CHAPTER 3

AFFECTED ENVIRONMENT

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing environment of the Planning Area, including the physical, biological, human, and management environments (Sections 3.2 through 3.5, respectively). The descriptions provide a baseline against which to compare the impacts under each alternative. Figure 1-1 shows the location of the Planning Area in relation to the region and the State of Colorado. Figure 1-2 shows the land status (ownership and management) of the Planning Area, including NOSRs 1 and 3 and areas with private surface but Federal minerals. Figure 1-3 in Chapter 1 depicts site topography using a hill shade simulation based on a digital elevation model (DEM) obtained from the U.S. Geological Survey (USGS). Figure 1-3 also shows the location of the line used to differentiate between areas referred to as "atop the plateau" versus "below the rim," or similar descriptors.

Information used in the following sections is based on existing BLM or other Federal agency publications and reports (especially the GSRA RMP, as revised and amended, the 1997 WRRA RMP, the 1999 FSEIS, the AMS prepared by GSFO staff, and publicly available sources in the published literature or through internet websites. Specific references are cited throughout.

The 1984 GSRA RMP and 1997 WRRA RMP were amended on February 12, 1997, by the Colorado Standards for Public Land Health for all BLM lands in Colorado. These Land Health Standards describe the conditions needed to sustain public land health, and apply to all program uses on public lands. Where applicable, resources described in the following sections are assessed in terms of the Land Health Standards (Appendix F).

3.2 PHYSICAL ENVIRONMENT

3.2.1 Geology

3.2.1.1 Regional Setting

The Planning Area is located in west-central Colorado, on the northeastern edge of the Colorado Plateau physiographic province. The Planning Area lies west of the Grand Hogback monocline, a northwest-trending feature that separates the Colorado Plateau from the White River Plateau of the Southern Rocky Mountain province to the east (Press and Siever 1974).

The term "Roan Plateau" is a topographic term used to describe the area above (north of) the Roan Cliffs, located north of the Colorado River, west of Government Creek, and east of Parachute Creek. Map 13 is a geologic map of the Planning Area. Elevations range from approximately 5,200 feet above mean sea level (MSL) along the Colorado River to nearly 9,300 feet MSL atop the plateau. The top of the plateau slopes generally northward and is steeply dissected by generally west-flowing tributaries of Parachute Creek. The eastern, southern, and western edges of the plateau are defined by steep slopes and prominent cliffs, known as the Roan Cliffs.

3.2.1.2 Bedrock and Surficial Geology

Exposed bedrock in the Piceance Basin consists of sedimentary units ranging from Upper Cretaceous (late Mesozoic) to Middle Eocene (early Cenozoic) in age. Bedrock is exposed on dissected uplands, cliffs, and hogbacks. Outcrops in the Planning Area include the upper portion of the Piceance Basin sequence: the Eocene Uinta, Green River, and Wasatch Formations, ranging from 42 to 58 million years in age. The youngest and highest of these, the Uinta Formation, forms the undissected upland surfaces on top of the

plateau. The Uinta Formation includes up to 1,000 feet of siltstone with interbedded sandstone and marlstone.

The Uinta Formation is underlain by predominantly lacustrine (lake-deposited) rocks of the Green River Formation, which contains the oil shale for which the area is well known. Deep, narrow stream valleys that dissect the upland surfaces expose the Parachute Creek Member of the Upper Green River Formation, while the older (lower) Garden Gulch Member is exposed in the deepest portions of some of the canyons. The Anvil Points Member is exposed along the high (Roan) cliffs on the eastern and southern edges of the Roan Plateau. Both the Parachute Creek and Anvil Points Members are up to 1,900 feet thick, while the Garden Gulch Member is less than half that thickness. A small amount of the Douglas Creek Member crops out below the Anvil Points Member on cliffs in the southwestern corner of the Planning Area.

The Wasatch (DeBeque) Formation—the oldest of the bedrock units exposed within the Planning Area—underlies the Green River Formation and is approximately 6,900 feet thick near the town of Rifle, including a 500-foot exposed section along the Roan Cliffs. Exposed Wasatch rocks include clays and shales with some interbedded sandstone and are found in the lowest elevations of the Planning Area, between the base of the cliffs and the major streams that surround the site (the Colorado River, Government Creek, and Parachute Creek). The Wasatch Formation is one of the strata that produce oil and natural gas in the region. The bottom of the Wasatch Formation is not exposed within the Planning Area, nor is the underlying Late Cretaceous Mesaverde Group. The latter is several thousand feet thick and is the major oil- and gas-producing formation beneath the Planning Area.

Quaternary alluvium occurs as a broad belt along the lower reaches of Parachute, Rifle, and Government Creeks and along the Colorado River (U.S. Soil Conservation Service [SCS, now the NRCS] 1985).

Elsewhere in the region, the Grand Hogback exposes Paleozoic and Mesozoic sedimentary bedrock units that dip steeply to the west and southwest. Tertiary basalt flows cover much of the higher elevation areas south of the Colorado River (i.e., Battlement Mesa) and the White River Plateau to the northeast. Volcanic tuffs and some evaporite deposits occur in the Parachute Creek Member of the Green River Formation north of the Planning Area. Glacial deposits are widely distributed throughout the higher elevations of the region, but not within the Planning Area.

3.2.1.3 Anvil Points Claystone Cave

A claystone cave known as the Anvil Points Cave is located below the rim in the south-central portion of the Planning Area (Map 13). A natural arch feature formed of claystone and sandstone in the Wasatch Formation is associated with the cave. Both features are considered unique, fragile, and regionally significant (BLM 2002a).

The cave has been noted as one of the longest verified caves of this type in the world. The cave system is intact and has limited signs of use, most dating back to early recreational users as evidenced by the presence of graffiti at the cave dating to 1947. Research has shown that recreational use and graffiti started with residents and employees from the nearby Anvil Points experimental station (BLM 2002a).

The cave complex poses management concerns regarding public safety as it relates to potential collapses due to drilling and/or seismic activity.

The Anvil Points Cave area was leased subsequent to the 1999 FSEIS. The lease has an NSO stipulation attached under the FSEIS to protect the cave resources against ground-disturbing activities such as oil and gas drilling and to avoid difficulties inherent in drilling such locations; no surface occupancy is permitted in the area encompassing the cave openings and subsurface features and the watersheds immediately above the caves. This stipulation does not provide for protection of other resource uses and/or reduce or minimize safety concerns. However, any new stipulations developed under the amended management plan would not apply to these pre-existing leases.

BLM has some concern about highlighting this geologic resource, because increased visits could have a negative effect on the resource conditions and could create a risk of injury associated with visitation by inexperienced cavers (spelunkers). Because of this concern, BLM does not make information concerning the specific location of the cave available to the public, pursuant to 5 USC 522 and as stated at 43 CFR 37. Additionally, the Anvil Points Cave is under consideration to be listed under the Federal Cave Protection Act of 1988 as part of this planning process.

3.2.1.4 Geologic Hazards

The Piceance Basin is a structural basin that trends generally northwest-southeast and is asymmetrical, with steeper dips on the eastern limb. The axis of the Piceance Basin lies generally west of the Planning Area. A baseline characterization of NOSRs 1 and 3 prepared for DOE (1992) concluded that no major faults are present within these portions of the Planning Area. One small fault was identified in the Uinta Formation in the northwestern portion of the Planning Area, but this fault was concluded not to represent a geologic hazard. Joints—fractures in bedrock that do not involve offset (displacement) of rocks—were found to be rather common in the Planning Area (TRW 1982). While these may have posed some hazard to underground mining for oil shale due to instability of rock pillars, they do not pose a seismic (earthquake) risk and would not affect potential oil and gas development or any other anticipated uses of the Planning Area.

Overall, the Planning Area is in an area of relatively low seismic risk (Seismic Risk Zone 1)(Richter 1958). The most severe earthquakes expected within this seismic risk zone correspond to Modified Mercalli intensities V and VI. These intensities could offset small, unstable objects (e.g., items on a shelf) or potentially cause cracks in plaster or masonry.

A more common geologic hazard in the Planning Area is associated with instability of soil and bedrock in areas of steep slopes. The potential hazard from mass wasting is evident when observing the Roan Cliffs: areas beneath the cliffs are covered with scree, talus, and rockfall from the exposed bedrock due to undercutting of cliffs by erosion of softer underlying strata.

3.2.2 Paleontological Resources

Paleontological (fossil) resources of the Roan Plateau and southern Piceance Creek Basin have been professionally studied since the turn of the 20th century (Armstrong and Kihm 1980). Earl Douglas collected vertebrates for the Carnegie Museum (CM) in 1903, followed by Leroy Kay in the 1950s. Vertebrates, invertebrates, and plants were collected for the University of Colorado Museum in Boulder (MCU) in the 1920s by T.D. Cockerell and from the 1970s to present by Allen Kihm, Peter Robinson, and Paul Murphy. In the 1930s and 1940s, Bryan Patterson collected vertebrates for the Field Museum of Natural History (FMNH) in Chicago.

David Kohls worked several localities for the Smithsonian National Museum of Natural History (NMNH) in the 1990s, and Ivan Kladder's collection from the 1960s went to the Museum of Western Colorado (MWC). Scientific interest in the paleontologic record of the Planning Area lies in the major Eocene fossil assemblages that are preserved in a fairly continuous record of deposition of sediments within a closed basin 43 to 52 million years ago. During this time, the Piceance Basin was a tropical to subtropical region teeming with rich floral and faunal ecosystems. Paleontologically, the important rock units comprise three major formations: the Wasatch (DeBeque), Green River, and Uinta Formations (oldest to youngest). Each formation intertongues with the overlying formation due to fluctuations in depositional environments, creating a stratigraphic challenge when defining the extent of each mapable unit.

The Wasatch or DeBeque Formation is the lowest of the geologic units exposed in the Planning Area. Johnson and May (1978) described three members of the Wasatch in the Piceance Creek Basin. The Atwell Gulch Member is the lowest of the three and is composed of both alluvial plain environments marked by mudstones and channel sands and a paludal (swamp) environment marked by carbonaceous

clays and thin coals. The middle member is the Molina, dominated by fluvial sand facies and conglomeratic lenses indicative of braided stream environments. The upper Shire Member contains both alluvial plain environments with very few channel sands and marginal lacustrine (lake) environments characterized by woody coals. In the Roan Plateau region, the Wasatch is mapped as undifferentiated and identified as the Shire Member only east of Parachute Creek and south of the Colorado River (Hail and Smith 1997).

In the Planning Area, exposures of the Wasatch are found at the base of the cliffs north of the Colorado River (I-70), east of Parachute Creek (CR 215), and west of Government Creek (SH 13). Over 180 known fossil localities occur in the Wasatch Formation within the boundaries of the Planning Area. These localities contain rich and scientifically critical terrestrial early Eocene mammal fauna. One of the earliest known rodents, *Paramys*, and the earliest known member of the horse family, *Hyracotherium*, occur in the Wasatch, as do several strange families of mammals that did not evolve into forms extant today. A common dead-end mammalian lineage was the pantodonts, represented by the tusked hippo-like *Coryphodon*. In addition to the important mammal fauna, flamingo-like birds, horned crocodiles, diverse turtles, and freshwater clams and snails are also common in Wasatch fossil localities.

The Green River Formation is a lacustrine deposit associated with a huge freshwater lake (Lake Uinta) that filled the closed Uinta Basin. The lowest member of the Green River Formation near the Planning Area (and possibly in it) is the Cow Ridge Member. In the western half of the Piceance Creek Basin, the Cow Ridge Tongue of the Green River Formation extends southeastward into the Wasatch Formation. This unit is a mix of sandstone, limestone, and shale of early Lake Uinta. The Cow Ridge Member bears fish, turtles, crocodiles, flamingoes, and a diverse assemblage of fresh-water mollusks (Johnson 1984). It is underlain and overlain by the Wasatch Formation and was arbitrarily terminated as a map unit at Conn Creek, although it extends farther east (Hail and Smith 1997).

The top of the Wasatch Formation is marked by a distinctive persistent gastropod-rich bed known as the Long Point bed of the Green River Formation. This unit signifies the abrupt change from the fluvial depositional environments of the Wasatch Formation to the lacustrine environments of the Green River Formation (Johnson and May 1978). The bed ranges in thickness from approximately 8 inches to approximately 46 feet and is sandier in the Roan Plateau, where it is less fossiliferous (Johnson 1984).

In the area of the Roan Plateau, the lower Green River Formation consists of the Garden Gulch Member (630 to 720 feet thick) overlying the Anvil Points Member (430 to 470 feet thick), which Duncan and Denson (1949) called the Douglas Creek Member. The Formation shows the Garden Gulch Member grading into the Anvil Points Member at Wheeler Gulch in the southwestern part of the Planning Area (O'Sullivan and Hail 1987). Duncan and Denson (1949) called the lower part of the Green River Formation east of Wheeler Gulch the Lower Sandy Member where units become less distinctive from one another. However, the unit still bears the characteristic beds rich in algae, oolities, and ostracods seen in the Garden Gulch and Douglas Creek Members and is interpreted as sandy marginal lacustrine to deltaic facies (Johnson and May 1978). These units occur in the steep slopes of the Roan Plateau, below the Roan Cliffs.

