-fir (*Pseudotsuga menziesii*), Utah juniper (*Juniperus osteosperma*), pinyon pine (*Pinus edulis*), Utah snowberry (*Symphoricarpos oreophilus*), mountain mahogany (*Cercocarpus* spp.), saline wildrye (*Leymus salinus*), slender wheatgrass (*Elymus trachycaulus*), Indian ricegrass, Rocky Mountain juniper (*Juniperus scopulorum*), big sagebrush (*Artemisia tridentata*), Utah serviceberry (*Amelanchier utahensis*), Mormon tea (*Ephedra viridis*), antelope bitterbrush (*Purshia tridentata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), sandberg bluegrass (*Poa secunda*), and needle-and-thread (*Stipa comada*). Textures range from loam to bedrock and potential for runoff is very high. The reclamation potential for this unit is rated fair by the NRCS.

Natural, background erosion rates in the Tumbleweed II Project Area are about 1.45 tons per-acre per-year (BLM 1984).

3.2.2 WATER RESOURCES

The Tumbleweed II Project Area is drained by numerous small ephemeral tributaries of Willow Creek and Upper Bottom Creek. Willow Creek is a perennial stream that lies immediately west of the Tumbleweed II Project Area. However, there are no perennial streams, springs, or seeps within the immediate Project Area. From the Tumbleweed II Project Area, Willow Creek flows north-northwest more than 40 miles to its confluence with the Green River. As described in **Section 3.2.5**, Willow Creek does not provide habitat for fish species. Upper Bottom Creek is an ephemeral tributary of Willow Creek that occurs along the western and northern boundary of the Tumbleweed II Project Area.

Stream flow in Willow Creek and Upper Bottom Creek is dependent on seasonal storms and snowmelt runoff. The majority of runoff is generated by melting of the winter snow pack and occurs during the spring and early summer. During the late summer months, cloudburst rainstorms sometimes result in severe local flashfloods. With the exception of Willow Creek, the drainages are dry for most of the year and a single rainstorm event can account for a large percentage of the total annual runoff in these areas.

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. All streams within the Tumbleweed II Project Area are classified as Class 2B, 3A, and 4. Class 2B streams are protected for secondary contact recreation such as boating, wading, or similar uses. Class 3A streams are protected for cold water species of game fish and other cold water aquatic life. Class 4 streams are protected for agricultural uses including irrigation of crops and stock watering.

USGS Sample Results

The water quality characteristics of surface waters generally reflect the chemical nature of precipitation in the region and the geologic strata over which the water flows. Water sampling results are often compared to a numerical standard defined for protection of drinking water, aquatic organisms, and other beneficial water uses. Most States, including Utah, now have primacy for the administration of the CWA and have also adopted State water-quality standards (UDEQ 2000). The Utah standards include a series of aquatic water quality standards that are protective of aquatic organisms and fisheries.

Table 3-1 provides a summary of water quality analyses for samples collected from the USGS Willow Creek gauging station 09307500. This station on Willow Creek is located about 15 miles north of the Tumbleweed II Project Area. Water quality samples were collected at this station from September 1969 to September 1983. Waters in Willow Creek are described as calcium bicarbonate-sulfate type waters

with very high hardness (260 – 370 mg/L as CaCO₃). Total dissolved solids (TDS) ranges from 349 mg/L to 571 mg/L, and averages 482 mg/L. The waters are generally alkaline with pH ranging from 7.4 to 8.6 units. Specific conductance ranges from 450 to 920 uS/cm with an average of 693 uS/cm. These values are generally in the moderate salinity class and indicate that the waters can be used for irrigation (U.S. National Salinity Laboratory 1954). Values for all parameters reported are less than the associated aquatic life water quality standards, except for TSS and copper. Copper samples collected from the USGS Willow Creek gauging station 09307500 exceeded the aquatic standard for one of four samples. The sodium adsorption ratio (SAR) of the waters ranges from 0.6 to 2 and averages 0.97. These are considered to be safe values for SAR (Hergert and Knudsen 1997).

Table 3-1. Summary of Water Quality Analyses for Willow Creek above Diversions, USGS Gauging Station 09307500

Parameter	Aquatic Biota Standard ¹	Summary Statistics		
		No. of Samples	Range	Mean
General Water Quality Indicators				
Temperature (°C)	—	133	0 – 25	9.28
Specific Conductance (uS/cm)	—	72	450 – 920	693
Dissolved Oxygen (mg/L)	Min 6.5	40	6.8 – 12.2	8.89
pH (standard units)	6.5-9.0	40	7.4 – 8.6	8.13
Sodium Adsorption Ratio	—	33	0.6 – 2	0.97
Total Hardness (mg/L)	—	33	260 – 370	328
Total Dissolved Solids (mg/L)	1,200	24	349 – 571	482
Total Suspended Solids (mg/L)	90	46	41 – 15,000	2240
Ionic Constituents				
Calcium (mg/L)	—	35	54 – 86	71.3
Magnesium (mg/L)	—	35	24 – 46	35.9
Sodium (mg/L)	—	35	22 – 77	41.5
Potassium (mg/L)	—	35	1 – 3.3	1.74
Chloride (mg/L)	—	35	2.4 – 8	5.03
Sulfate (mg/L)	—	35	86 – 210	134
Fluoride (mg/L)	1.2 - 2.4 ²	35	<0.1 – 0.4	0.25
Ammonia (mg/L)	0.11 – 2.49 ²	25	<0.01 – 0.1	0.03
Silica (mg/L)	—	35	1.5 – 19	15.1
Bicarbonate (mg/L)	—	26	250 – 381	330
Nitrite & Nitrate (mg/L)	4	32	0.01 – 1.4	0.23
Trace Metals				
Aluminum (ug/L)	750	29	<10 – 80	30.1
Arsenic (ug/L)	190	21	1 – 7	3.90
Barium (ug/L)	1,000	8	70 – 200	95.9

Parameter	Aquatic Biota Standard ¹	Summary Statistics		
		No. of Samples	Range	Mean
Boron (ug/L)	—	34	30 – 100	49.1
Copper (ug/L)	12	4	<2 – 670	173
Iron (ug/L)	1,000	35	<10 – 90	33.0
Manganese (ug/L)	—	10	<10 – 20	11.0
Selenium (ug/L)	5	21	<1 – 2	0.64
Strontium (ug/L)	—	26	600 – 960	828
Zinc (ug/L)	—	14	<20 – 30	18.6

All samples are dissolved (filtered) unless otherwise noted.

Average values calculated using one-half the detection limit for non-detect values.

Bold values exceed standards.

¹Aquatic life (Utah Water Quality Standards, R317-2 Utah Administrative Code).

²Value is dependent on temperature and pH

Source: <http://waterdata.usgs.gov/nwis/>

State of Utah Section 303(d) List

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 the States to:

Identify waters that are and would 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 that would allow polluted water bodies to meet water quality standards, accounting for seasonal variations and a margin of safety.

Willow Creek is listed in Utah's 2006 Integrated Report list of 303(d) impaired water bodies for TDS (UDEQ 2006). The majority of the TDS in the Willow Creek watershed is due to erosion of the naturally saline geologic formations in the area, including the slightly to moderately saline Uinta Formation. Other potential sources of TDS in the watershed include irrigation return flows, erosion of unpaved road surfaces, as well as oil and gas activities.

According to BLM (Vernal Field Office) GIS data and the USFWS National Wetland Inventory, there are no riparian corridors or jurisdictional wetlands in the Tumbleweed II Project Area.

3.2.3 VEGETATION RESOURCES

3.2.3.1 Noxious and Invasive Weeds

Although undisturbed portions of the Tumbleweed II Project Area (those without access roads or previous development) are relatively weed-free, low levels of invasive and non-native species are present in and near the Tumbleweed II Project Area. Cheat grass (*Bromus tectorum*) and other non-native species, such as Russian thistle (*Salsola pestifer*), perennial pepperweed (*Lepidium latifolium*), and hound's-tongue (*Cynoglossum officinale*) are found along roads leading into the Tumbleweed II Project Area. Some non-native plants have spread into nearby rangelands, including those in the Tumbleweed II Project Area.