The upper member of the Green River Formation is the kerogen-rich (shale oil-bearing) lacustrine facies of the Parachute Creek Member. This distinctive member is a black, brown, and gray cliff-forming, thinly bedded organic marlstone that includes the principal oil shale zones of the Green River Formation. This member is exposed just below the top of the plateau and forms the steep, 500-to-1,000-foot-high cliffs and slopes. One of the more distinctive beds in the Parachute Creek Member is the Mahogany Ledge, on which Waldron et al. (1951) based their structural contours, and which is higher to the southwest (at 7,900 feet southwest of Roan Creek) and lower to northeast (7,200 feet at the head of Parachute Creek). The Parachute Creek Member is thickest southward and rises stratigraphically from north to south due to the southward pinchout of three separate tongues of the Uinta Formation, which extend southwest into the Green River Formation.

World-class insect and leaf localities occur in the Parachute Creek Member of the Green River Formation of the Roan Plateau area (Dayvault et al. 1995). Six sites on BLM land and two on private land were collected by David Kohls for the Smithsonian Institution between the "A and B groove," lying 150 to 180 feet below the Mahogany Ledge (Kohls 2003, personal communication). The result of those efforts is the largest unbiased collection of any fossil insect community. Over 100,000 specimens of lakeshore insects, spiders, and leaves representing 23 orders and 1,000 to 1,500 species are now curated at the NMNH. Several type species have yet to be formally described and are currently being studied by workers all over the world (Conrad Labandeira, personal communication 2003).

Prior to the work of Cashion and Donnell (1974), the top of the Roan Plateau was considered the Evacuation Creek Member of the Green River Formation, but is now recognized as the main body of the Uinta Formation. In the upper part of the Parachute Creek Member of the Green River Formation, and below the main body of the Uinta, lies a thick, complex sequence of inter-tongued units of both formations. To the north, these Uinta tongues thicken and converge into the main body of the Uinta Formation. To the south, the tongues of the Green River Formation thicken and converge into the main body of the Parachute Creek Member (Hail et al. 1997).

The main body of the Uinta Formation is well known in northwestern Colorado, Wyoming, and eastern Utah for its scientifically important mammal fauna. However, paleontological pedestrian surveys within the main body of the Uinta on top of the Roan Plateau have yielded only sparse and scrappy bone fragments (Armstrong 2003, personal communication). Little paleontological investigation has been done in the complex interval where the many named and unnamed Uinta and Green River tongues interfinger. Some fossil plants were recovered from the sandy units of the Uinta tongues on the eastern side of Parachute Creek during construction of the American Soda Yankee Gulch Pipeline (Bilbey et al. 2001), but no other surveys have been reported from this interval. Paleontologically, these units would be considered areas of good fossil potential, and the marginal lacustrine environments are likely to bear diverse and densely rich faunal and floral ecosystems.

3.2.3 Soils

3.2.3.1 General Soil Characteristics

Soils of the Planning Area are described in detail in the soil map of the Rifle area (SCS [NRCS] 1985). The survey covers the Planning Area and includes a general soil map (1:253,440), detailed soil maps of individual 7.5-minute quadrangles on aerial photograph bases (1:24,000), descriptions of soil series and map units, and information useful for detailed soil management planning.

The soil survey mapped and described 44 soil units in the BLM portion of the Planning Area, with 20 dominant soils comprising 97 percent of the area. Soils in the Planning Area can be described in four groups: soils atop the plateau, soils below the rim in the southern and western areas, soils below the rim in the eastern area, and alluvial soils along major drainages. These are described below.

3.2.3.2 Soils atop the Plateau

Moderately sloping uplands atop the Planning Area, at elevations of 7,500 to 9,300 feet MSL, are mostly well-drained, cool soils with dark-colored, organic-rich surface layers (Cryoborolls). These soils are formed in material weathered from the Green River Shale and Uinta Sandstone. Surface textures are generally loam, with loam to clay loam subsoils and channery profiles (sandstone and shale fragments). Soil thicknesses range from deep (>60 inches) in swales to shallow (<20 inches) on ridge tops. The principal soil map units above the rim, listed in order of predominance, include:

- Irigul Channery Loam, 9 to 50 percent slopes
- Northwater Loam, 15 to 65 percent slopes

- Parachute Rhone Loams, 5 to 30 percent slopes
- Parachute Loam, 25 to 65 percent slopes
- Rhone Loam, 5 to 30 percent slopes
- Rhone Loam, 30 to 70 percent slopes

Together, these soils constitute 45 percent of the BLM lands in the Planning Area, or about 30,000 acres. Where slopes are less than 30 percent, most have surface horizons suitable for salvage and use as reclamation material. The Irigul Channery Loam on slopes less than 30 percent is generally less suitable for reclamation due a high percentage of small rock fragments, although they probably are satisfactory except where excessively rocky.

The soils on top of the plateau are not particularly susceptible to impacts from wind erosion. In an undisturbed condition, they tend to be relatively well vegetated. Where disturbed, the typically loamy texture, relatively high organic matter content, and granular surface structure tend to resist wind erosion.

Except for a limited area of steep slopes along the East Fork Parachute Creek, all of the upland soils atop the plateau are in the low or medium erosion classes, and most occur on slopes of less than 30 percent. Annual precipitation is about 25 inches, and average annual temperature is about 40 degrees Fahrenheit (40F).

3.2.3.3 Soils below the Rim, Southern and Western Areas

The escarpment known as the Roan Cliffs marks the boundary between areas above and below the rim. The area below the rim on the southern and western sides of the Planning Area is characterized by cliffs, talus, and steep colluvial slopes of Green River shale. The area is dominated by shallow, poorly developed soils and rock outcrops, listed as Torriorthents – Rock Outcrop map units in the soil survey (SCS 1985). Below the cliffs and talus is a zone of soils formed from colluvium and Wasatch Formation. This zone includes rock outcrops, badlands, moderately sloping valleys, and fans draining into the Colorado River.

The badlands are steep, nearly barren, and dissected by many ephemeral drainages eroded into soft shales, siltstones, and sandstones. Soils on the upper slopes have a thin organic-rich surface layer and little development of soil horizons. Soils on the lower slopes range from shallow to moderately deep (20 to 40 inches) and are well drained. Soils developed from the Wasatch Formation often have loam, clay loam, or silty clay loam surface textures and are moderately alkaline. Subsoils often have higher clay content and are calcareous. Erosion hazard is generally severe.

The principal soils below the rim in the southern and western areas are:

- Rock Outcrop – Torriorthents Complex, Very Steep
- Badlands
- Torriorthents – Camborthids – Rock Outcrop Complex, steep
- Ildefonso – Lazear Complex, 6 to 65 percent slopes

Together, these soils constitute 28 percent of the BLM lands in the Planning Area, or 19,000 acres. In general, they have poor reclamation potential due to steep, stony, and/or shallow topsoils and elevated salinity. Except for a few locations where the topsoil of these units may be suitable for salvage and use in reclamation, importation of soil may be needed to facilitate meeting reclamation standards.

In addition to generally less suitable physical or chemical characteristics, these soils occur in areas that are both drier and warmer than soils atop the plateau, with an average annual precipitation of 14 inches and an average annual temperature of 46F. The warmer, drier conditions than atop the plateau contribute

to the poorer reclamation potential of soils below the rim and also make these soils more susceptible to wind erosion—due both to the lower soil moisture and the generally sparser plant cover. However, because of the steep slopes on which these soils occur, water erosion is a potentially greater constraint.

3.2.3.4 Soils below the Rim, Eastern Area

Soils below the rim in the eastern part of the Planning Area are more complex, occurring on steep mesa breaks and alluvial fans ranging downward to mesas, terraces, and benches. These soils are in a variety of subgroups including Haplargids, Torriorthents, Cryoborolls, Argiborolls, Cryorthents, and Calciorthids. These soils are generally formed in alluvium, with a few formed in residuum derived from shales and sandstone. Some are formed from eolian (wind-deposited) material. Average annual precipitation ranges from 12 to 14 inches. The soils range from shallow to deep, are well drained, and have very slow to moderate permeability. Most have loam surface textures underlain by sandy loam to clay loam. These soils are mildly to strongly alkaline and are often calcareous. Erosion hazard is moderate or severe.

The dominant soils below the rim in the eastern area are:

- Cushman – Lazear Stony Loams, 15 to 65 percent slopes
- Ildefonso Stony Loam, 25 to 45 percent slopes
- Irigul Channery Loam, 50 to 70 percent slopes
- Irigul – Starman Channery Loams, 5 to 50 percent slopes
- Jerry Loam, 12 to 50 percent slopes
- Villa Grove – Zoltay Loams, 15 to 30 percent slopes
- Torriorthents – Rock Outcrop Complex, steep

Together, these soils constitute 20 percent of the Planning Area, or about 14,000 acres. They typically are suitable for reclamation but not particularly good sources of reclamation material for use at other sites. Topsoils of the Villa Grove and Zoltay Loams are suitable for salvage and use in reclamation and typically occur on slopes less than 30 percent. Topsoils of the Cushman – Lazear, Jerry, and Irigul – Starman soils are less suitable for use in reclamation but generally satisfactory for salvage on slopes less than 30 percent.

Soils below the rim in the eastern area are somewhat more susceptible to wind erosion than the soils atop the plateau but, with one exception, are not particularly susceptible to wind erosion. This is due primarily to the surface layers, which are mostly gravelly loams with granular texture. The exception is the Ildefonso soil which is formed from some aeolian materials that is expected to be more susceptible to wind erosion than the other soils in the area. Also, because of the steep slopes on which they occur, water erosion is generally a greater constraint than wind erosion.

3.2.3.5 Soils along Major Drainages

Soils formed in alluvium derived from sandstones and shales occur on benches, terraces, alluvial fans, and floodplains in the valleys of the Colorado River and Parachute, Government, and Rifle Creeks. These soils are deep, well drained to somewhat poorly drained, and nearly level to gently sloping. Surface textures range from loam and sandy loam to clay loam, underlain by sandy loam to clay. Precipitation ranges from 12 to 14 inches. Soils are calcareous, moderately to strongly alkaline, and some are highly saline. Permeability ranges from very slow to moderately rapid, and erosion hazard for most soils is moderate; a few are severe.

Also present along these lower elevations are clayey soils affected by excess sodium and areas where groundwater fluctuates between 2 and 4 feet deep and may be near the surface during spring. Some areas have deep, nearly level, well-drained soils suitable for growing irrigated crops and hay.

The principal soils along the major drainages are:

- Arvada Loam, 1 to 6 percent slopes
- Arvada Loam, 6 to 20 percent slopes
- Silas Loam, 3 to 12 percent slopes

Together, these soils comprise 3 percent of the Planning Area, or about 2,000 acres. The topsoil of the Arvada loam is poor but suitable for salvage. The Silas loam is a good source of topsoil for reclamation.

The Arvada soil is more susceptible to wind erosion than most of the other soils of the study area. The surface layer is low in organic matter, strongly alkaline, sparsely vegetated, and droughty. The Silas soils are much less susceptible to wind erosion; they have organic rich, well drained loam surface horizons.

3.2.3.6 Erodibility

In terms of this RMPA/EIS, the most important soil characteristic affecting future management decisions is the erosion hazard or erodibility. While the 1985 soil survey (SCS [NRCS] 1985) describes the erosion hazard of each map unit in broad terms, BLM's 1999 FSRMPA/EIS assigned each map unit to one of four erosion classes based on natural rates of soil loss (Map 14). The average annual soil loss (tons per acre), number of acres within the Planning Area, and general distribution of soils in the four soil-erosion classes in the Planning Area are presented in Table 3-1. These erosion classes were determined by Mike McGuire, Rangeland Management Specialist with the GSFO (data file RP_SOILS). The average loss rates for the four erosion hazard classes are for undisturbed soils in natural or normal situations.

Table 3-1. Soil Erosion Classes, Areal Extent, and Location in the Planning Area

Erosion Class	*Soil Loss (tons/acre/year)*	*Acres*	*Principal Location in Planning Area*
Low	1 to 2	34,300	Gentle, well-vegetated slopes on drainage divides atop the plateau
Moderate	2 to 5	61,300	Moderate slopes along drainages atop the plateau and broad areas of moderate relief and good vegetation cover below the rim
Severe	5 to 12	24,900	Moderate to steep slopes with poor vegetation cover on shallow soils and rock outcrops along the cliffs and in gulches extending away from the cliffs; steep slopes of East Fork Parachute Creek canyon
Very Severe	12 to 30	6,500	Steep slopes with poor vegetation cover in badlands below the rim

The erodibility of a soil is affected by its inherent tendency for constituent soil particles to become detached and made available for transport, which is related to physical characteristics such as texture and percent organic matter. It is also affected by other site characteristics such as soil type, aspect, slope length and steepness, vegetation cover, and the magnitude and duration of rainfall and snowmelt events.

A land health assessment was performed for the area above the rim in 1999 (BLM 2001d). Physical indicators of soil health and function were assessed at 25 locations, including all of the livestock allotments in the Planning Area. Ten indicators—surface litter (dead remains of previous years' plant growth), soil movement by water, flow patterns, soil movement by wind, soil crusting and surface

sealing, compaction layer, rills, gullies, cover amount, and cover distribution—were used to determine upland soil health. Insects and burrowing animals appeared to be mixing the soils, thereby increasing aeration and mineral recycling. Vegetation cover was excellent. No signs of soil movement, soil pedestals, fills, or litter accumulation were observed. At many sites, the combination of vegetation, rock, and litter cover was at or near 100 percent of the soil surface. This assessment indicates that soils were properly functioning at all of the assessment sites.

An interdisciplinary team also evaluated land health at sixteen locations below the rim on the eastern side of the Planning Area in 2001. Generally, lower elevation areas in the south were not functioning as well as those to the north. Some of the lower ratings occurred because of naturally limited site potential, but in the Hubbard Mesa allotment, human activities such as OHVs, illegal dumping, livestock grazing, and drainage from roads, trails, and constructed facilities had affected soil conditions. OHV use around the JQS Road and to the south and livestock grazing along Government Creek and lower Thirty-Two Mile Gulch appear to have had the greatest negative impact on soils. As a result of these disturbances, soils are not meeting the upland soils Land Health Standard (#1)(BLM 2002a). Other allotments (Webster Park, Doodlebug, Magpie Creek, and Rees) are in good condition and meet this standard.

Soils in much of the western Planning Area below the rim are badlands with poorly developed soils, low precipitation, poor vegetation cover, and severe erosion rates. A land health assessment conducted in the Rifle-West Landscape Unit in 2004 (BLM 2005c) concluded that all assessed sites in this area below the rim met the upland soil Land Health Standard (#1) on a site-by-site basis. However, some areas across this watershed exhibit accelerated soil erosion. In particular, Cottonwood Gulch has experienced soil erosion from adjacent roads where maintenance activities have pushed soil into the channel.

3.2.3.7 Compaction

Soil compaction is a complex process that depends on the nature of the loading and moisture content of the soil, as well as characteristics such as particle size, organic matter content, structure, and percent of coarse fragments. Soil compaction due to operation of heavy equipment may make soils unsuitable for reclamation that otherwise would be suitable. All of the soil map units described above are susceptible to compaction, particularly when wet. Reclamation potential of the soils is reduced when compacted, generally requiring that the soils be ripped and scarified to restore a condition that allows infiltration of moisture and air and penetration by plant roots.

3.2.4 Water Resources

3.2.4.1 Surface Water

Planning Objective

Various Federal and State laws regulate surface water quality and yield, including the Clean Water Act, Water Quality Control Act, Colorado River Salinity Control Act, Safe Drinking Water Act, FLPMA, Public Land Health Standards, and the regulations set forth by COGCC for energy development. BLM must also comply with Executive Orders, such as *Floodplain Management* and *Wetland Management*.

Surface water in the Planning Area is currently being managed under guidance from the 1988 GSRA and 1997 WRRA RMPs. The planning objectives related to surface water are:

1. 1984 GSRA RMP for public lands below the Roan Plateau Rim
   - Maintain or improve existing water quality in the resource area where possible.
2. 1997 WRRA RMP
   - Maintain and improve both water quality and quantity to be compatible with existing and anticipated uses and to comply with applicable State and Federal water quality standards.

- Continue to work with the State of Colorado to identify and survey streams having high public values.

Physical Characteristics and Setting

The Planning Area lies within the Upper Colorado River Basin, which encompasses an area of approximately 17,800 square miles. The Colorado River originates in the mountains of central Colorado and flows southwesterly for more than 200 miles into Utah. The topography varies from rugged mountainous regions in the east to high plateaus bordered by steep cliffs along valleys in the west. The climate within the basin ranges from alpine conditions to semi-arid/arid conditions (USGS 2000).

The climate of the Planning Area is semi-arid, with annual precipitation ranging from 10 inches at lower elevations near I-70 to approximately 25 inches atop the plateau. Peak flow on the rivers and streams usually occurs in May. Deeper snowpacks typically delay peak flows, while lower snowpacks result in early peak flows. Intense summer cloudbursts are common and can lead to substantial runoff, often representing peak flows in smaller streams.

The Planning Area includes three primary hydrologic areas: (1) Parachute Creek tributaries atop the plateau and in the western end of the area below the rim, (2) Government Creek tributaries below the rim in the eastern part of the site area, and (3) south-trending ephemeral and intermittent gulches and washes that drain most of the area along and below the rim and flow directly into the Colorado River. A small portion in the extreme northeastern corner of the Planning Area drains into Cow Creek, which is a tributary of Piceance Creek north of the site. The three primary hydrologic areas are described below. Stream discharge (flow) and water quality data are provided in Tables 3-2 through 3-6 at the end of this section.

Parachute Creek and Tributaries — Parachute Creek flows through a narrow valley of high topographic relief (1,000 feet or more) for most of its length. As it approaches the Colorado River, the floodplain widens and relief becomes more moderate (100 feet to 1,000 feet). Parachute Creek has a sinuous to meandering planform; channel gradient below the confluence with West Fork is approximately 2 percent, dropping roughly 900 feet in 10 miles.

The Parachute Creek basin covers approximately 200 square miles and includes nearly all of the area on top of the plateau. Only an area of 548 acres along the northern edge drains into the Piceance Creek basin. Elevations of portions of the basin within the Planning Area range from 9,300 feet on high points north of the cliffs to 5,100 feet at the confluence of Parachute Creek with the Colorado River. Higher elevations atop the plateau, combined with dissected topography and extensive areas of north-facing slopes, result in a persistent snowpack, greater than 3 feet deep in most years. Snowpack accounts for approximately 60 percent of the average annual precipitation on top of the plateau (TRW 1982).

The main tributaries of Parachute Creek within the Planning Area are the East Fork and East Middle Fork of Parachute Creek, which TRW (1982) calculated as providing approximately 50 and 45 percent, respectively, of the total annual runoff from NOSR 1 during their monitoring program. Both of these streams have narrow floodplains that widen near their confluence with Parachute Creek. Both are straight to sinuous, with moderate valley relief above their respective falls (where they drop abruptly from the top of the plateau) and high relief below the falls. Channel gradients for these tributaries are approximately 4 to 5 percent.

Average annual streamflows in the basin range from less than 0.5 cubic feet per second (cfs) in the headwaters of small tributaries to approximately 32 cfs where Parachute Creek enters the Colorado River. Average peak discharges range from less than 10 cfs in tributaries to 600 cfs near the confluence. Mean low flows range from less than 0.1 cfs in tributaries to approximately 12 cfs near the confluence. Parachute Creek is a fifth-order stream as it joins the Colorado River.

Streamflows are highly variable not only during each year, but also from year to year. For example, the consulting firm TRW (1982) reported total annual discharges differing by more than an order of

magnitude (tenfold) at several gaging stations from 1977 through 1979. This reflects the variability in snowpack from the winter of 1976-77, which was one of the lowest on record, to that of 1978-79, which was deeper than average. Similarly, the winter of 2001-2002 had a record low snowfall in most of Colorado but was followed by a deep and persistent snowpack in the winter of 2002-2003. Adding to the variability in snowpack depth and persistence is annual variability in the timing and amount of spring and early summer rainfall in relation to the timing and rapidity of snowmelt.

Because of this variability, few streams in the Planning Area appear from the discharge data (e.g., Tables 3-3 and 3-4) to be perennial in the sense of carrying water throughout the year in all but extreme years. Besides Parachute Creek, these appear to include (based both on discharge data and the presence of Colorado River cutthroat trout populations) segments of Trapper Creek, Northwater Creek, East Middle Fork Parachute Creek, East Fork Parachute Creek, JQS Gulch, First Anvil Creek, and Second Anvil Creek (see Section 3.3.4)(Map 20).

Perennial segments of streams atop the plateau are typically in the lower reaches, but some middle reaches are also perennial due to inflow from numerous springs and the presence of numerous beaver dams that act as small impoundments. Many of the beaver ponds have old, unmaintained (inactive) dams that have evolved into more permanent features by infilling of sediments. Upper reaches of tributaries are generally ephemeral, carrying water only in response to snowmelt and heavy or protracted rainfall.

Although most of the Parachute Creek basin tributary streams are ungaged, flows are known to be small, consistent with their narrow drainage areas and locations in steep, narrow valleys. The two tributaries with USGS gaging stations, Northwater Creek and Ben Good Gulch, have baseflows well below 1 cfs, with annual peak discharges of roughly 100 cfs and 10 cfs, respectively. TRW (1982) reported annual peak flows from April to June as a combination of snowmelt and spring rainfall. After the completion of spring and early summer runoff, flows become more sporadic, depending on the frequency and intensity of summer thunderstorms. For some streams, TRW recorded no flow in late summer and fall.

The general pattern for tributary streams is of being gradually more persistent and carrying more flows in the downstream direction due to contributions of runoff from adjacent slopes, inflow from tributaries, and recharge from springs and groundwater (Section 3.2.4.2). However, this trend does not extend where the streams drop off the plateau to lower elevations below the cliffs east of Parachute Creek. For example, compare data for East Fork Parachute Creek above and below the falls (Table 3-2a). Lower baseflows below the cliffs are the result of warmer temperatures and seepage into thicker unconsolidated materials on the valley floors, combined with less runoff from adjacent dry terrain and a lack of spring recharge.

Government Creek and Tributaries — The Government Creek basin has a semiarid climate and covers approximately 50 square miles in a linear configuration between the Grand Hogback and Roan Cliffs. The basin, which includes no portion of the Planning Area atop the plateau, has an annual precipitation of roughly 10 inches. Elevations within the basin range from the high point of Monument Peak at elevation 9,196 feet to approximately 5,300 feet at the confluence with the Colorado River in Rifle. No USGS gages are present along Government Creek. Since streamflow is directly proportional to basin size, streamflow values can be generally approximated by making comparisons to adjacent basins of similar size, as long as watershed conditions are similar between the basins evaluated. Approximations of mean annual streamflow, average peak discharge, and mean low flow for Government Creek are 15 cfs, 250 cfs, and 2 cfs, respectively. Government Creek is a second-order stream as it joins the Colorado River.

The Government Creek valley becomes wider and less steep as it flows past the eastern edge of the Planning Area. The stream is straight to sinuous and has a gradient of 16 percent near the northeastern corner of the Planning Area, dropping roughly 1,300 feet in 1.5 miles. The stream along most of the eastern edge of the Planning Area is more meandering, with a slope of 2 to 3 percent. Floodplain width is also greater in the lower reaches, and adjacent relief is low (less than 100 feet) as the creek nears its confluence with the Colorado River.

Streams draining eastward toward Government Creek arise along the east-facing portion of the cliffs and are very steep in their upper ends, gradually decreasing in gradient as they approach their confluence. Seasonal flows in these streams are sustained by some snowmelt, but the lower elevations and more exposed terrain than atop the plateau result in highly variable snowpack depth and persistence. Most snowfall melts within a few days. Therefore, peak discharges occur earlier in the spring and summer, although minor snowpack in shaded gulches and seepage from talus slopes tend to delay or protract these flows somewhat. Following peak discharge, these streams are dry, except briefly in response to periods of heavy or protracted rainfall. Channel stability of these streams is generally poor due to poor vegetation cover and flashy flows. Natural flow characteristics are affected by some irrigation withdrawals.

Colorado River Tributaries — Tributaries to the Colorado River within the Planning Area are typically straight to sinuous channels, with low to moderate relief. Floodplain widths are narrow due to their steep gradients. Typical channel gradients are roughly 3 to 7 percent. Gulches draining the Colorado River are similar to the Government Creek tributaries in having steep headwater reaches that gradually flatten and broaden at lower elevations. These streams receive very little runoff from snowpack, with most snows melting quickly and behaving like rainfall events. Seepage from talus at the foot of the cliffs is also transitory in response to precipitation events.

Surface Water Quality

Overall, surface water quality in the Planning Area is good. Water quality in streams varies throughout the resource area, depending largely on the annual precipitation patterns, vegetation cover, and geology of the watershed. Sediment and, at lower elevations below the cliffs, salinity are the primary pollutants.

The State of Colorado has established classifications/water quality standards for streams based on existing or potential water uses. Table 3-6 lists the stream classifications and associated water quality standards for major streams in the Planning Area and vicinity. Classifications of streams in the Planning Area include Aquatic Life Coldwater 1 and 2; Recreation 1a and 2; Domestic Water Supply; and Agriculture. A comprehensive list of standards for physical, biological, inorganic, and metals parameters has been developed to protect these uses. The following are summaries of the relevant classifications:

- Aquatic Life – Coldwater 1 streams have physical characteristics to support a variety of coldwater biota, usually including trout. Coldwater 2 streams are not capable of sustaining a wide variety of coldwater biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that substantially impair species abundance and diversity.
- Recreation – Recreation 1 waters are used for recreational activities with primary contact, where ingestion of small quantities of water during use is likely to occur. These uses include swimming, kayaking, waterskiing, and other uses. Recreation 1a waters are those in which primary contact uses have been documented or are presumed to be present—e.g., the Colorado River. Recreation 2 waters are used for activities without primary contact (i.e., ingestion not likely to occur), such as fishing and other streamside recreation.
- Water Supply – These waters are classified for domestic water supply and are suitable for drinking with standard treatment. The water supply standard is placed on streams that are suitable for domestic water supply but are not necessarily being used for that purpose.
- Agriculture – These waters are classified for livestock watering or crop irrigation.

BLM coordinates with the State of Colorado in the location and identification of non-point sources of pollution as an aid in maintaining the established water quality reporting process pursuant to Section 305(b) of the Clean Water Act. None of the water quality parameters measured shows a violation of the water quality standards; all waters in the Planning Area appear to be meeting the standards for water quality established by the State of Colorado. With one exception, none of the streams is identified on the 303(d) list or 305(b) report that the Colorado Department of Public Health and Environment (CDPHE) provides to EPA under the Clean Water Act. These documents identify impaired streams—i.e., those that

do not meet water quality standards for the designated uses. The one exception is that tributaries to the Colorado River (stream segment 4a) are now on the 303(d) list for selenium, meaning that any point-source discharge permit would have to use total maximum daily loads (TMDLs) instead of technology-based standards. The affected streams include the south-trending ephemeral and intermittent tributaries between Parachute Creek and Rifle Creek.