3.2.3.2 Tumbleweed II Project Area Vegetation Communities

Vegetation Communities

There are two primary vegetation communities within the Tumbleweed II Project Area: sagebrush-steppe and pinyon-juniper woodlands. The sagebrush-steppe community includes such species as big sagebrush, shadscale (*Atriplex confertifolia*), rubber rabbitbrush (*Chrysothamnus nauseosus*), snakeweed (*Gutierrezia* spp.), Mormon tea, winterfat (*Ceratoides lanata*), wild buckwheat (*Eriogonum* spp.), Indian ricegrass, prickly pear cactus (*Opuntia polyacantha*), and scarlet globemallow (*Sphaeralcea coccinea*). Pinyon-juniper woodlands include such species as pinyon pine, Utah juniper, serviceberry (*Amelanchier alnifolia*), curl-leaf mahogany (*Cercocarpus ledifolius*), needle-and-thread grass, Indian ricegrass, wild buckwheat, pepperweed, and prickly pear cactus. Sagebrush flats along Winter Ridge were chained in the 1950s. As such, average height of sagebrush within the Tumbleweed II Project Area is approximately 2 to 3 feet.

The BLM recently completed restoration work in the Tumbleweed II Project Area. The restoration work consisted of removing the encroaching pinyon and juniper trees from the sagebrush-grass vegetative community. Approximately 1,210 acres of vegetation have been treated in the Tumbleweed II Project Area.

Crested wheatgrass (*Agropyron cristatum*), and alfalfa (*Medicago sativa*) are examples of introduced species used by livestock, wild horses, and wildlife that are present in the Tumbleweed II Project Area.

As discussed in **Section 3.2.1**, reclamation potential for the Tumbleweed II Project Area is rated fair by the NRCS. Recent BLM field observations support this rating of reclamation potential in the area. In August 2009, the BLM assessed revegetation of two well sites, Winter Ridge U1 (API #04304710018) and Atlantic Alpine Southland 22-2 (#4304710059), which were plugged and abandoned in the 1960s (BLM 2009b). These two well sites are located in Section 22, T15S, R21E. The BLM found that sagebrush has established as the dominant species over the last 40 years. Rabbitbrush, an early successional species, was also prevalent. Although portions of the previous development footprints were still distinguishable, in general, these two well sites have progressed towards successfully blending in with the surrounding landscape. Based on proximity to Stewart's proposed wells, and for analysis purposes in this EA, it is assumed that reclamation potential in the Tumbleweed II Project Area would be similar to the reclamation potential at these two well sites.

Commercial Forests and Woodlands

Small pockets of mixed conifer are restricted to north-facing slopes at relatively high elevations within or surrounding the Tumbleweed II Project Area. These pockets of mixed conifer primarily include ponderosa pine (*Pinus ponderosa*) with isolated occurrences of Douglas fir and Engelmann spruce (*Picea engelmannii*). The understory consists of mountain mahogany, Utah serviceberry, snowberry (*Symphoricarpos oreophilus*), and Indian rice grass. The BLM authorizes limited commercial forest and woodland harvesting within the Tumbleweed II Project Area on approximately 4,448 acres of mixed conifer.

3.2.4 RANGELAND MANAGEMENT AND WILD HORSES

3.2.4.1 Rangeland Management

The Tumbleweed II Project Area occurs within Horse Point Pasture #4 of the Winter Ridge Allotment, which is grazed by cattle on a seasonal basis (i.e., 5/01–4/30). Approximately 5,188 acres of the Tumbleweed II Project Area fall within a portion of this pasture. 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). Within the Winter Ridge allotment, approximately 14 acres are required to support one AUM. Based on this estimate, the portion of Horse Point Pasture #4 in the Tumbleweed II Project Area supports roughly 370 AUMs.

3.2.4.2 Wild Horses

Wild horses within the Tumbleweed II Project Area are part of the Winter Ridge Herd. The Tumbleweed II Project Area provides year-long range for wild horses. According to management prescriptions in the Vernal Field Office Approved RMP, wild horses will be gathered and removed from the Winter Ridge Herd Area. The next approved gather for Winter Ridge is scheduled for July 2010. Horses will be gathered into corrals using low-flying helicopters and ground support. Following medical evaluations, the horses will then be removed from the Winter Ridge Herd Area. Forage will be allocated during the life of the plan until the horses have been removed. The Winter Ridge Herd Area designation will continue, but there will be no management for horses. Any horses present after the wild horses are removed will be in trespass (BLM 2008a).

3.2.5 FISH AND WILDLIFE

3.2.5.1 General Wildlife Species

Common mammals likely to occur in the Tumbleweed II Project Area include the black bear (*Ursus americanus*), mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereargenteus*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), Nuttall’s or mountain cottontail (*Sylvilagus nuttallii*), black-tailed and white-tailed jackrabbit (*Lepus californicus* and *Lepus townsendii* respectively), and various species of rodents and bats. Bird species that may be present in the Tumbleweed II Project Area include numerous species of migratory birds, upland game birds, and raptors. Waterfowl frequently use riparian areas along Willow Creek and other drainages. Reptiles that may be present in the Tumbleweed II Project Area include the short-horned lizard (*Phrynosoma hernandesi*), sagebrush lizard (*Sceloporus graciosus*), western whiptail (*Cnemidophorus tigris*), Great Basin gopher snake (*Pituophis catenifer deserticola*), wandering garter snake (*Thamnophis elegans vagrans*), Great Basin spadefoot (*Spea intermontana*), midget-faded rattlesnake (*Crotalus oreganus concolor*), and various others.

Upland game birds known to utilize habitats within and near the Tumbleweed II Project Area include the greater sage-grouse (*Centrocercus urophasianus*) and wild turkeys (*Meleagris gallopavo intermedia*). The greater sage-grouse is considered a State of Utah Wildlife Species of Concern and is therefore discussed in Section 3.2.6 (Special Status Species).

Although no perennial drainages occur within the immediate Tumbleweed II Project Area, both Willow Creek and Upper Bottom Canyon are adjacent to the Tumbleweed II Project Area. Based on their relatively low flows, they generally do not hold enough water to support fish or other special status aquatic species. Both of these streams drain to the Green River, approximately 41 miles downstream from the Tumbleweed II Project Area.

3.2.5.2 Big Game

The principal big game species in the Tumbleweed II Project Area include elk (*Cervus canadensis*) mule deer (*Odocoileus hemionus*), and the occasional pronghorn antelope (*Antilocapra americana*), Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*), and bison (*Bison bison*). The UDWR has identified various types of big game seasonal ranges (i.e., summer, winter, yearlong). These ranges are ranked according to their relative biological value and are defined below.

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 substantial declines in carrying capacity and/or numbers of the wildlife species in question.

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.

Elk occupy much of the greater Tumbleweed II Project Area on a year-round basis. As shown on **Figure 3-2 – Appendix E**, the entire Tumbleweed II Project Area is designated as UDWR crucial value winter habitat. The Vernal Field Office Approved RMP recognizes UDWR crucial wildlife habitat boundaries, but does not designate forage allocations for these habitats (BLM 2008a).

Mule Deer

Mule deer occur throughout the western mountains, forests, deserts, and brushlands. Typical habitats include short-grass and mixed-grass prairies, sagebrush and other shrublands, coniferous forests, and forested and shrubby riparian areas. The species is common State-wide in Utah, where it can be found in many types of habitat, ranging from open deserts to high mountains to urban areas.

The UDWR has identified approximately 1,658 acres of land within the Tumbleweed II Project Area as crucial value winter habitat; and has identified the remainder (approximately 5,997 acres) as substantial value winter habitat. **Table 3-2** shows UDWR mule deer habitat values within the Tumbleweed II Project Area. UDWR mule deer habitats are also shown on **Figure 3-3 – Appendix E**. The Vernal Field Office Approved RMP recognizes UDWR crucial wildlife habitat boundaries, but does not designate forage allocations for these habitats (BLM 2008a).

Table 3-2. UDWR Mule Deer Habitat within the Tumbleweed II Project Area

Agency	Habitat Values	Acreage within the Tumbleweed II Project Area	Percent of the Tumbleweed II Project Area
UDWR	Crucial Value, Winter Season	1,658	21.7
	Substantial Value, Winter Season	5,997	78.3

Pronghorn Antelope

Pronghorn typically inhabit grasslands and semi-desert shrublands at elevations ranging from 4,000 to 6,000 feet. Pronghorn are typically less abundant in xeric habitats, preferring areas that average 12-15 inches of precipitation per year. 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 have been observed in the Tumbleweed II Project Area; however, habitat usage has been limited to the summer months. Approximately 1,878 acres of the 7,655 acre Tumbleweed II Project Area has been identified as UDWR substantial value summer habitat.

Rocky Mountain Bighorn Sheep

The Rocky Mountain bighorn sheep is native to rugged mountainous areas of western North America. A small population of Rocky Mountain bighorn sheep has been documented along Willow Creek. In recent years, bighorn sheep have been observed in Willow Creek Canyon immediately west of Winter Ridge. Approximately 5,744 acres of the 7,655 acre Tumbleweed II Project Area is considered as UDWR crucial value year-long habitat. The Vernal Field Office Approved RMP recognizes UDWR crucial wildlife habitat boundaries, but does not designate forage allocations for these habitats (BLM 2008a).

Bison

In 2003, bison were reintroduced to the East Tavaputs Plateau area. Since then, bison have occasionally been observed in the Tumbleweed II Project Area. The entire Tumbleweed II Project Area is considered UDWR crucial value year-long habitat. The Vernal Field Office Approved RMP recognizes UDWR crucial wildlife habitat boundaries, but does not designate forage allocations for these habitats (BLM 2008a).

3.2.5.3 Migratory Birds

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

Numerous migratory bird species may occupy the Tumbleweed II Project Area. Those migratory bird species that are Federally-listed under the Endangered Species Act (ESA) of 1973, as amended, are addressed in **Section 3.2.6**. This section identifies migratory birds that may inhabit the Tumbleweed II Project Area, including those species classified as Priority Species by Utah Partners in Flight (PIF) or as Birds of Conservation Concern (BCC) by the USFWS. Migratory bird species are addressed below in

Table 3-3 according to the habitat types (i.e., vegetative communities) found within the Tumbleweed II Project Area. Utah PIF priority species and BCC species are denoted by an asterisk (*).

Table 3-3. Migratory Bird Species Potentially Occurring Within the Tumbleweed II Project Area

Pinyon-Juniper Woodlands		Sagebrush-Steppe	
Common Name	Scientific Name	Common Name	Scientific Name
black-chinned hummingbird	<i>Archilochus alexandri</i>	Brewer’s sparrow*	<i>Spizella breweri</i>
black-throated gray warbler*	<i>Dendroica nigrescens</i>	sage sparrow*	<i>Amphispiza belli</i>
bushtit	<i>Psaltriparus minimus</i>	sage thrasher	<i>Oreoscoptes montanus</i>
gray flycatcher	<i>Empidonax wrightii</i>		
gray vireo*	<i>Vireo vicinior</i>		
juniper titmouse*	<i>Baeolophus ridgewayi</i>		
northern shrike	<i>Lanius excubitor</i>		
pinyon jay*	<i>Gymnorhinus yanocephalus</i>		
Virginia’s warbler*	<i>Vermivora virginiae</i>		
western scrub-jay	<i>Aphelocoma californica</i>		

Sources: Parrish et al. 2002; USFWS 2008; UDWR 2007.

3.2.5.4 Raptors

Some of the more common and visible birds in and near the Tumbleweed II Project Area include several species of raptors (**Table 3-4**). Habitats in and around the Tumbleweed II Project Area provide diverse breeding and foraging habitat for raptors. These habitats include cool desert shrub communities, rocky outcrops, riparian zones, and lower elevation shrublands.

Table 3-4. Raptor Species with the Potential to Occur in or Near the Tumbleweed II Project Area

Common Name	Scientific Name	Nesting Habitat
American kestrel	<i>Falco sparverius</i>	Tree cavities, cliff crevices
Bald eagle	<i>Haliaeetus leucocephalis</i>	Tall trees near large bodies of water (no nesting habitat provided in or near the Tumbleweed II Project Area)
Cooper’s hawk	<i>Accipiter cooperii</i>	Ponderosa pine, Douglas fir, pinyon-juniper woodlands
Ferruginous hawk	<i>Buteo regalis</i>	Ground, pinyon-juniper woodlands, balanced pinnacles
Golden eagle	<i>Aquila chrysaetos</i>	Cliff ledges and rock outcrops
Great-horned owl	<i>Bubo virginianus</i>	Cliff ledges or nests of other species
Mexican spotted owl	<i>Strix occidentalis lucida</i>	On platforms and large cavities in trees, on ledges, and in caves.
Prairie falcon	<i>Falco mexicanus</i>	Cliff ledges
Red-tailed hawk	<i>Buteo jamaicensis</i>	Cliff ledges, rock outcrops, aspen, pinyon-juniper woodlands, etc.
Rough-legged hawk	<i>Buteo lagopus</i>	Grasslands, fields, marshes, sagebrush flats, and other open habitats
Sharp-shinned hawk	<i>Accipiter striatus</i>	Conifers and oak brush
Turkey vulture	<i>Cathartes aura</i>	Rock outcrops, caves, and tree cavities

The bald eagle, golden eagle, ferruginous hawk, and Mexican spotted owl (MSO) are special status species and thus, are discussed further in **Section 3.2.6**, Special Status Species.

In 2007, the BLM completed raptor nest inventories and no occupied raptor nests were documented in the Tumbleweed II Project Area (i.e., proposed surface disturbance locations plus ½-mile buffer zone) (BLM 2007b). In the summer of 2008, Buys & Associates, Inc. completed a raptor nest inventory of the Tumbleweed II Project Area. Three nests were identified within the Project Area during the inventory. Two of these nests were determined to be inactive at the time of the survey. An American kestrel nest was determined to be active during the survey. All three nests are located within the bottom of the Willow Creek drainage (B&A 2008).

Although all raptor species and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (MBTA) (16 USC, 703 et seq.), general raptor management is dictated by surface ownership. On BLM-administered lands, raptor management is guided by *Best Management Practices for Raptors and Their Associated Habitats in Utah, August 2006* (BLM 2008). On SITLA-administered lands, raptor management is typically coordinated with the appropriate AO.

3.2.6 SPECIAL STATUS SPECIES

Numerous Federally-listed and Utah sensitive species have the potential to occur within Uintah County. The list of threatened, endangered, and candidate⁶ species potentially occurring in the Tumbleweed II Project Area was provided by the USFWS (Utah Field Office), and the BLM list was provided by BLM's State Director during preparation of the Tumbleweed 3D Seismic EA (BLM 2005a). A brief description of each of the Federally-listed and state sensitive species with the potential to occur in the Tumbleweed II Project Area is presented below. All special status plant and wildlife species information considered during the preparation of this EA for the Tumbleweed II Project Area is summarized in **Appendix C**.

3.2.6.1 Special Status Fish Species

The USFWS has identified four Federally-listed fish species historically associated with the Upper Colorado River Basin, including the Green River: Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*), and bonytail (*Gila elegans*). These fish are Federally- and State-listed as endangered and have experienced severe population declines due to flow alterations, habitat loss or alteration, and introduction of non-native fish species. The Green River and its 100-year floodplain have been designated as critical habitat for these four endangered fish species (USFWS 1994).