Streams atop the Plateau — Designated classifications and beneficial uses of streams on top of the plateau—including East Fork and East Middle Fork Parachute Creek and their tributaries—are included in Table 3-6. Water quality and discharge data collected at USGS gaging stations from 1976 through 1983 (Tables 3-2a and 3-2b), during studies by DOE (TRW 1982)(Table 3-3), and during the 1999 land health assessment (BLM 2001d)(Table 3-4) show the variable flows and low minimum temperatures characteristic of small streams in areas with cold winters (as evidenced by the substantial snow accumulation atop the plateau). The higher summer temperatures in many of the streams are rather high for coldwater (trout) streams and reflect the combination of small, often slow flows; limited shading for considerable lengths; and contribution primarily by rainfall and shallow groundwater. Conductivity values and salinity data (Table 3-4) reflect the low quantity of dissolved solids. Suspended loads are usually small, except during peak runoff, or in areas of surface disturbance. The pH of these streams is slightly basic.

Streams below the Rim — In contrast to the snowmelt- and spring-fed streams atop of the plateau, those that originate along and below the Roan Cliffs are warmer (compare May temperatures for these streams [Table 3-5] with July and August temperatures for higher elevation streams [Table 3-4]). The lower elevation streams also have higher conductivity, salinity, and pH values, reflecting the warmer temperatures, generally lower flows (less dilution from snowmelt or rainfall runoff), and soils derived from different bedrock. Major ions contributing to the increased conductivity are calcium, magnesium, and sulfate, with sodium more prevalent at lower elevations.

Reduction in vegetation cover due to OHV use and sheep grazing has exacerbated the naturally low cover on the saline/alkaline soils and increased sediment loads. All of the streams below the cliffs are tributaries to the Colorado River—either directly (for streams draining southward) or indirectly via Government Creek (for streams draining eastward) or via Parachute Creek (for streams draining southwestward). Note from Table 3-6 that these streams are listed as "Aquatic Life Coldwater 2" because of physical limitations of aquatic habitat (warmer temperatures and ephemeral flows) and poorer water quality. Parachute Creek also falls within this category. Note the much higher sediment concentration in Parachute Creek at the two stations below the cliffs reported in Table 3-2b.

Despite the lower quality of surface waters in streams below the cliffs, data do not show a violation of the water quality standards established to protect the classified uses. Additionally, Government Creek and its tributaries are not included on the 303(d) list or 305(b) report for Colorado. However, the Colorado River between its junctures with the Roaring Fork and Parachute Creek is included on the 303(d) preliminary monitoring and evaluation list for sediment. Inclusion on this list indicates that information suggesting impairment is available, but additional information is needed for a final determination. Recently, as described above, south-trending ephemeral and intermittent tributaries to the Colorado River between Rifle and Parachute have been added to the 303(d) list for selenium. This naturally occurring element is a common and widespread component of soils and bedrock formations such as occur in lower portions of the Planning Area, and selenium is often a water quality issue in semi-arid regions.

A spent oil shale disposal pile generated during operation of the Anvil Points Research and Development facility is located south of the cliffs and adjacent to West Sharrard Creek. The State of Colorado has issued an evaluation of the pile identifying concerns related to pile stability and elevated arsenic levels detected during monitoring activities. BLM is completing plans for remediating the spent oil shale pile.

Table 3-2a. Long-term Stream Discharge Data for USGS Gaging Stations, Parachute Creek Basin

Station Name/ Location	*Station Number*	*Period of Record for Streamflow*	*Elevation (MSL) and Basin Area*	*Avg. and Range of Annual Mean Flow[1]*	*Avg. and Max. Annual Peak Flow[1]*	*Avg. and Min. Annual Low Flow[2]*	*Average Annual Yield[1]*
East Middle Fork Parachute Creek	09092850	10/1/76 – 9/30/83 4/25/77 – 5/27/83	7,400 feet (ft) 22.1 square miles (sq mi)	6.2 cfs, 0.6 – 11.7 cfs	170 cfs, 645 cfs	0.23 cfs, 0.09 cfs	4,490 ac-ft
Ben Good Creek	09092980	11/19/76 – 10/6/83 4/9/77 – 5/4/82	6,520 ft 4.0 sq mi	0.5 cfs, 0.001 – 1.1 cfs	7 cfs, 13 cfs	0 cfs, 0 cfs	360 ac-ft
East Fork Parachute Creek (above Falls)	09092960	10/1/76 – 10/7/83 8/25/77 – 5/30/83	7,860 ft 14.5 sq mi	6.7 cfs, 0.6 – 13.7 cfs	139 cfs, 364 cfs	0.38 cfs, 0.07 cfs	4,850 ac-ft
East Fork Parachute Creek (below Falls)	09092970	10/21/76 – 9/30/83 8/25/77 – ?/1983	6,880 ft 20.4 sq mi	6.5 cfs, 0.1 – 12.6 cfs	146 cfs, 462 cfs	0.02 cfs, 0 cfs	4,710 ac-ft
Northwater Creek	09092830	10/1//76 – 5/16/83 8/19/77 – 5/5/82	Unknown 12.6 sq mi	4.1 cfs, 0.5 – 7.5 cfs	84 cfs, 225 cfs	0.25 cfs, 0.01 cfs	2,970 ac-ft
Parachute Creek below East and West Forks	09093000	10/1/48 – 9/30/86 5/4/49 – 4/24/86	5,770 ft 141 sq mi	33.3 cfs, 1.8 – 121.0 cfs	464 cfs, 2,310 cfs	1.81 cfs, 0 cfs	24,110 ac-ft
Parachute Creek at Parachute	09093500	4/1/21 – 9/30/82 5/17/21 – 10/15/81	5,100 ft 198 sq mi	31.9 cfs, 4.8 – 65.5 cfs	606 cfs, 2,600 cfs	2.71 cfs, 0 cfs	23,090 ac-ft

[1] *Averages using statistics provided for gaging stations at http://waterdata.usgs.gov/co/nwis/sw. Gaps in data exist for stations 09092970, 09093000, and 09093500.*
[2] *Approximations of low flows using daily average flows provided for gaging stations at http://waterdata.usgs.gov/co/nwis/sw.*

Table 3-2b. Long-term Water Quality Data for USGS Gaging Stations, Parachute Creek Basin

Station Name/ Location	*Station Number*	*Period of Record*	*Temperature (C)*	*pH*	*Conductivity (microSiemens per centimeter[µS/cm])*	*Suspended Sediment Conc. (milligrams per Liter [mg/L])*	*Suspended Sediment Load (tons/day)*
East Middle Fork Parachute Creek	09092850	2/76 – 7/83	0 – 16.5	7.3 – 9.3	415 – 800	--	--
Ben Good Creek	09092980	11/76 – 9/83	0 – 20	7.1 – 8.7	390 – 680	--	--
East Fork Parachute Creek (above Falls)	09092960	2/76 – 9/83	0 – 16.5	7.7 – 8.8	350 – 675	1 – 279	0.01 – 33
East Fork Parachute Creek (below Falls)	09092970	4/77 – 9/83	0 – 19	7.3 – 8.8	380 – 1,250	10 – 654	0.1 – 127
Northwater Creek	09092830	2/76 – 5/83	0 – 21	7.7 – 8.6	380 – 697	10 – 61	0.01 – 1.0
Parachute Creek below East and West Forks	09093000	9/64 – 9/86	0 – 22	7.2 – 9.2	202 – 1,150	1 – 2,940	0.01 – 4,170
Parachute Creek at Parachute	09093500	11/74 – 10/82	0 – 21.5	7.3 – 8.9	520 – 2,300	10 – 5,670	0.44 – 4,850

Source: http://waterdata.usgs.gov.co.nwis

Table 3-3. DOE Discharge and Water Quality Data for NOSR 1 Streams

Stream/Location	*Sampling Period*	*Flow (cfs)*	*Temp. (C)*	*Conductivity (µS/cm)*	*pH*
Ben Good Creek	seasonal, 1981	0 – 7	2.5 – 15.5	490 – 580	7.3 – 8.2
East Fork Parachute Creek below First Anvil Creek	seasonal, 1981	0.1 – 119	0 – 18	410 – 680	7.1 – 8.4
East Fork Parachute Creek below Falls	seasonal, 1981	0 – 52	0 – 15.5	305 – 490	7.7 – 8.3
East Middle Fork Parachute Creek	seasonal, 1981	0.2 – 95	0 – 24.5	322 – 601	7.9 – 8.5
Northwater Creek	seasonal, 1981	0 – 81	0 – 17	380 – 530	8 – 8.5
Parachute Creek at Town of Parachute	seasonal, 1981	0 – 560	0 – 32	395 – 2,550	7.5 – 8.5
Parachute Creek below East and West Forks	seasonal, 1981	0 – 390	0 – 34	375 – 910	7.6 – 8.6
Trapper Creek (1 sample)	Sept. 1981	0.5	15.5	560	8.7

Source: TRW (1982)

Table 3-4. BLM Discharge and Water Quality Data for Some Streams Atop the Plateau

Stream/Location	*Date*	*Flow (cfs)*	*Temp. (C)*	*Conductivity (µS/cm)*	*pH*	*Salinity (parts per thousand [ppt])*
Ben Good Creek	8/25/99	0.15	14.7	504	8.8	0
Bull Gulch	7/12/99	0.01	19.0	169	8.9	0
Camp Gulch	7/12/99	0.01	17.0	189	8.7	0
East Fork Parachute Creek	7/12/99	1.50	15.0	382	9.0	0
East Forked Gulch	8/24/99	0.14	22.0	520	8.5	0
Golden Castle Gulch	8/24/99	0.02	12.5	389	8.5	0
JQS Gulch	8/24/99	0.03	12.5	518	8.0	0
Northwater Creek	7/06/99	1.20	22.6	445	-	0
Raspberry Creek	7/13/99	0.06	18.5	369	8.2	0.10
Second Anvil Creek	8/24/99	0.02	24.5	567	7.6	0
Sheep Trail Hollow	8/24/99	0.02	21.0	410	8.2	0
Third Water Gulch	8/25/99	0.05	14.7	416	8.8	0
Trapper Creek	7/06/99	0.41	20.2	451	-	0
West Forked Gulch	8/24/99	0.15	17.5	507	8.4	0
Yellowjacket Creek	7/13/99	0.14	18.0	372	8.6	0.25

Source: BLM (2001d)

Table 3-5. BLM Discharge and Water Quality Data for Some Streams Below the Cliffs

Stream Name	*Date*	*Flow (cfs)*	*Temperature (C)*	*Conductivity (υS/cm)*	*pH*	*Salinity (ppt)*
Doodlebug Gulch	5/7/01	0.001	11.50	1,630	8.4	1.30
Goodrich Gulch	5/7/01	0.004	6.50	710	8.5	0.75
Government Creek above JQS Road	5/7/01	1.97	23.00	1,100	8.4	1.00
Government Creek near 32 Mesa Rd	5/7/01	1.60	20.00	1,305	8.6	1.00
Thirty-Two Mile Gulch – upper reach	5/7/01	0.07	15.00	1,080	8.5	0.80
Thirty-Two Mile Gulch above SH 13	5/8/01	0.001	27.00	1,750	8.5	0.50
Magpie Gulch	5/8/01	0.66	5.00	610	8.4	8.00
Piceance Creek	5/16/01	2.10	15.00	695	8.4	0.50
Government Creek south of Rio Blanco	5/16/01	0.20	16.00	1,150	7.6	0.80
Government Creek near Magpie Gulch	5/23/01	0.26	11.00	1,730	8.6	1.20
Government Creek below Magpie Gulch	5/23/01	0.53	12.00	1,400	8.6	1.10

Source: BLM (2001d)

Table 3-6. Stream Classifications and Selected Water Quality Standards

Stream Segment Description	*Classification*	*Physical and Biological Standards*
Mainstem of Colorado River from Roaring Fork confluence to just below Parachute Creek confluence	Aquatic Life Coldwater 1 Recreation 1a Water Supply Agriculture	dissolved oxygen (D.O.) = 6.0 mg/L, spawning (sp) = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform = 200/100 milliliters (mL) E. coli = 126/100 mL
Tributaries to the Colorado River from Roaring Fork confluence to just below Parachute Creek confluence	Aquatic Life Coldwater 2 Recreation 2 Water Supply Agriculture	D.O. = 6.0 mg/L, sp = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform = 2,000/100 mL E. coli = 630/100 mL
All tributaries to East Fork Parachute Creek from source to below mouth of First and Second Anvil Creeks	Aquatic Life Coldwater 1 Recreation 2 Agriculture	D.O. = 6.0 mg/L, sp = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform = 2,000/100mL E. coli = 630/100 mL
Mainstem of Northwater and Trapper Creeks including tributaries, lakes, and reservoirs	Aquatic Life Coldwater 1 Recreation 2 Water Supply Agriculture	D.O. = 6.0 mg/L, sp = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform = 2,000/100 mL E. coli = 630/100 mL
Mainstem East Middle Fork Parachute Creek, including tributaries, from source to confluence with Middle Fork Parachute Creek	Aquatic Life Coldwater 1 Recreation 2 Agriculture	D.O. = 6.0 mg/L, sp = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform =2,000/100 mL E. coli = 630/100 mL

Source: www.cdphe.state.co.us/op/regs/waterqualityregs.asp

3.2.4.2 Groundwater

Planning Objectives

Groundwater in the Planning Area is currently being managed under guidance from several planning documents and other agreements, including identify planning objectives and criteria for groundwater quality specific to the Roan Plateau. These documents include

1. 1984 GSRA RMP for public lands below the Roan Cliffs
   - No specific objectives for groundwater.
2. 1997 WRRA RMP
   - Groundwater quality standards within the WRRA are met using the conditions of approval in the RMP to prevent degradation by toxins and other impurities from BLM projects and commodity extraction activities that may affect usable subterranean water.
   - Ensure that BLM-administered projects are in compliance with USFWS Programmatic Biological Opinion for minor water depletions in the Upper Colorado River Basin.
   - Ensure the integrity of aquifer systems in both quantity and quality.