The endangered Colorado pikeminnow, humpback chub, razorback sucker, and bonytail were once abundant in the upper and lower Colorado River Basin. Today their distribution is limited to a small portion of their historic habitat. Habitats of these species include the major rivers and tributaries in the Colorado River System, backwaters, sloughs, oxbow lakes, seasonally inundated flood plains, and reservoirs (USFWS 1990a; USFWS 1990b; and USFWS 1998).

Three additional species of fish endemic to the Colorado River Basin, including the Green River, are the roundtail chub, flannelmouth sucker, and bluehead sucker. The roundtail chub is a State-listed threatened

⁶ Candidate species have no legal protection under the ESA. Candidate species are those species for which the USFWS lacks sufficient information to support issuance of a proposed rule to list under the ESA. However, identification of and evaluation of impacts to candidate species can assist environmental planning efforts by providing advance notice of potential listings, allowing resource managers to alleviate threats and thereby, possibly remove the need to list species as endangered or threatened. Therefore, candidate species with the potential to occur in the Tumbleweed II Project Area are evaluated in this EA.

species, while the two suckers are species of special concern due to declining population numbers and distribution.

Although no streams occur within the immediate Tumbleweed II Project Area, both Willow Creek and Upper Bottom Canyon are adjacent to the Tumbleweed II Project Area. However, no habitat for the Colorado River endangered fish or BLM sensitive fish species occurs within these drainages. The nearest habitat for the Colorado River endangered fishes and BLM sensitive species occurs approximately 41 miles downstream of the Tumbleweed II Project Area in the Green River.

3.2.6.2 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was delisted from the Endangered Species List. Bald eagles are an opportunistic species, sometimes predator and sometimes scavenger. They feed heavily on fish and therefore, the bald eagle is almost always found near water. In areas where fish are not readily available, they feed on waterfowl and small mammals (e.g., jackrabbits). In many areas of the arid west, bald eagles primarily scavenge for food, feeding largely on dead and dying fish and carrion (e.g., ungulate species, waterfowl, rabbits, and small mammals) (Anderson and Patterson 1988; USGS-NPWRC 2002). As the rivers freeze over, bald eagles utilize ungulate winter ranges and primarily feed on carrion along roadways.

No bald eagle nests or identified winter roost areas occur within the Tumbleweed II Project Area. Winter foraging habitat for the species is found within the Tumbleweed II Project Area and therefore wintering bald eagles may occur there anytime between November 1 and March 31.

3.2.6.3 Golden Eagle (*Aquila chrysaetos*)

The golden eagle is protected under the Bald and Golden Eagle Protection Act, based upon the similarity of the juvenile bald eagle's appearance to that of the adult golden eagle. Throughout the summer, golden eagles are found in mountainous areas, canyons, shrublands and grasslands. During the winter, they inhabit shrub-steppe vegetation, as well as wetlands, river systems and estuaries. Given the habitat types and local resident species present in the Tumbleweed II Project Area, golden eagles may forage or could establish nests within the Tumbleweed II Project Area.

3.2.6.4 Greater Sage-grouse (*Centrocercus urophasianus*)

At the time the Draft Tumbleweed II Exploratory Natural Gas Drilling Project EA was published, the greater sage-grouse was identified as a State of Utah Wildlife Species of Concern because of widespread losses of sagebrush habitat throughout the western states, including Utah. Since then, on March 5, 2010, the USFWS announced the greater sage-grouse warrants the protection of the ESA, but is precluded by higher priority listing actions (i.e., by the need to take action on other species facing more immediate and severe extinction threats). As a result of this decision, the USFWS placed the greater sage-grouse on the candidate list for future action, meaning the species would not receive statutory protection under the ESA and individual states would continue to be responsible for managing the bird (USFWS 2010). However, the USFWS will review the status of the species annually to determine whether it warrants more immediate action (USFWS 2010).

Immediately following issuance of the decision above, the BLM released Instruction Memorandum (IM) No. 2010-071 (BLM 2010). This IM supplements the BLM's 2004 National Strategy for sage-grouse and identifies those management actions necessary to sustain sage-grouse populations while also achieving the Department of the Interior's energy-related priorities. Under this IM, the BLM will require a combination of management actions (e.g., onsite modification and offsite mitigation) for energy development projects proposed in "priority habitat" for sage-grouse. Management actions may also

include requirements to avoid priority sage-grouse habitat or require that development not exceed certain density thresholds. In general, it is important to note these management actions may be more protective than the stipulations or restrictions identified in a Field Office's current land use plan. In addition, priority habitat, which is the habitat of highest conservation value relative to maintaining suitable sage-grouse populations range-wide, has not yet been identified by the BLM using a consistent methodology. Priority habitat will be areas of high habitat quality supporting important sage-grouse populations, including those populations that are vulnerable to localized extirpation, but necessary to maintain range-wide connectivity and genetic diversity. Until these areas are identified, the BLM will identify priority habitat on an interim basis using a variety of plans and professional judgment.

In the Tumbleweed II Project Area, greater sage-grouse habitat is primarily found in the sagebrush-steppe community located much of which is located on Winter Ridge. Sage-grouse have been recorded in these communities, and suitable nesting, brooding, and lek habitat occur. Two historic leks occur in, or within 2 miles of, the Tumbleweed II Project Area. The UDWR has identified approximately 4,448 acres of sage-grouse crucial brooding habitat in the Tumbleweed II Project Area (**Figure 3-4**), within 2 miles of these lek sites. The Horse Point lek located in the Tumbleweed II Project Area has been considered active within the past 4-5 years. Activity on the Winter Ridge lek (outside the Tumbleweed II Project Area but within 2 miles) has not been monitored for the past 3-5 years. However, prior to that, the lek was considered inactive for several years. As sage grouse do occur in the Winter Ridge area, these leks could be used as strutting grounds in the future (BLM 2007b). Since sage-grouse leks are sensitive to human activity, legal locations of Tumbleweed II Project Area leks are not disclosed within this EA.

3.2.6.5 Mexican Spotted Owl (*Strix occidentalis lucida*)

The Mexican spotted owl (MSO), a Federally-threatened species, nests, roosts, and forages in a diverse array of biotic communities across its range (USFWS 2001). Preferred nesting habitat of the species in Utah includes complex, thickly forested, steep-walled, rocky canyons, with uneven-aged, multi-storied mature, and/or old growth stands that have high canopy closure. In the northern portion of its range (Utah and Colorado), most MSO nests are located in caves or on cliff ledges in steep-walled canyons (USFWS 2001).

The Final Assessment of Potential MSO Nesting Habitat on BLM-Administered Lands in Northeastern Utah (SWCA 2005) identified Willow Creek as potential "good" and "fair" nesting habitat. In 2006, the BLM reevaluated "fair" and "good" habitat designations found in SWCA's report, at which time habitat near the Tumbleweed Unit was confirmed as "fair" or "good". At the direction of the BLM, all areas of "fair" or "good" habitat must be surveyed for the presence of MSO prior to any disturbance within ½ mile of these areas. MSO surveys of "fair" and "good" habitat in and near the Tumbleweed II Project Area began as early as 2006. For some habitat areas, surveys were conducted 2007 and/or 2008. The most recent surveys were conducted by Buys & Associates in 2009 (B&A 2009). In reviewing these data, as of August 2009, 2 years of MSO surveys had been completed according to USFWS protocol for Stewart's proposed well pads (TUF #4-3, #5-8, #9-3, #9-11, #17-4, TUF #17-12, and TUF #18-9) and associated road and pipeline corridors in the Tumbleweed II Project Area. No MSO were seen or heard during any of the inventories conducted for this project (B&A 2009).

Two consecutive years of surveys are required for clearance of a MSO habitat. However, if more than 4 years have elapsed between the end of the two years of survey and the initiation of the Proposed Action, then another complete inventory (i.e., two years of survey) is recommended prior to project implementation (USFWS 2003). As of August 2009, Stewart's proposed development locations in the Tumbleweed II Project Area are cleared until the 2013 breeding season.

3.2.7 RECREATION

The Tumbleweed II Project Area is approximately 70 miles south of Vernal, Utah. The majority of roads that provide access to the Tumbleweed II Project Area from Vernal are either gravel surfaced or unimproved. Travel distance, road conditions, and adverse weather conditions can make it difficult to access the Tumbleweed II Project Area. As such, recreational use is relatively limited when compared with other areas in northeastern Utah. Because visitor use of the Tumbleweed II Project Area is limited, there are opportunities for primitive and unconfined recreation and high-quality hunting. The Tumbleweed II Project Area also offers limited opportunity for motorized recreation. Each of these recreational opportunities is discussed below.

The Tumbleweed II Project Area provides visitors with opportunities for primitive and unconfined recreation. The existing landscape could appropriately be characterized as remote, and as an area where human intrusions are substantially unnoticed. The land includes scenic vistas, a diversity of vegetation, flat-top narrow ridges, and open canyons, which provide opportunities for activities such as hiking, backcountry camping, and wildlife viewing. The majority of the recreation which occurs in the Project Area is centered on Willow Creek and Upper Bottom Canyon, which are accessible only by foot or horseback.

The Tumbleweed II Project Area occupies a portion of the Book Cliffs Hunting Unit for elk, mule deer, black bear, and cougar. Hunting seasons are different for each species and weapon type (e.g., archery, muzzleloader, any weapon); however, hunting seasons generally begin in the early fall and end in the early winter. Black bear, unlike other species, can also be hunted during the spring (UDWR 2009a). Although pronghorn, bighorn sheep, bison, and sage-grouse habitat can be found within the Tumbleweed II Project Area, hunting these species is not permitted. Opportunities for hunting within the Book Cliffs Hunting Unit are summarized in **Table 3-5**. It is important to note that the Tumbleweed II Project Area constitutes only a fraction of the Book Cliffs Hunting Unit, which for mule deer and elk incorporates a substantial portion of Uintah and Duchesne Counties, and for cougar and black bear incorporates a substantial portion of Uintah and Grand Counties (UDWR 2008a; UDWR 2009a; UDWR 2009b).

Table 3-5. Limited Entry Hunting Opportunities within the Book Cliffs

Hunt Seasons	Hunt Boundary	Weapon Type	2009 Season Dates	2009 Permits		2009 Applicants	
				Resident	Nonresident	Resident	Nonresident
Limited Entry Buck Deer	Book Cliffs	Archery	08/15 – 09/11	106	11	877	292
		Any Weapon	10/17 – 10/25	321	34	4,880	1,103
		Muzzleloader	09/23 – 10/01	106	11	1,004	198
Limited Entry Bull Elk	Book Cliffs, Bitter Creek	Archery	08/15 – 09/11	32	3	125	98
		Any Weapon	09/21 – 09/20 (early)	49	5	1,337	394
			11/07 – 11/13 (late)	26	2	220	84
		Muzzleloader	09/23 – 10/01	19	2	196	75
	Premium	All limited entry season	4	0	137	0	

Hunt Seasons	Hunt Boundary	Weapon Type	2009 Season Dates	2009 Permits		2009 Applicants	
				Resident	Nonresident	Resident	Nonresident
Cougar	Book Cliffs, Bitter Creek	NA	11/19/2008 – 2/08/2009	13	1	72	27
Black Bear	Book Cliffs	NA	04/11 – 05/31 (spring); & 08/22 – 09/30;	14	2	654	27
			10/31 – 11/22 (fall)	4	1		

Source: (UDWR 2008a; UDWR 2008b; UDWR 2008c; UDWR 2009a; UDWR 2009b; UDWR 2009c; UDWR 2009d; UDWR 2009e; UDWR 2009f; UDWR 2009g)

Off-highway vehicle (OHV) use within the Tumbleweed II Project Area is “limited” to designated roads and trails (BLM 2008a). Because there are limited roads and no designated trails, motorized vehicle use is largely restricted.

3.2.8 CULTURAL RESOURCES

The cultural-chronological sequence in the Tumbleweed II Project Area includes the Archaic stage (7000 B.C. to A.D. 400), which can be further subdivided into Early, Middle, Late, and Terminal periods; the Formative stage (A.D. 700 to A.D. 1250), which is largely associated with the San Rafael Fremont in the Tumbleweed II Project Area; the Protohistoric stage (A.D. 1200 to A.D. 1750), largely associated with Numic-speaking (Ute) peoples; and the historic period, which began with the arrival of Europeans in the eighteenth century. The Tumbleweed II Project Area and adjacent areas include sites associated with the historical Northern Ute migration route along Main Canyon and historical inscription dating to the early French fur trade era.

As per regulations set forth under 36 CFR 800, the area of potential effects (APE) for the Tumbleweed project is defined as the individual areas surveyed for Class III inventories. To date, Class III inventories have been completed for the TUF #18-9, #17-4, and #17-12 proposed well pads and associated access roads and pipeline corridors. Following project approval and prior to beginning any project-related surface disturbance, additional Class III survey work (i.e., 100 percent pedestrian field surveys) would be conducted for the remaining proposed well pads and associated access roads and pipeline corridors in the Tumbleweed II Project Area. These additional surveys would be completed to ensure that all locations proposed for surface disturbance have been examined by an archaeologist approved by the appropriate SMA in order to determine the presence of cultural resources in the APE for the Tumbleweed project.

All cultural resource inventories completed within the Tumbleweed II Project Area have been and will continue to be conducted in compliance with Federal and State legislation including Section 106 of the NHPA of 1966, the NEPA of 1969, the Archaeological and Historic Preservation Act of 1974, the ARPA of 1979, the American Indian Religious Freedom Act of 1978, and the NAGPRA of 1990.

The NHPA sets forth national policy and procedures regarding “historic properties”—that is, regions, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places (NRHP). Section 106 of the NHPA requires Federal agencies to consider the effects of their undertakings on such properties, following regulations issued by the Advisory Council on Historic Preservation

(ACHP) (36 CFR 800). Criteria for evaluating the significance of resources for listing on the NRHP are outlined in 36 CFR 800.10, “National Register Criteria.” The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- That are associated with events that have made a significant contribution to the broad patterns of our history;
- That are associated with the lives of persons significant in our past;
- That embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and
- That have yielded, or may be likely to yield, information important in prehistory or history.

Summary of Surveys Conducted and Inventory Results

In all, at least nine cultural resource surveys have been completed in the Tumbleweed II Project Area. These inventories were completed for 3D seismic exploration, well pads and associated roads and pipelines, and buried gas pipelines. These inventories cover approximately 2,460 acres, or roughly 32 percent, of the approximately 7,745 acre Tumbleweed II Project Area.

The nine previous inventories provide a broad, but varied coverage of the Tumbleweed II Project Area. Inventories conducted as part of a seismic exploration program provide a fairly systematic coverage of Horse Point and Winter Ridge, though the spacing of the shot lines were relatively wide and the corridors inventoried were relatively narrow (100 feet on either side of centerline). As part of these surveys, the canyon rim above Willow Creek received intensive coverage where seismic lines came within 300 feet of the rim. The bottom of Willow Creek was also inventoried at this time from canyon wall to canyon wall. Two large block inventories have been conducted on Winter Ridge. Eight well pads and their associated access have also been inventoried in the Tumbleweed II Project Area, three of which are detailed in this EA (TUF #18-9, #17-4, and #17-12). Several of the remaining proposed well locations and access routes are adjacent or partially covered by previously-inventoried areas. Additionally, several pipeline corridors have been inventoried throughout the Tumbleweed II Project Area.