Groundwater standards are regulated pursuant to the Water Quality Control Act, sections 25-8-202, 25-8-203, and 25-8-204. BLM must comply with Regulation 41, *The Basic Standards for Groundwater*, to protect existing and potential beneficial uses of groundwater.

Characteristics and Setting

The hydrologic studies of NOSRs 1 and 3 on behalf of DOE (TRW 1982) indicate that a topographic (surface water) divide between the NOSR streams and the Piceance Creek drainage to the north is also a groundwater divide. The groundwater system underlying NOSRs 1 and 3, for about the first 2,000 feet in depth, is effectively an island having very little interaction with the rest of the Piceance Creek basin.

Furthermore, the hydrogeology on BLM lands within the Planning Area is generally different from that of private lands along the Colorado River and its major tributaries in that the BLM lands tend to have fewer exposures of shallow water-bearing deposits associated with alluvial aquifers. Consequently, few water wells are located on public lands, most being associated with either private lands or portions of the Planning Area closest to the major streams.

Lands atop the Plateau — The groundwater resource underneath the top of the plateau is contained within the Uinta Formation, which crops out along steep valleys and canyons sideslopes, and the underlying Parachute Creek Member of the Green River Formation. Based on hydrologic studies conducted on NOSRs 1 and 3 (TRW 1982), potentially usable groundwater occurs within four persistent aquifers (water-bearing zones). The uppermost aquifer (Zone 1) includes the Uinta and upper Parachute Creek Member. The other aquifers (Zones 2 through 4) are located just above or below the oil shale-rich Mahogany Zone. The combined thickness of these four aquifers is 430 feet.

Pump tests and injection tests of ten groundwater wells in NOSR 1 (atop the plateau) revealed responses typical of fractured media (TRW 1982), with heterogeneously low transmissivities and hydraulic conductivities. The lower three aquifers (Zones 2 through 4) are confined, while the uppermost aquifer (Zone 1) appears to be semi-confined in the recharge area.

Recharge of the aquifer system occurs primarily through a combination of snowmelt and loss from streams. Summer rainfall does not appear to be a major contributor to recharge, except to the extent that it contributes to streamflow. TRW (1982) described instantaneous streamflow data collected by USGS at

63 locations in the East Fork Parachute Creek, Ben Good Creek, and East Middle Fork Parachute Creek/Trapper Creek drainages. These measurements revealed several losing reaches corresponding to outcrops of bedrock associated with Zones 2, 3, and 4.

Preliminary analysis of groundwater beneath NOSRs 1 and 3 indicates generally good quality. While quality may decrease slightly with depth overall due to increases in conductance and dissolved solids, the data show considerable variability and overlap of concentration ranges. Of the parameters measured, three sometimes exceeded Safe Drinking Water Standards: arsenic and lead in Zone 1 and fluorides in Zones 2, 3, and 4. Groundwater quality data for the four aquifers investigated by TRW (1982) are summarized in Table 3-7.

In NOSR 1 atop the plateau, groundwater is discharged from the three upper water zones at numerous springs, which contribute to base flows in the East Fork Parachute Creek and East Middle Fork Parachute Creek basins (TRW 1982). Results of a detailed reconnaissance of 90 springs in NOSR 1 (TRW 1982) yielded a range of specific conductivities of 340 to 695 μmhos/cm at 25C (mean = 516). Water quality data for selected springs are presented in Table 3-8.

TRW (1982) described the quality of spring water on NOSR 1 as being rather uniform calcium-bicarbonate waters or mixed-cation-bicarbonate waters with calcium dominant. Concentrations of trace elements were extremely low, and all samples met EPA drinking water standards, with a low sodium and medium salinity hazard. TRW (1982) also inferred that the spring water had moved predominantly through water Zone 1 or 2 and had a relatively short residence time in the aquifer. They noted that the "high concentration of carbonate species helps explain the travertine-like deposits often found near springs on NOSR 1."

Lands below the Rim — The surficial geology of NOSR 3 (along and below the cliffs) consists of the lower part of the Green River Formation (below the Parachute Creek Member) and underlying Wasatch Formation. These formations are not known to contain significant usable water-bearing zones. A slight potential exists for minor aquifers in the lenticular sandstones of the Wasatch Formation. Hydrologic information from the Garfield County landfill studies indicates that no usable aquifers exist within the landfill area.

Nearly all of the wells below the cliffs are located on private lands. Many of these are less than 100 feet deep and generally intersect the alluvial aquifers along the Colorado River, Parachute Creek, and other lower elevation streams and tributaries throughout the area. The deeper wells range in depth from about 100 to 250 feet, with a few in excess of 400 feet. These wells are mostly located on the slopes and benches south of the Colorado River and south of the Planning Area.

3.2.4.3 Water Yield

Planning Objectives

Water yield in the Planning Area is currently being managed under guidance from several planning documents. Other agreements identify planning objectives and criteria for water rights and yields specific to the Roan Plateau. These include:

1. 1984 GSRA RMP
   - Increase water yield throughout the resource area through forest management practices and through treatment of mountain brush vegetation types to improve livestock and big game forage.
2. 1997 WRRA RMP
   - No specific objectives for water yield

Table 3-7. Concentration Ranges of Major Ions in Eight Geographically Distributed Groundwater Samples from NOSR 1[1]

Well No.	Area	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Bicarbonate (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductance (µS/cm)
15/16	NW	4.9 – 18	5.6 – 9.8	70 – 410	4.0 – 20	223 – 910	3.5 – 106	20 – 240	272 – 1,060	480 – 1,820
17	NC	9.8 – 35	12 – 23	45 – 130	3.0 – 4.7	248 – 414	4.9 – 9.1	<4.0 – 25	296 – 415	556 – 682
18	NW	51 – 67	17 – 26	63 – 65	0.1 – 1.5	345 – 395	8.5 – 13	32 – 64	345 – 430	550 – 650
19	NE	insufficient aquifer (zones dry)								
20	WC	15 – 82	5.8 – 19	132 – 155	1.3 – 8.4	438 – 500	<3.0 – 12	22 – 145	490 – 587	785 – 1,030
21	C	21 – 49	3.7 – 20	30 – 85	<0.1 – 3.0	248 – 362	<3.0 – 6.5	17 – 68	290 – 430	495 – 855
22	C	23 – 26	13 – 15	55 – 125	<1.0 – 3.7	255 – 435	9.1 – 9.2	22 – 50	302 – 450	<0.2 – 460
24	SC	71 (2)	16 – 25	21 – 55	4.0 (2)	357 – 382	<3.0 – 12	22 – 48	371 – 420	660 – 671
25	SE	insufficient aquifer (zones dry)								
26	SW	23 – 33	4.4 – 16	70 – 125	3.0 – 6.2	280 – 414	5.6 – 13	<4.0 – 59	340 – 400	649 – 670

[1] *Compilation of water quality data for samples of water zones 1 through 4 (TRW 1982); some zones not present in some wells.*

Table 3-8. Major Ion Concentrations in Nine Geographically Distributed Spring Samples from NOSR 1 in 1981[1]

Site No.	Area	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Bicarbonate (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Specific Conductance (µS/cm) [2]
2	NE	61	19	41	<1.0	310	6.4	53	340	520
26	C	72	24	48	<1.0	390	11	49	400	665
33	E	66	15	37	<1.0	295	11	48	330	480
43	W	46	17	31	2.4	245	12	37	315	450
46	NW	54	20	25	2.6	245	23	39	280	490
53	SE	66	16	30	<1.0	310	5.6	33	330	505
78	SW	59	19	47	2.5	300	7.1	62	350	540
84	NE	62	20	39	2.8	335	11	25	340	520
87	NC	54	19	44	2.7	310	20	29	320	520

[1] *One-time samples from selected nine springs (TRW (1982).*

[2] *Specific conductivity for 90 springs sampled: range = 340 – 695 µS/cm at 25°C; mean = 516 µS/cm at 25°C (TRW 1982).*

Characteristics and Setting

Areas on top of the plateau consist of forested or other areas of relatively dense vegetation cover. Many of these areas are relatively steep and characterized by shallow bedrock. Snowpack is variable, but typical winter accumulations are sufficient to sustain a marked snowmelt season in spring. Springs are abundant atop the plateau, supplementing the yield from snowmelt and precipitation runoff. Few wells have been developed on public lands atop the plateau, and the resource remains little utilized.

Below the rim, the lower elevations, generally southern exposures, and comparatively sparse vegetation result in little or no accumulated snowpack in most years. This drier regime is also reflected by fewer springs. Opportunities for enhanced yield through vegetation management are therefore limited. Little or no use of groundwater is occurring on public lands, except for some undeveloped springs used by livestock and wildlife, and a few springs developed for livestock watering.

Factors Affecting Water Yield

Water yield is dependent on both natural factors and land management. Natural factors include climate, geology and soils, slope, channel conditions, and vegetation type and density. Management of lands in such a way that affects these natural factors plays a role in altering water yield.

3.2.4.4 Water Rights

Planning Objectives

The Colorado Division of Water Resources, also known as the State Engineer's Office, issues water well permits and administers water rights. Water rights in the Planning Area are currently being managed under several planning documents and other agreements that identify planning objectives and criteria for water rights specific to the Roan Plateau:

1. 1984 GSRA RMP
   - No specific objectives for water rights.
2. 1997 WRRA RMP
   - No specific objectives for water rights.

Characteristics and Setting

For all of the more than 125 springs identified within the Planning Area, BLM has filed for and secured water rights from the State of Colorado for listed uses, including wildlife watering, wildlife habitat, livestock watering, and recreation. Mapping of locations, measurement of flow, and collection of water quality data including pH, specific conductance, and temperature have been completed.

BLM has completed instream flow assessments for all of the perennial streams within the Planning Area that are capable of supporting a fishery. These creeks include JQS Gulch, First Anvil Creek, Second Anvil Creek, East Fork Parachute Creek, East Middle Fork Parachute Creek, Northwater Creek, and Trapper Creek. These assessments document type and size of fish populations, types of macroinvertebrate communities, water quality parameters, channel morphology, and flow rates necessary to provide fish habitat. Using the results from the instream flow surveys, BLM has recommended that the Colorado Water Conservation Board (CWCB) appropriate instream flow water rights on each of the creeks above and has provided recommended flow amounts. The CWCB secured water rights pursuant to these recommendations in 2000.

Factors Affecting Water Rights

The use of water in Colorado is governed by what is known as the prior appropriation system. This system of water allocation controls who uses how much water, the types of uses allowed, and when those waters can be used. Simplified, the first to appropriate water and apply that water to use has the first right to that water within a particular stream system (DWR 2002).

3.2.5 Climate and Air Quality

3.2.5.1 Climate

The Planning Area lies along the Colorado River drainage between the communities of Rifle to the east and Parachute to the west, with mountainous areas of the White River National Forest to the north and the Grand Mesa National Forest to the south. Because of broad variations in elevation and topography within the study area, climatic conditions vary considerably. Along the Colorado River valley floor, average daily temperatures typically range between 12F and 40F in mid-winter and between 50F and 95F in mid-summer. The frost-free period (i.e., during which temperatures do not dip below 32F) is generally 170 days between mid-April and mid-October. The annual average total precipitation at lower elevations is approximately 12 inches, with 30 to 40 inches of annual snowfall. At higher elevations atop the plateau, temperatures are cooler, frost-free periods shorter, and both precipitation and snowfall greater than at lower elevations (e.g., approximately 25 inches of mean annual precipitation and 60 to 80 inches of annual snowfall).

Wind conditions reflect channeling and mountain valley flows due to complex terrain. Nighttime cooling enhances stable air, inhibiting air pollutant mixing and transport along the Colorado River valley. Dispersion potential improves farther east and west and along the ridges and mountaintops, especially during the winter/spring weather transition and summertime convective heating periods.

3.2.5.2 Air Quality

The CDPHE-Air Pollution Control Division (APCD) implements the Clean Air Act as promulgated by EPA. The APCD is responsible for maintaining compliance with Prevention of Significant Deterioration (PSD) Increments and National Ambient Air Quality Standards (NAAQS). The APCD may also set its own State Ambient Air Quality Standards (AAQS) that are equally or more stringent that the Federal NAAQS. BLM is required to comply (through FLPMA and the Clean Air Act) with Federal, State, Tribal, and local air quality standards and regulations.

Although specific monitoring is not conducted in the Planning Area, existing air quality is generally good based on regional monitoring. Air pollution emission sources are limited to a few industrial facilities, transportation emissions along the I-70 corridor, and residential emissions in the relatively small communities adjacent to the Planning Area. Based on data provided by CDPHE-APCD, concentrations of particulate matter (PM) less than 10 microns (μ) in effective diameter (PM_{10}) measured at Rifle (24 micro grams per cubic meter [$\mu g/m^3$] annual and 54 $\mu g/m^3$ second 24-hour maximum) and of particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$) measured at Grand Junction (7 $\mu g/m^3$ annual and 19 $\mu g/m^3$ second 24-hour maximum) are well below the Colorado AAQS and NAAQS. Rural values are likely to be lower (Trinity 2004). Similarly, gaseous pollutant concentrations at several locations are well below applicable air quality standards.