Surveys conducted for the 2,460 inventoried acres in the Tumbleweed II Project Area have resulted in the identification of 36 prehistoric and historic cultural resources. Of these 36 sites, 5 sites are located within the APE for the TUF #18-9, #17-4, and #17-12 proposed well pads and associated access roads and pipeline corridors. More specifically, Class I and Class III inventories completed to date for these locations have resulted in the location of one previously recorded site (42Un3186) and the documentation of four new sites (42Un4530 – 42Un4533) (**Table 3-6**). These five sites are considered eligible for nomination to the NRHP under Criterion D due to their potential for buried cultural remains and likelihood for further contribution to various prehistoric research topics in the region. Consultations for the TUF #18-9, #17-4, and #17-12 have been completed with the Utah SHPO and Native American Tribes, and site-specific adjustments to these locations have been made, as necessary, to avoid the eligible sites listed below. Consultations for these locations would be re-initiated on a site-specific level as appropriate, if previously unknown sites are found during surface-disturbing activities.

Table 3-6. List of Known Archaeological Sites within the Tumbleweed II Project Area Based on Class I and Class III Inventories Completed to Date

Site Number	Site Type	Cultural Affiliation	NRHP Assessment	Recorded By
42Un3186	Prehistoric Temporary Camp	Unknown Prehistoric	Eligible	MOAC 2003
42Un4530	Lithic Scatter	Middle Archaic	Eligible	MOAC December 2004
42Un4531	Prehistoric Camp	Unknown prehistoric	Eligible	MOAC December 2004
42Un4532	Lithic Scatter	Unknown prehistoric	Eligible	MOAC December 2004
42Un4533	Prehistoric Temporary Camp	Unknown prehistoric	Eligible	MOAC December 2004

3.2.9 AIR QUALITY

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

Climate

The Project Area is located in the Uinta Basin, a semiarid, mid-continental climate regime typified by dry, windy conditions and limited precipitation. The elevation ranges from approximately 5,882 to 7,372 feet above mean sea level (famsl), with an average elevation of 6,627 famsl. The terrain is generally gently sloping with the exception of the incised drainages of the Green River Canyon and its tributary canyons on the eastern portion of the Project Area. The Uinta Basin is bordered by the Wasatch Range to the west, which extends north and south through the middle of the State, and the High Uinta Mountains to the north, which extend east and west through the northeast portion of the State.

Temperature and Precipitation

The closest climate measurements to the Project Area were recorded at Nutters Ranch, Utah (1963-1986). The Nutters Ranch station is located approximately 40 miles west/northwest of the geographic center of the Project Area. The elevation of the Nutters Ranch station is approximately 5,790 feet amsl (WRCC 2008). **Table 3-7** summarizes the mean temperature range, mean total precipitation, and mean total snowfall by month.

Prevailing synoptic-scale westerly air masses originating from the Pacific Ocean are typically interrupted by the western mountain ranges before reaching the Uinta Basin. As a result, the lower elevations of the Uinta Basin receive relatively slight amounts of precipitation. The higher elevations of the area generally receive more favorable amounts of precipitation. The annual mean precipitation at Nutters Ranch is 11.6 inches, and ranges from a minimum of 6.4 inches recorded in 1974, to a maximum of 24.8 inches recorded in 1965. On average, February is the driest month with a monthly mean precipitation of 0.53 inches, and August is the wettest month with a monthly mean precipitation of 1.37 inches. The annual average snowfall is 45.6 inches. December is the snowiest month. A maximum annual snowfall of 101 inches was recorded in 1964.

The surrounding area has an annual mean temperature of 46.2 degrees Fahrenheit (°F). However, abundant sunshine and rapid nighttime cooling result in a wide daily range in temperature. Wide seasonal temperature variations typical of a mid-continental climate regime are also common. Average monthly

winter temperatures range from 9 °F to 38 °F, while average summer temperatures range from 50 °F to 84 °F. Recorded daily extreme temperatures are minus 40 °F in 1937 and 106 °F in 1994 (WRCC 2008).

Table 3-7. Temperature, Precipitation, and Snowfall at Nutters Ranch, Utah

Month	Average Temperature Range (in degrees Fahrenheit)	Average Total Precipitation (inches)	Average Total Snowfall (inches)
January	6.4 – 35.3	0.56	6.1
February	11.5 – 42.0	0.53	9.0
March	22.4 – 51.6	1.16	6.1
April	29.8 – 61.4	1.02	4.1
May	38.5 – 71.9	1.10	0.6
June	46.4 – 81.3	0.86	0.0
July	53.6 – 87.7	1.19	0.0
August	51.3– 85.4	1.37	0.0
September	42.2 – 77.1	1.08	0.5
October	31.2 – 65.3	1.16	1.3
November	20.1 – 49.4	0.71	5.4
December	9.2 – 36.6	0.85	12.4
Total Annual Average	30.2 – 62.1	11.57	45.6

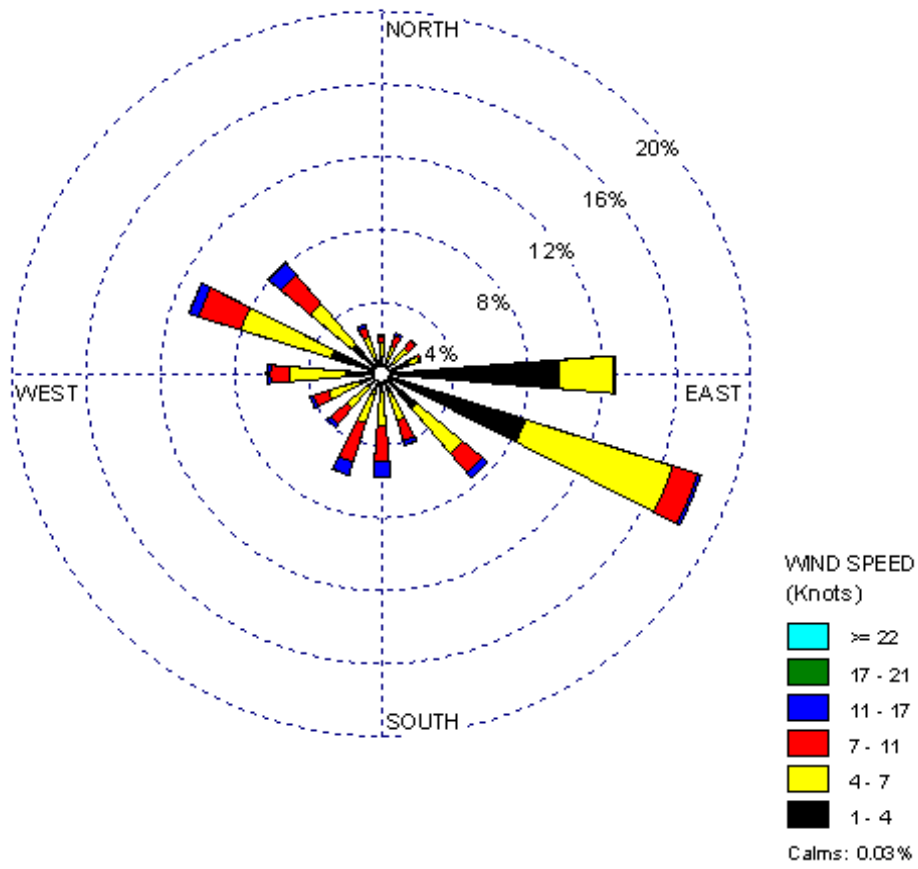
Source: WRCC 2008. Data collected at Nutters Ranch, Utah from 1963 to 1986 (<http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ut6340>)

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 Project Area. However, representative wind speed and direction data has been developed for the West Tavaputs Draft Environmental Impact Statement (BLM 2008c). These data have been peer-reviewed by BLM air quality specialists and have been deemed representative of the Uinta Basin for dispersion modeling purposes. **Figure 3-5** presents a wind rose depicting wind speed and direction for all 5 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-southeast 16.7 percent of the time. The average measured wind speed is 6.4 miles per hour. Winds are calm 0.03 percent of the time.