The Colorado and National AAQS set upper limits for specific air pollutant concentrations at all locations accessible to the public. The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined "baseline" level, based on the specific conditions at a particular location. All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a "threshold of concern" and do not represent a regulatory "PSD Increment Consumption

Analysis." The determination of PSD increment consumption is a regulatory agency responsibility conducted as part of the New Source Review process, which also includes a Federal Land Management Agency evaluation of potential impacts to Air Quality Related Values (AQRVs) such as visibility, aquatic ecosystems, and flora and fauna.

Although EPA has revised the $PM_{2.5}$ AAQS, this revised limit will not be enforceable until formally approved in the Colorado State Implementation Plan. However, due to public concern and possible impacts on human health and visibility, $PM_{2.5}$ is considered in this analysis. Current Colorado and National AAQS and PSD Class I and II increments are provided in Table 3-9.

Table 3-9. Air Pollutant Background, Ambient Air Quality Standards, and Prevention of Significant Deterioration Incremental Concentrations ($\mu G/M^3$) by Applicable Averaging Time

Pollutant and Averaging Time	*Measured Background Concentration*[1]	*National Ambient Air Quality Standards*	*Colorado Ambient Air Quality Standards*	*PSD Class I Increment*	*PSD Class II Increment*
Carbon Monoxide (CO)					
1 hour	8,000	40,000	--	NA	NA
8 hours	4,444	10,000	--	NA	NA
Particulate Matter (PM_{10})					
24 hours	54	150	--	8	30
Annual	24	50	--	4	17
Particulate Matter ($PM_{2.5}$)					
24 hours	19	65	--	NA	NA
Annual	7	15	--	NA	NA
Sulfur Dioxide (SO_2)					
3 hours	110	1,300	700	25	512
24 hours	39	365	--	5	91
Annual	11	80	--	2	20
Nitrogen Dioxide (NO_2)					
Annual	34	100	--	2.5	25

[1] *All background values from Trinity 2003a.*

PSD Class I areas and sensitive Class II areas included in the analysis are listed in Table 3-10. Limitations on incremental air pollution allowed in PSD Class I areas from additional major sources are strict. Similar but less stringent incremental limits apply to PSD Class II areas. Allowable incremental concentrations for Class I and Class II areas are shown in Table 3-9.

CDPHE-APCD is the air quality regulatory agency responsible (under the EPA-approved State Implementation Plan) for determining potential impacts once detailed development plans have been made, subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, the State of Colorado has ultimate responsibility for reviewing and permitting air pollutant emission sources before they become operational. Potential air quality impacts associated with Alternatives I through V are described in Section 4.2.5.

Table 3-10. PSD Class I and Sensitive Class II Areas Considered in the Analysis

Mandatory Federal Class I Areas and Sensitive Class II Areas	*Managing Agency* [1]	*Class Category*	*State*	*Distance and Direction*
Black Canyon of the Gunnison National Park	NPS	Class I	Colorado	25 mi SSE
Colorado National Monument	NPS	Class II [2,3]	Colorado	40 mi SW
Dinosaur National Monument	NPS	Class II [2,3]	Utah/Colorado	60 mi NW
Eagles Nest Wilderness Area	USFS	Class I	Colorado	65 mi E
Flat Tops Wilderness Area	USFS	Class I	Colorado	30 mi ENE
Holy Cross Wilderness Area	USFS	Class II [2]	Colorado	45 mi ESE
Hunter-Frying Pan Wilderness Area	USFS	Class II [2]	Colorado	40 mi ESE
La Garita Wilderness Area	USFS	Class I	Colorado	80 mi SSE
Maroon Bells-Snowmass Wilderness Area	USFS	Class I	Colorado	25 mi SE
Mount Zirkel Wilderness Area	USFS	Class I	Colorado	90 mi NE
Raggeds Wilderness Area	USFS	Class II [2]	Colorado	25 mi SE
Rawah Wilderness Area	USFS	Class I	Colorado	120 mi NE
Weminuche Wilderness Area	USFS	Class I	Colorado	100 mi SSE
West Elk Wilderness Area	USFS	Class I	Colorado	35 mi SE

[1] *NPS = National Park Service; USFS = U.S. Forest Service.*

[2] *Sensitive Class II areas included in the analysis (Trinity 2003a).*

[3] *SO_2 increment in these Class II areas in Colorado has the same protection as Class I areas.*

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 Vegetation and Riparian/Wetland Communities

3.3.1.1 Introduction

Vegetation is a resource that must be addressed under BLM resource management planning process (BLM 2001a). Plant species and associations also comprise a large portion of the ecological richness, uniqueness, and diversity values identified as being a major issue within the Roan Plateau Planning Area.

A number of surveys, NEPA documents, and land health assessments have mapped and described in detail the vegetation in the Planning Area TRW 1981, BLM 1991a, Colorado Natural Heritage Program [CNHP] 1997a and 2001). Current conditions and trends for each resource are summarized in the AMS (BLM 2002a). An extensive map of plant communities within two regional watersheds, the Parachute-Roan Creek and the Colorado River-Plateau Creek, was finalized in 2001 under the auspices of CDOW. All of these studies are integrated into this section.

The current condition and assessment of trends for upland and riparian/wetland plant communities and noxious weeds are described in Section 3.3.1.2. Botanical nomenclature follows Weber and Wittmann (2001) and CNHP. Past conditions and uses are also briefly described. Special status plants and other species or communities of special concern are discussed in Section 3.3.3. These include Federally listed

threatened or endangered species, Federal candidate species, BLM and USFS sensitive species, and selected other plant species or communities considered rare or imperiled.

3.3.1.2 Major Plant Community Types

The physical environment of the Planning Area is created by an unusually variable combination of topography, aspect, hydrology, soils, and exposed rock outcrops. This complex environment supports ten major plant communities. Table 3-11 lists their relative areas and general condition. The "general vicinity" referenced in the table comprises the two regional watersheds described above. These communities form two distinct mosaics, determined by their relative position above or below the rim (Map 17).

Table 3-11. Vegetation Community Types and Condition in BLM Lands in Planning Area

Community Type	*Acres*	*Percent*	*General Condition* [1]
Agricultural land	119	<0.2	NI
Aspen woodland	11,108	15.1	Good
Coniferous forest	2,809	3.8	Healthy
Mountain grassland	2,412	3.3	Good
Mixed mountain shrubland	18,332	24.9	Healthy, diverse, and productive
Pinyon/juniper woodland	17,643	24.0	Variable
Riparian/wetland	363	<0.5	Variable
Sagebrush shrubland	11,570	15.7	Healthy, diverse, and productive above rim; poor to fair below
Semi-desert shrubland	1,042	1.4	Good above rim; poor to fair below
Shale barrens	191	<0.3	Good
Unvegetated [2]	8,013	10.9	NA
Total	73,602	100.0	--

[1] *NI = no information, NA = not applicable.*

[2] *Includes rock, exposed soil, talus slopes, rock outcrops, and surface water.*

Lands atop the Plateau

The rim of the Roan Plateau is defined by the steep, largely unvegetated Roan Cliffs. Above the Southeast Cliffs, the more mesic conditions associated with higher elevation, less-severe topography, and exposure and more fertile soils support plant communities typically associated with lower mountainous regions of Colorado. The undulating plateau surface is dominated by woodlands of quaking aspen (*Populus tremuloides*) on north- and northeast-facing slopes, and two shrubland types on south- and west-facing slopes and drier ridgetops. The two upland shrub communities occur on ridge tops and drier south- and west-facing slopes atop the plateau: sagebrush shrubland, dominated by mountain sagebrush (*Seriphidium vaseyanum*) with Utah serviceberry (*Amelanchier utahensis*) and mountain snowberry (*Symphoricarpos rotundifolius*); and mixed mountain shrubland, including Gambel's oak (*Quercus gambelii*), mountain snowberry, Utah serviceberry, mountain-mahogany (*Cercocarpus montanus*), and Douglas (sticky) rabbitbrush (*Chrysothamnus viscidiflorus*).

The Roan Plateau is dissected by Trapper Creek, Northwater Creek, East Middle Fork Parachute Creek, Ben Good Creek, and East Fork Parachute Creek and their tributaries. North-facing slopes along the drainages are generally cloaked by stands of aspen, with mixed conifer woodlands of Douglas-fir (*Pseudotsuga menziesii*) and subalpine fir (*Abies lasiocarpa*) along the cooler north-facing slopes of the deeper canyons and valleys. In lower reaches of these drainages, the opposite slopes support scattered

individual Douglas-fir within a matrix of shale barrens and mountain grasslands. Sagebrush shrublands and mountain grasslands form a narrow band along the top of the cliffs. Two of the grasslands are considered significant plant communities (Section 3.3.3).

Moist meadow wetlands, dominated by herbaceous species, are associated with the headwaters of drainages. Riparian shrublands that support willows (*Salix* spp.), elderberry (*Sambucus* spp.), gooseberry (*Ribes* spp.), and riparian grasses are found along the bottoms of the major drainages.

Lower reaches of the main drainages atop the plateau—East Middle Fork Parachute Creek, East Fork Parachute Creek above the waterfalls, and the canyon section of Northwater Creek—support a narrow ribbon of coniferous woodland dominated by blue spruce (*Picea pungens*) and Engelmann spruce (*P. engelmannii*) with a mosaic of mesic shrubs. Deciduous woodlands characterized by narrowleaf cottonwood (*Populus angustifolia*), box-elder (*Negundo aceroides* subsp. *interius*), and riparian shrubs are found below the falls in East Fork Parachute Creek and in upper Cottonwood, Hayes, Wheeler, Sharrard, and Thirty-Two Mile Gulches.

Canyon wall seeps, or "hanging gardens" are unique wetland features limited to seep areas on canyon walls where year-round water is available and the substrate is soft enough to allow roots to penetrate deeply, holding plants on the walls, which are often extremely steep. The hanging gardens are most abundant on the north-facing walls along the East Fork Parachute Creek and Northwater Creek where Green River shale beds are exposed. This wetland type is characterized by the presence of hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*), an endemic Colorado plant (i.e., occurring only in Colorado) that is restricted to calcareous seeps on steep canyon walls. Two of the riparian woodlands and the hanging garden seeps are considered significant plant communities (Section 3.3.3).

Lands below the Rim

Where it wraps around the eastern edge of the plateau, the Roan Cliffs escarpment becomes less steep and is dissected by a number of ravines. The north-facing ravine slopes support solid stands of mature ("old growth") Douglas-fir, some of which are considered remnant communities.

Just below the steepest cliffs, a mixed mountain shrubland with isolated stands of aspen and Douglas-fir gives way to more extensive pinyon/juniper (*Pinus edulis/Sabina osteosperma*) woodlands on the lower west-, south-, and east-facing slopes. Douglas-fir persists on some north-facing slopes through portions of this transitional zone but is finally replaced by mixed mountain shrublands of oak, serviceberry, and mountain-mahogany.

The dissected ridges and ravines extend away from the cliffs and onto the broad floor of the Colorado River valley, where pinyon/juniper woodland and slopes of mountain sagebrush grade into semi-desert shrubland of shadscale *(Atriplex confertifolia),* common saltbush (*A. brandegei*), and greasewood (*Sarcobatus vermiculatus*), with localized, sometimes large, stands of basin big sagebrush (*Seriphidium tridentatum*). This elevational gradation reflects the progressively hotter, drier conditions extending from the base of the cliffs to the flat terrain along I-70, representing a vertical distance of more than 1,000 feet.

3.3.1.3 Current Condition and Trends

Upland Vegetation

As noted in the introduction, upland vegetation in the Planning Area is a diverse resource, providing a large amount of the local and regional biodiversity and ecological value. Grazing allotments in portions of the Planning Area were assessed for land health in the Roan Cliffs Landscape Unit (BLM 2001d), Rifle Creek Landscape Unit (BLM 2002b), and Rifle-West Landscape Unit (BLM 2005c). These assessments indicated that upland plant communities were in generally good to excellent condition in terms of the upland vegetation (Land Health Standard #3). For most sites, it was noted that (1) distribution of native plant communities appeared sufficient to ensure sustainability, and (2) most communities appeared to have mixed age classes in sufficient amounts to sustain recruitment. Exceptions are discussed below.

Most aspen stands on top of the plateau were described as mature during the land health assessments in 1999 and 2001, and some were becoming overmature or decadent. The presence of numerous aspen sprouts and saplings in some stands, combined with a lack of young conifers, suggests that these stands are beyond late-seral stage and instead may be climax communities (i.e., self-sustaining rather than transitional to coniferous forest).

In pinyon/juniper areas below the cliffs, community condition was variable. Areas at higher elevations and on steeper and north-facing slopes tended to be in good condition with evidence of regeneration, including dense canopy and an understory of shrubs and grasses. However, these areas could be susceptible to fire as ladder fuels are available and the canopy is deemed dense enough to carry a crown fire. Stands at lower elevations or south-facing slopes often consisted of mature trees with little understory. Shrubs tended to be old and decadent, with little or no recruitment.

Semi-desert and sagebrush shrublands at the lowest elevations were in poor to fair condition, meeting Land Health Standard #3, but with problem areas. The shrub stands are even-aged with little evidence of new recruitment. In Cottonwood Gulch grazing allotments, monitoring data from 2001 indicated an understory comprising mostly annual grasses and forbs, with cheatgrass (*Anisantha tectorum*) a dominant species. Monitoring data from the mid-1990s noted few perennial grasses in shrub interspaces in the Webster Park allotment and a large amount of cheatgrass. In other areas within this community, the herbaceous understory was poor, dominated by prickly pear cactus (*Opuntia* spp.), cheatgrass, and annual forbs. Several areas in the Hubbard Mesa grazing allotment were noted to be in moderate to extreme departure from the upland vegetation standard (Land Health Standard #3).

Riparian/Wetland Vegetation

Several types of riparian/wetlands are found within the Planning Area. These include moist meadows, riparian shrublands, riparian woodlands, and canyon wall seeps. All of these communities occur as narrow strips that are sustained by surface water, groundwater discharge, or a combination of the two.

Wetland areas have characteristic soils, hydrology, and plant associations that develop in response to persistent soil saturation during a substantial portion of the growing season. Riparian areas are plant communities that are influenced primarily by proximity to a stream or, less commonly, a pond or lake (e.g., see BLM 1988a). In the arid and semi-arid western United States, including the Planning Area, streams capable of sustaining riparian habitat are often ephemeral (including features termed "washes" or "gulches"), meaning that they carry water only in response to heavy or protracted rainfall or snowmelt.

Riparian may or may not be wetlands, and wetlands may or may not be associated with riparian areas. Thus, the terms are distinct but not mutually exclusive. Regardless, both types of habitats are important because of the presence of water and the increased vegetation diversity (both structure and composition) that the water sustains. Healthy riparian systems are recognized as being important for many species of wildlife; in Colorado, for example, CDOW rates riparian areas as the most important habitat type in the state, in terms of both overall wildlife species richness and the number of special status species present.

Riparian areas are also known for their ability to filter sediments and pollutants adsorbed to those sediments, contribute to groundwater recharge, reduce flood energy, extend seasonal streamflow, improve stream habitat for aquatic life (through a combination of increased thermal cover, bank stability, and sources of invertebrate and vegetal food items), and provide recreational and scenic values (BLM 1998a). For these reasons, riparian/wetland habitats are considered an important resource in the Planning Area, despite representing less than 1 percent of the land surface (Table 3-11).

Riparian function and value throughout the Planning Area have been adversely affected by road construction, informal stream crossings, livestock grazing, and invasive weeds. PFC analysis (BLM 1998a) was used to assess the condition of a number of riparian reaches along creeks atop the Roan Plateau during 1994 and 1999 land health assessments (BLM 2001d). In 1994, 31.6 miles were assessed: 10.8 percent (3.4 miles) were considered to be at PFC, 83.9 percent (26.5 miles) were found to be

Functioning-at-Risk (FAR), and 5.4 percent (1.7 miles) were Non-functional (NF). Of the reaches considered FAR, six of the sites (17 percent, 7.2 miles) had a downward trend.

In 1999, the assessment showed an improving trend for many of the same reaches (with an additional three sites, 2.2 miles): slightly more than 25 percent (8.6 miles) were found to be PFC, almost 73 percent (24.6 miles) were FAR, and slightly less than 2 percent (0.6 miles) were NF. All of the reaches that received a FAR rating were considered to be improving in condition and making progress towards meeting the riparian system Land Health Standard (#2). However, it was noted that grazing distribution was a concern in these areas, as the streambanks require vegetation cover to protect them from erosion and to trap sediment and debris. Proper grazing management was also a concern in terms of retaining adequate herbaceous cover, and limited utilization of wood riparian plant species was critical (BLM 2001d). There has been some concern expressed by BLM staff that since the 1999 assessment, riparian conditions have reversed into a downward trend in some of these reaches (Fresques 2002). Distribution of grazing animals continues to be a concern in some areas.

Approximately 8.9 miles of riparian areas below the cliffs were assessed for PFC in 2001. Of these, almost 60 percent (5.3 miles) were rated as PFC, and 42 percent (3.6 miles) were FAR.

One 0.6-mile reach on Government Creek (Lower Reach 1) was ranked as FAR in a downward trend, due in part to OHV use in the area. A second reach (0.4 mile) assessed to be FAR in a downward trend may be caused by sheep trailing through the riparian zone. A final 2.6 miles was determined to be FAR with no apparent trend. The area around Fravert Reservoir (2 acres) was also assessed and determined to be at PFC.

Additional areas in Webster Park Gulch were visually assessed in 1995. At this time, Webster Park Gulch was considered to be in declining condition.

As part of a 2004 land health assessment of the Rifle West Landscape Unit, Sharrard Gulch (1.2 miles) was determined to be a non-riparian system. Cottonwood Gulch (Upper and West Branches 1 and 2 – 2.7 miles) was rated as PFC. Cottonwood Gulch (West Branch 3 – 0.4 mile) was determined to be a non-riparian system. Cottonwood Gulch (Lower Branch – 0.6 mile) was rated as FAR with an upward trend. The causal factor for the FAR rating was due to road encroachment, which had changed flow patterns and had increased sediment within the riparian zone. The area appeared to be stabilizing. Hayes Gulch (2.4 miles) was also assessed and was rated as PFC (BLM 2005c).

Noxious Weeds and Other Invasive Non-Native Species

Invasive non-native plants ("weeds") pose an ever-increasing threat to native plant communities, wildlife habitat, croplands, rangelands, and human recreation throughout the world (Temple 1990). Many invasive non-natives are known to displace native plants and disrupt the structure and function of local ecosystems (Vitousek 1990). "Noxious weeds" are invasive non-natives designated as noxious pursuant to state law, in this case the Colorado Noxious Weed Act of 1996. In general, state-listed noxious weeds include the most invasive and most problematic species. As populations of noxious weeds and other invasive non-native plants increase in size and frequency, they tend to reduce the diversity of surrounding native plant communities, altering species composition and community structure, reducing habitat quality for wildlife, and affecting the aesthetic quality of the landscape. Because weeds can also displace desirable plant species in rangeland (Usher 1988, USFS 1998, Weiss and Murphy 1998, CNAP 2000), infestations may adversely affect forage quality and quantity for livestock.

To date, no systematic surveys or mapping projects for weeds have occurred on the Planning Area. However, land health assessments in 1999, 2001, and 2004 (BLM 2001d, 2002b, 2005c) noted the presence of invasive non-natives, many of which are on the Colorado noxious weed list and/or BLM's national list (BLM 2002c). Noxious weed and other invasive non-native plants species known to occur in the Planning Area are listed in Table 3-12 and discussed below.

Table 3-12. Noxious Weeds and Other Invasive Non-Native Plants in the Planning Area

Common Name	*Scientific Name*	*BLM List*	*Colorado List*
Bull thistle	*Cirsium vulgare*	√	√
Burdock	*Arctium minus*	√	√
Canada thistle	*Breea arvensis*	√	√
Cheatgrass	*Anisantha tectorum*	√	√
Common dandelion	*Taraxacum officinale*		
Houndstongue	*Cynoglossum officinale*	√	√
Kentucky bluegrass	*Poa pratensis*		
Knapweeds	*Centaurea* or *Acosta* spp.	√	√
Musk thistle	*Carduus nutans*	√	√
Plumeless thistle	*Carduus acanthoides*	√	√
Russian-thistle	*Salsola iberica*		√
Salt-cedar or tamarisk	*Tamarix ramosissima*	√	√
Yellow toadflax	*Linaria vulgaris*	√	√

Houndstongue (*Cynoglossum officinale*) was noted in almost 66 percent of the land health assessment sites. Canada thistle (*Breea arvense*) and common dandelion (*Taraxacum officinale*)—the latter not included on Colorado or BLM weed lists—were found in a few sites. As noted above, cheatgrass has been found in localized patches of light to moderate densities in grazing allotments below the cliffs. These were often closely associated with activities that result in surface disturbance to vegetation such as roads and woodcutting. Additional weeds such as burdock (*Arctium minus*), knapweeds (*Centaurea* or *Acosta* spp.), yellow toadflax (*Linaria vulgaris*), and salt-cedar or tamarisk (*Tamarix ramosissima*) were noted as present at variable population sizes throughout the Planning Area during the land health assessments. Canada thistle occurs along almost every riparian reach on top of the plateau, some in dense populations, and both Canada thistle and houndstongue occur along most roads on top of the plateau.

Other invasive non-natives observed in the Planning Area by BLM personnel, but not within the land health assessment sites, include bull thistle (*Cirsium vulgare*), musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), and Russian-thistle (*Salsola iberica*). Another invasive non-native, Kentucky bluegrass (*Poa pratensis*), was found in 25 percent of the 1999 assessment sites but was rarely a dominant component. While this grass is not on the Colorado or BLM weed lists (Table 3-12), it is capable of out-competing native cool-season grasses under heavy grazing pressures (Rutledge and McLendon) and is therefore an indicator of declining habitat quality in rangelands or riparian areas.

Weed management is an ever-increasing issue throughout BLM lands. All weed species are capable of establishing large populations rapidly. Therefore, even where not currently dominant, the presence of weeds in a community indicates conditions that could lead to future infestations, especially if conditions become more favorable for them (e.g., increased amounts of bare soil, increased dispersion of seeds along new roadways, protracted drought, and decreased cover by native species due to excessive grazing of livestock, off-route travel by vehicles, or wildland fire). The expected trend, absent specific measures to control weeds, is for increasing sizes and numbers of weed populations. Invasive non-natives are therefore a threat to land health and multiple use land management by contributing to loss of rangeland

productivity, increased soil erosion, reduced species richness, reduced wildlife habitat quality, and reduced aesthetic quality.

3.3.1.4 Current Management and Desired Future Conditions

Upland Vegetation

The 1984 GSRA RMP contains no objectives for upland vegetation management. Upland vegetation within the Planning Area is currently managed to meet or exceed the upland vegetation Land Health Standard (#3)(Appendix F). This is specifically addressed in grazing allotment management plans as well as stipulations in the 1999 ROD and RMP Amendment.

Vegetation management objectives in the 1997 WRRA RMP include conservation of healthy, diverse populations of native plants and communities that are sustainable and provide products for human use, enjoyment, and well-being, and the RMP notes that "conserving a site's ability to produce vegetation is key to sustainability." Another objective is to maintain a plant community mosaic that represents "successional stages and distribution patterns consistent with the natural disturbance and regeneration regimes." Desired plant communities (DPCs) are identified, and specific DPC goals are specified for consideration during activity plan development. In the small portion of the site within WRRA, upland vegetation is managed to enhance and maintain sustainable ecological condition of plant communities. Upland vegetation is inventoried and ecological status is determined using BLM site inventory procedures, and the vegetation is protected in accordance with the RMP objectives.

Riparian/Wetland Vegetation

The 1984 GSRA RMP contains no objectives for riparian and wetland management. These values were recognized in the BLM Riparian/Wetland Initiative (BLM 1991a) that established national goals and objectives for managing these resources. One of the main goals of this initiative was to maintain or restore riparian/wetland systems so that 75 percent or more were in proper functioning condition by 1997.

Riparian and other wetland vegetation within the GSRA is currently managed to meet or exceed the riparian system Land Health Standard (#2)(Appendix F). This is specifically addressed in grazing allotment management plans as well as stipulations in the 1999 ROD and RMP Amendment. These include:

- Riparian and Wetland Zones (NSO 2) – Allows no long-term ground disturbing activities in these areas (231.7 acres).

  (CSU 2) – Moves proposed locations of ground-disturbing activities more than 200 meters, if required to avoid these areas (11,507 acres).

- Major River Corridors (Colorado River)(NSO 3) – Establishes a 0.5-mile protective buffer along either side of the Colorado River (80 acres).

The 1997 WRRA RMP states that riparian and wetland management objectives are to "achieve an advanced ecological condition on all high and medium priority riparian habitats except where resource management objectives, including proper functioning condition, require an earlier successional stage. The goal would be to have 75 percent of all riparian areas in the Resource Area in proper functioning condition within 5 years of approval of the RMP, Record of Decision." For the small area of the Planning Area in the WRRA, riparian and wetland vegetation is managed by communities to enhance and maintain sustainable ecological condition. DPC goals are identified and considered during activity plan development. Vegetation is inventoried and ecological status is determined using BLM site inventory procedures. This vegetation is protected in accordance with the RMP objectives and in cooperation with Colorado Natural Areas programs and other interested parties.

Noxious Weeds

Noxious weed management is mandated on Federal lands by the Federal Noxious Weed Act of 1974 (amended by Management of Undesirable Plants of Federal Lands, Section 15, 1990) and the Carson-Foley Act of 1968. Colorado BLM has a Weed Management Program based on the National BLM strategy, *Partners Against Weeds* (BLM 1996b), which focuses on integrated management of plant species included on the BLM National List of Non-Native Invasive Species. BLM is also a partner in the State of Colorado Strategic Plan for Noxious Weed Management (Colorado Department of Agriculture 2001).

The 1984 GSRA RMP has no objective for noxious weed management. The objective of noxious and problem weed management in the 1997 WRRA RMP is to manage noxious weeds so that they "cause no further negative environmental, aesthetic, or economic impact."

3.3.2 Terrestrial and Aquatic Wildlife

3.3.2.1 Introduction

In general, distribution, abundance, patterns of movement, and seasonal use by wildlife are related to habitat type, quality, size, shape, and connectivity, and historic or existing land use. At a more local level, interrelationships such as competition and predation may also affect individual species.

The Planning Area contains three broad landscape categories: (1) semi-desert habitats at lower elevations along I-70 and other nearby highways along the edges of the site, (2) transitional habitats immediately below the Roan Cliffs and on dissected slopes extending away from the cliffs, and (3) montane to marginal subalpine habitats at higher elevations above the rim. In addition to these major types are relatively narrow but ecologically important riparian habitats along streams, ranging from minor ephemeral tributaries to the Colorado River to two perennial tributaries: Parachute Creek and Government Creek.