Figure 3-5 Wind Rose from AERMET Canyonlands NP Data 1995-1999
Wind Speed Direction (blowing from)



Average Wind Speed 5.52 Knots

Existing Sources of Air Pollution

The Uinta Basin has seen recent oil and gas development on Tribal, Federal, and private lands. Existing point and area sources of air pollution within the Project Area and surrounding region include the following:

- Exhaust emissions, primarily CO, NO_x, PM_{2.5}, and HAPs, from existing natural gas fired compressor engines used in transportation of natural gas in pipelines;
- Natural gas dehydrator still-vent emissions of CO, NO_x, PM_{2.5}, and HAPs;
- Gasoline and diesel-fueled vehicle tailpipe emissions of VOCs, NO_x, CO, SO₂, PM₁₀, and PM_{2.5};
- Oxides of sulfur (SO_x), NO_x, and fugitive dust emissions from coal-fired power plants and coal mining and processing;
- Fugitive dust (in the form of PM₁₀ and PM_{2.5}) from vehicle traffic on unpaved roads, wind erosion in areas of soil disturbance, and road sanding during winter months; and
- Long-range transport of pollutants from distant sources.

Regulatory Environment

Criteria Pollutants

National Ambient Air Quality Standards (NAAQS) have been promulgated for the purpose of protecting human health and welfare with an adequate margin of safety. Pollutants for which standards have been set include sulfur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO), and particulate matter less than 10 microns in diameter (PM₁₀) or 2.5 microns in diameter (PM_{2.5}). Existing air quality in the region is acceptable based on EPA's NAAQS. The surrounding area is designated as an "attainment area," meaning that the concentration of criteria pollutants in the ambient air is less than the NAAQS. Site-specific air quality monitoring data are not available for the Project Area; however, estimated background criteria pollutant concentrations for the Uinta Basin were provided by the Utah Department of Environmental Quality, Division of Air Quality and incorporated into **Table 3-8**.

Ground-level ozone (O₃) is a secondary pollutant that is formed by a chemical reaction between NO_x and VOCs in the presence of heat and sunlight. Precursor sources of ozone – volatile organic compounds and nitrogen oxides – include motor vehicle exhaust and industrial emissions, gasoline vapors, some tree species emissions, wood burning, and chemical solvents. Sunlight and hot weather cause ground-level ozone to form. As a result, it is generally known as a summertime air pollutant. Ozone is a regional air quality issue because, along with its precursors, it transports hundreds of miles from its origins. Maximum ozone levels generally occur at locations many miles downwind from the sources. Primary health effects from ozone exposure range from breathing difficulty to permanent lung damage. Significant ground-level ozone also contributes to plant and ecosystem damage.

The NAAQS have been recently revised to reflect changes to the PM₁₀ and PM_{2.5} standards. The changes reflect a stricter PM_{2.5} 24-hour standard for the 98th percentile of a 3 year average (lowered from 65 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$] to 35 $\mu\text{g}/\text{m}^3$) and elimination of the PM₁₀ annual standard. These changes are illustrated in the **Table 3-8** below.

Under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act (CAA), incremental increases of specific pollutant concentrations are limited above a legally defined baseline

level. Many national parks and wilderness areas are designated as PSD Class I. The PSD program protects air quality within Class I areas by allowing only slight incremental increases in pollutant concentrations. Areas of the State not designated as PSD Class I are classified as Class II. For Class II areas, greater incremental increases in ambient pollutant concentrations are allowed as a result of controlled growth. The PSD increments for Class I and II areas are presented in **Table 3-8**. The closest Class I areas are Arches National Park (74 miles south) and Canyonlands National Park (96 miles south).

Table 3-8. Ambient Criteria Pollutant Concentrations in the Uinta Basin

Pollutant	Averaging Period(s)	Uinta Basin Background Concentration ^a ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)	PSD Class I Increment ($\mu\text{g}/\text{m}^3$)	PSD Class II Increment ($\mu\text{g}/\text{m}^3$)
SO ₂	Annual	5	80	2	20
	24-hour	10	365	5	91
	3-hour	20	1,300	25	512
NO ₂	Annual	17	100	2.5	25
PM ₁₀	24-hour	63	150	8	30
PM _{2.5}	Annual	11	15	None	None
	24-hour	15 / 52 ^c	35	None	None
CO	8-hour	1,111	10,000	None	None
CO	1-hour	1,111	40,000	None	None
O ₃	8-hour	105	147 ^b	None	None

^a Source: Utah Division of Environmental Quality - Division of Air Quality (UDAQ).

^b The 147 $\mu\text{g}/\text{m}^3$ value in the table is equivalent to the NAAQS of 0.075 ppm.

^c The state of Utah currently does not have an official background value for PM_{2.5}. The PM_{2.5} concentrations given in this table represent 98th percentile values from limited PM_{2.5} monitoring conducted in Vernal, Utah in 2006 and 2007. The smaller figure of the 24-hour averaging period is representative of average summer concentrations, while the larger value is representative of winter inversion conditions, based on this monitoring.

The UDAQ conducted limited monitoring PM_{2.5} in Vernal, Utah that started in December 2006. During the 2006-2007 winter season, PM_{2.5} levels were measured at the Vernal monitoring station higher than the new PM_{2.5} health standard that became effective in December 2006. The PM_{2.5} levels recorded in Vernal were similar to other areas in northern Utah that experience wintertime inversions. The State of Utah is in the process of identifying areas that are experiencing high PM_{2.5} levels and identifying potential strategies to improve wintertime air quality in those areas.

Particulate Matter (PM₁₀ and PM_{2.5})

Airborne particulate matter (PM) consists of tiny coarse-mode (PM₁₀) or fine-mode (PM_{2.5}) particles or aerosols combined with dust, dirt, smoke, and liquid droplets. PM_{2.5} is derived primarily from the incomplete combustion of fuel sources and secondarily formed aerosols, whereas PM₁₀ is primarily from crushing, grinding, or abrasion of surfaces. Sources of PM include industrial processes, power plants, mobile sources, construction activities, and fires. With regard to mobile sources, more PM is emitted into the atmosphere from the use of diesel fuel than the use of gasoline.

PM causes a wide variety of health and environmental impacts. Many scientific studies have linked breathing PM to significant health problems, including aggravated asthma, increased respiratory symptoms, such as coughing, and difficult or painful breathing, chronic bronchitis, decreased lung function, and premature death. PM is the major cause of reduced visibility and can stain and damage stone and other materials, including culturally significant objects, such as monuments and statues.

Potential Control Measures

The sources of elevated PM_{2.5} concentrations during winter inversions in Vernal, Utah haven't been identified as of yet. Based on experiences and studies in other areas of the Rocky Mountain west and the emission inventory in the Uinta Basin, potential sources and controls can however be tentatively identified. In Utah elevated PM_{2.5} concentrations along the Wasatch Front are associated with secondarily formed particles from sulfates, nitrates, and organic chemicals from a wide variety of sources (UDAQ, 2006). In the Cache Valley of northern Utah approximately half of ambient PM_{2.5} during elevated concentrations are composed of ammonium nitrate, most likely from agricultural operations, with the rest from combustion, primarily mobile sources and woodstoves (Martin, 2006). For comparison, PM_{2.5} in most rural areas in the western United States is typically dominated by total carbonaceous mass and crustal materials from combustion activities and fugitive dust respectively (EPA, 2009).

As the Uinta Basin is neither a major metropolitan area as found on the Wasatch Front, nor has significant agricultural activities as found in Cache Valley, the most likely causes of elevated PM_{2.5} at the Vernal monitoring station are probably those common to other areas of the western US (combustion and dust) plus nitrates and organics from oil and gas activities in the Basin. Typical combustion controls include burning restrictions such as open burning and woodstove bans during poor air quality, and improvements in combustion devices such as woodstove change-out programs. Mobile combustion controls include diesel engine retrofitting (school bus retrofits for example), clean fuels (low sulfur diesel), and vehicle miles travelled reduction programs. Oil and gas industry precursor controls include nitrogen oxide engine controls such as catalytic reduction, ignition retard, and newer low emission engines (Tier II or better). Though volatile organic compound (VOC) control measures are usually not required in PM_{2.5} nonattainment areas unless it is demonstrated that their presence contributes significantly to PM_{2.5} concentrations, their dual application in reducing ozone precursor gases suggest it may be prudent to include VOC controls in the overall emission control package. Examples of VOC controls that can be used for oil and gas development and production include flaring, green completions, vapor recovery, dehydrator and pneumatic controls, and fugitive leak detection. Several of these measures are included in the operator's ACEPMs for this project (see **Section 2.1.15.1**)

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, benzene, toluene, ethylbenzene, isomers of xylene (BTEX) compounds, and normal-hexane (n-hexane).

The CAA requires the EPA to regulate emissions of toxic air pollutants from a published list of industrial sources referred to as "source categories." As required under the CAA, EPA has developed a list of source categories that must meet control technology requirements for these toxic air pollutants. Under Section 112(d) of the CAA, the EPA is required to develop regulations establishing national emission standards for hazardous air pollutants (NESHAP) for all industries that emit one or more of the pollutants in major source quantities. These standards are established to reflect the maximum degree of reduction in HAP emissions through application of maximum achievable control technology (MACT). Source categories for which MACT standards have been implemented include oil and natural gas production and natural gas transmission and storage.

There are no applicable Federal or State of Utah ambient air quality standards for assessing potential HAP impacts to human health. Therefore, reference concentrations (RfC) for chronic inhalation exposure and Reference Exposure Levels (REL) for acute inhalation exposures are applied as significance criteria. **Table 3-9** 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 3.9. HAP Reference Exposure Levels and Reference Concentrations

Hazardous Air Pollutant (HAP)	Reference Exposure Level (REL 1-hr Average) ($\mu\text{g}/\text{m}^3$)	Reference Concentration ^a (RfC Annual Average) ($\mu\text{g}/\text{m}^3$)
Benzene	1,300 ^{b, c}	30
	160,000 ^d	-
Toluene	37,000 ^b	5,000
Ethylbenzene	350,000 ^d	1,000
Xylenes	22,000 ^b	100
n-Hexane	390,000 ^d	700
Formaldehyde	94 ^b	9.8

^aEPA Air Toxics Database, Table 1 (EPA 2007a)

^bEPA Air Toxics Database, Table 2 (EPA 2007a) REL from California EPA (most conservative level in Table 2)

^cREL for benzene is for a 6-hr average.

^dImmediately Dangerous to Life or Health (IDLH)/10, EPA Air Toxics Database, Table 2 (EPA 2007a) since no REL is available

Greenhouse Gases

Greenhouse gases keep the planet's surface warmer than it otherwise would be. But, as the concentrations of these gases continue to increase in the atmosphere, the Earth's temperature is climbing above past levels. According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2 to 1.4° F in the last 100 years. The eight warmest years on record (since 1850) have all occurred since 1998, with the warmest year being 1998. However, according to the British Meteorological Office's Hadley Centre (BMO 2009), the United Kingdom's foremost climate change research centre, the mean global temperature has been relatively constant for the past nine years after the warming trend from 1950 through 2000. So while most scientists believe that Earth will continue to warm in the future, this warming has not occurred for the past ten years. Therefore, quantified or globally accepted predictions on the ultimate outcome of global warming are still unknown. The warmest year on record was 1998, a year associated with the most intense El Nino global phenomena ever experienced. Most of the warming from 1950 through 2000 is speculated to be the result of human activities. Other aspects of the climate, such as rainfall patterns, snow and ice cover, and sea level, are also changing.

3.2.10 VISUAL RESOURCES

The Tumbleweed II Project Area consists of flat top ridges and open canyons that offer scenic vistas. The canyon walls of Willow Creek and Upper Canyon Bottom have gently sloping terraces alternating with steep, cliff-forming outcrops. Dominant vegetation includes pinyon-juniper interspersed with bunch grasses, sagebrush, and rabbit brush. The area also includes isolated stands of aspen and fir, and patches of oak brush and mountain mahogany. The Tumbleweed II Project Area offers a predominantly natural appearing landscape with little evidence of human activity. Human imprints within the southernmost portion of the Tumbleweed II Project Area include the existing Winter Ridge Road and pipeline. The Project Area also includes an existing unnamed and unmaintained road leading to historical oil and gas developments. Deep canyons and narrow ridges as well as the diversity of vegetation screen most human intrusions from sight within the area. There are no developed recreation facilities, residential dwellings, critical viewpoints, or commonly traveled viewer sensitive routes that would be considered as Key Observation Points within the Tumbleweed II Project Area.

According to the Vernal Field Office Approved RMP, the entire Tumbleweed II Project Area has been designated by the BLM as VRM Class III. The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate.

3.2.11 NON-WSA LANDS WITH WILDERNESS CHARACTERISTICS

Non-WSA lands with wilderness characteristics are defined as areas having at least 5,000 acres in a natural or undisturbed condition, and provide outstanding opportunities for solitude or primitive forms of recreation. The Tumbleweed II Project Area is completely contained within an 11,802-acre area that was inventoried by BLM in 2007 and found to have wilderness characteristics. Within the 2007 inventory of the Wolf Point area, there were an additional 2,764 acres that were inventoried and found not to have wilderness characteristics. This information is documented in a 2007 Wilderness Characteristics Review completed by the Vernal Field Office and further discussed in the Vernal Proposed Plan/Final EIS on pages 3-43 through 3-48.

As illustrated in **Figure 3-5**, the 11,802 acres of the Wolf Point area that were found to have wilderness characteristics are located north of the existing Winter Ridge Pipeline and west of the Bull Canyon Road. In 2007, Stewart Petroleum drilled the TUF #18-9 in the wilderness characteristics area and constructed approximately 0.6 miles of new access road co-located with surface-laid pipeline, and upgraded approximately 1.7 miles of existing two-track. To estimate the indirect impacts of this existing development on wilderness characteristics, a ½ mile sight and sound buffer was applied to all existing roads and well pads in the Tumbleweed Project Area. This GIS based exercise showed that of the 11,802 acres of non-WSA lands with wilderness characteristics, approximately 2,234 acres currently fall within ½ mile of existing access roads and oil and gas related development.

The ROD for the Approved Vernal RMP (2008) did not carry the Wolf Point area forward as a BLM natural area for the protection, preservation, or maintenance of the wilderness characteristics. This management decision was based on analysis in the Vernal Proposed Plan/Final EIS (2008), which showed Wolf Point as being located in an oil and gas development area with a moderate to high potential for future development. Page 4-227 of the Vernal Proposed RMP/Final EIS showed that 53 percent of the Wolf Point area is currently under lease. Given the existing leases, resource potential, level of past production, and ongoing exploration and development in the area, it was anticipated, under the Proposed RMP, that Wolf Point would have a direct loss of natural characteristics and opportunities for solitude and primitive and unconfined recreation due to surface disturbance and sights and sounds of development. Ultimately, the Proposed RMP analysis showed that 99 percent of the Wolf Point area would be affected over the life of the Approved RMP. A full analysis of impacts to this area and other non-WSA lands with wilderness characteristics in the Vernal Field Office is contained in the Proposed RMP/Final EIS from pages 4-175 to 4-186. Under the Approved RMP the Wolf Point area is subject to other management decisions that allow for degradation or loss of the wilderness characteristics values.

During the RMP planning process, a BLM interdisciplinary team inventoried a total of 34 areas within the Vernal Field Office to determine if they possessed wilderness characteristics. The Vernal Field Office determined that 25 of the 34 areas outside of existing WSAs, totaling about 277,596 acres, were found to have wilderness characteristics. At the same time, they determined that 133,723 acres did not possess wilderness characteristics. The lands found to have wilderness characteristics were carried through the land-use planning process to assess the impacts of management options on these lands and to determine how their wilderness characteristics would be managed. The ROD for the Approved RMP carried forward 14 areas totaling 106,198 acres as BLM natural areas that are to be managed to protect, preserve, and maintain their wilderness characteristics values. The other lands are subject to other management decisions that allow for degradation or loss of the wilderness characteristics values.

This page intentionally blank.