Because of the ecological diversity related to the topographic extremes of the Planning Area, accentuated by its location near the boundary of the Colorado Plateau and Southern Rocky Mountain geographic provinces (e.g., Shelford 1963), the unit supports a wide range of terrestrial vertebrate communities, including upper montane/lower subalpine species that normally are not associated with BLM lands in the region.

The following subsections describe existing fish and wildlife resources of the Planning Area and existing resource management. Special status species—including Federally listed or candidate threatened or endangered species, State-listed threatened or endangered species, sensitive species as listed by BLM and USFS—and other species of special concern are described in Section 3.3.4.

3.3.2.2 Major Habitat Types

Wildlife habitat requirements vary significantly by species, but it is generally true that healthy and sustainable wildlife communities require an appropriate mix of plant communities to provide cover, food (including direct sources such as foliage, fruit, and seeds and indirect sources such as insects attracted to the plants), and structure (including thermal cover, hiding cover, and sites for nesting, resting, or feeding). For many species, availability of water or specific types of physical habitat (e.g., rough topography, caves) is also critical.

The Planning Area contains seven habitat types roughly corresponding with plant community types (Section 3.3.1), one habitat type related to the presence of caves, and both lentic (standing water) and lotic (flowing water) aquatic habitat types. These are described below.

Semi-desert Scrub

This community extends along I-70 west of Rifle and is formed on nearly level terrace deposits and adjacent fans north of the Colorado River. It occupies 5,384 acres within the Planning Area, but only 568 acres on BLM land. This discrepancy reflects the large area of semi-desert scrub on private land between the cliffs and Parachute Creek. The habitat is dominated by shadscale saltbush and greasewood, with localized areas of basin big sagebrush and a sparse understory of grasses and forbs. Because of the sparse forage and low height, this community is used primarily for nesting by certain songbirds and small mammals, for feeding by raptors and coyotes, and as severe winter range for deer. CDOW uses severe winter range to describe the portion of the range of a species where 90 percent of the individuals are located when the annual snowpack is at its maximum in the two worst winters out of ten—i.e., areas used during severe winters when higher quality habitats are unavailable due to deep and persistent snow.

Sagebrush Shrubland

Two types of sagebrush shrubland in the Planning Area have a combined area of 26,784 acres, of which approximately 38 percent is on BLM land. On top of the plateau, mountain sagebrush occurs on slopes and uplands throughout much of the area, where it shares dominance with other shrubs such as serviceberry and bitterbrush. Because of the more mesic conditions at these higher elevations, the sagebrush shrubland above the rim also has a relatively lush and diverse understory of grasses and forbs. Besides increasing the overall diversity of the sagebrush community, the presence of serviceberry (a tall species that provides cover), bitterbrush (a low-growing species favored as winter browse), and relatively lush herbage also make this important summer and transitional range for deer and elk. The higher elevations make this type of sagebrush community available for winter range only during mild (relatively warm and snow-free) winter seasons.

Below the rim, Wyoming big sagebrush (now considered a subspecies of mountain sagebrush) occurs on lower ridges and fans grading between the semi-desert scrub (which includes basin big sagebrush) and pinyon/juniper communities. The lower precipitation and warmer temperatures of these areas support foliage that tends to be underdeveloped compared to higher elevation sagebrush. However, the warmer and more snow-free conditions make the lower elevation sagebrush important as winter range.

Pinyon/Juniper Woodland

This type is extensive throughout the region, where it occupies large areas of transitional habitat at elevations intermediate between river valleys and mountain slopes—including the dissected foothills extending away from the Roan Cliffs. The total area of pinyon/juniper in the Planning Area is 24,450 acres, of which 16,352 acres occur on BLM land. Most of this type is formed on Wasatch shale. As is typical of this type, the pinyon pine and Utah juniper are associated with a sparse understory of grasses and forbs, as well as soil-specific subshrubs. The "pygmy conifers" support nesting by a variety of small birds, including several species that nest either primarily or only in this type. Mule deer, elk, predators (including the mountain lion, bobcat, and coyote), and a variety of raptors, small mammals, and reptiles also occur in this habitat. In addition to some shrubs, including sagebrush and mountain-mahogany, for winter forage, the pinyon/juniper habitats also provide hiding cover and thermal cover for deer, both of which are relatively lacking in the sagebrush and semi-desert scrub communities.

Mixed Mountain Shrubland

Throughout the region, mixed communities of tall shrubs such as Gambel's oak and serviceberry (sometimes with mountain maple) dominate transitional areas between more xeric pinyon/juniper and more mesic aspen-conifer types. Site conditions that support the mountain shrub type are related to suitable substrate—typically less clayey than the more xeric communities—as well as intermediate elevations and exposures. This type occupies 30,832 acres within the Planning Area, of which 16,713 acres are on BLM land. The tall shrubs, occasional conifers (Utah juniper and Douglas-fir), lush herbaceous stratum, and associated shrubs such as snowberry, bitterbrush, wax currant, and chokecherry

combine to provide highly palatable forage and ample cover for wintering ungulates and large predators, as well as a compositionally and structurally diverse habitat for small mammals and songbirds. Several species of small birds occur either mostly or entirely within this habitat type. Additionally, the presence of acorns and berries makes this habitat a favorite area for black bears during pre-hibernal hyperphagia (putting on fat for winter).

Aspen Forest

This deciduous tree species is common throughout the Rocky Mountains and on mountain islands of the Colorado Plateau. Mature, in many cases apparently climax, stands of aspen occur across much of the area atop the Roan Plateau, where they form a mosaic with the mountain sagebrush, mixed mountain shrub, and conifer forest types. Of the 14,531 acres of aspen forest within the Planning Area, BLM land accounts for 10,417 acres (72 percent). Aspen forests within the Planning Area, and in general throughout the region, support a rich and lush understory of grasses, forbs, and shrubs. The species is often associated with minor areas of surface water, including seeps and springs, and other areas of slightly elevated moisture associated with persistent snow, cooler aspects, or reduced exposure to wind. The mesic conditions, lush forage, and dense thermal and hiding cover it provides make aspen forest a preferred summer habitat for deer and elk, as well as for black bear and a variety of smaller species. Such habitat is also preferred for deer and elk fawning and calving. The structural complexity offered by the trees also attracts arboreal bird species and provides nesting and hunting habitat for a variety of raptors.

Conifer Forest

The Planning Area contains a total of 5,167 acres of conifer forest, of which 2,610 acres is on BLM land. Douglas-fir, subalpine fir, and Engelmann spruce attract a variety of forest species that do not occur in the other habitat types present. Besides the raptors, small mammals, and small birds attracted to the conifers, the dense forest also provides thermal and hiding cover for large mammals including deer, elk, and black bear. The understory beneath the conifers can be rather sparse in areas of dense growth, but more lush and diverse in more open stands and small clearings. Another type of conifer forest occurs in some areas below the rim—especially in the east-facing portion of the Roan Cliffs and Magpie Gulch. Mature Douglas-fir forest, in some places classified as "old-growth" forest, provides remote, secluded, and mature forest habitat for summer and transitional use by large mammals as well as year-round use by forest birds and small mammals. During hunting season, this rugged terrain provides secure, secluded habitat for big game, because the rough terrain and lack of roads makes it all but inaccessible to hunters.

Low Elevation Riparian/Wetland Communities

Communities of narrowleaf cottonwood, box-elder, associated wetland shrubs (willows, alders, and birches), riparian-margin shrubs (chokecherry, hawthorn, and dogwood), scattered conifers (blue spruce and Rocky Mountain juniper), and herbaceous wetlands (especially cattails) occur along the Colorado River, Parachute Creek, and Government Creek. The large trees, tall shrubs, and lush understory provide cover and forage for some resident deer, for migratory deer during winter, and for deer fawning and elk calving in spring. Wild turkeys use the habitat for nesting and wintering (Map 20), and a variety of raptors use the trees for nesting and perching. Bald eagles use them as winter roosts while hunting for waterfowl, fish, and carrion in adjacent habitats. The structural complexity and compositional diversity of the habitat also attracts numerous small birds, small mammals, reptiles, and amphibians. Among these are several species of neotropical migrant songbirds that winter at southerly latitudes, as well as year-round residents and local (elevational) migrants. Smaller, scattered patches of cottonwoods also occur along minor drainages such as Cottonwood and Goodrich Creeks.

The lowland riparian woodlands are especially important because they occur in areas that otherwise are hot, dry, and relatively barren, and therefore receive disproportionately high levels of use. This includes species that spend most of their time within the riparian habitat, species that nest in the corridor and feed in adjacent terrain, and species that remain mostly in the nearby terrain but move into the corridor for

water, shade, or forage. The trees and dense shrubs also provide seclusion for aquatic species along the river (e.g., water birds) and enhance the aquatic habitat quality compared to unsheltered stream reaches.

High Elevation Riparian/Wetland Communities

Tributary streams atop the plateau support a riparian community typically dominated by wetland shrubs and herbaceous wetland species, with discontinuous areas of aspen and scattered conifers. A small area of cottonwood and box-elder trees occurs along a reach of East Fork Parachute Creek below the falls. Although less densely wooded than the low-elevation cottonwood forests, the high-elevation riparian/wetland communities are nonetheless important because they provide movement corridors, thermal and escape cover, nesting and resting sites, and lush forage. They also enhance aquatic habitat by improving bank stability, provide shade to reduce thermal stress and seclusion along the streams, and serve as a source of insect prey for aquatic species.

Aquatic Habitats

The major aquatic habitats within the Planning Area and vicinity include the Colorado River and smaller streams in the Parachute Creek tributary system, with more limited aquatic habitat along Government Creek. The Colorado River and Parachute Creek are perennial and support a diverse fish community, including four species of rare (Federally listed) Colorado River fishes, other native non-game fishes, and introduced gamefishes. The smaller tributaries atop the plateau support only two fish species, but one—the Colorado River cutthroat trout—occurs in genetically pure populations that are regionally important. All of the perennial, intermittent, and ephemeral drainages within the Planning Area offer potential breeding habitat for amphibians and nesting or feeding habitat for water birds—either within the aquatic habitat of the drainage or in riparian/wetland vegetation sustained by periodic surface flows and more protracted subsurface moisture.

Ponds and reservoirs are limited within the Planning Area. Numerous small stockponds provide potential habitat for breeding by amphibians and resting/feeding sites for water birds. A larger impoundment, Fravert Reservoir, is located in the southeastern portion of the area below the cliffs and provides high-quality habitat for feeding and breeding by waterbirds.

Cliffs and Caves

The Roan Cliffs, while extensive, provide limited habitat for most wildlife species, although some birds nest in niches or ledges—chiefly the white-throated swift and rock wren, but also the cliff-nesting raptors such as peregrine falcon. These niches are also used for roosting and breeding by bats, as are caves.

3.3.2.3 Current Use by Wildlife

Information on species occurrence, abundance, seasonality, and habitat use of the area surrounding the Planning Area is available in a number of Colorado sourcebooks, including information on fish (Woodling 1984 and 1985), reptiles and amphibians (Hammerson 1999), birds (Andrews and Righter 1992, Kingery 1998), and mammals (Armstrong 1972, Fitzgerald et al. 1994). In addition to these sources, information on special-interest species—including hoofed mammals, predators, several species of raptors (birds of prey), Federally listed or State-listed threatened or endangered species, and other sensitive species—is compiled by CDOW in its Wildlife Resource Information System (WRIS) GIS database, organized by County. This information is incorporated with data from the CNHP and other sources into the Colorado Natural Diversity Information Source (NDIS) database, available online. NDIS data can be displayed by County, BLM resource area, or other geographic or political unit. Sources of information on wildlife within the Planning Area include a baseline characterization of NOSRs 1 and 3 (TRW 1982), a rare-species inventory of NOSR 3 (CNHP 1998), a sensitive-species monitoring survey (Greystone 1995), and observations by BLM personnel. The 1999 FSEIS and 1984 GSRA RMP describe wildlife resources for the GSRA, which includes the Planning Area.

Big Game Ungulates (Hoofed Mammals)

The Planning Area provides regionally important habitat for two native ungulates: the mule deer (Map 18) and Rocky Mountain elk (Map 19). These are the most abundant, widely distributed, intensively managed, and sought-after big game species in Colorado. Consequently, they are of special interest in the region due to their monetary value to CDOW and the tourist industry, and their recreational value to hunters. Many tourists and non-consumptive recreationists also place value on seeing deer and elk in conjunction with their travels and outdoor experience.

Deer and elk are managed by CDOW through a licensing system for hunting, with annual "harvest" rates in a given area (based on the number of permits issued) adjusted based on population trends and habitat quality and extent. The Planning Area lies almost entirely in Game Management Unit (GMU) 32, with a small portion along the northern edge in GMU 22. The boundaries of GMU 32 include SH 13 on the east, the divide between the Parachute Creek and Roan Creek basins on the west, the Colorado River on the south, and the divide between the Colorado River and Piceance Creek basins on the north. The Planning Area represents 66 percent of the total area of 301 square miles in GMU 32. Approximately 39 percent of GMU 32 is public land, consisting largely of BLM lands within the Planning Area. The parcels of private land are typically large tracts (>15,000 acres) acquired by energy companies during exploration and research related to oil shale or, more recently, oil and gas exploration and development.

Deer and elk generally migrate seasonally from summer range at higher elevations to winter range at lower elevations. In some situations, such as specific site conditions and favorable weather years, deer and elk may remain in the same area throughout the year. However, even this is generally combined with smaller scale winter movement to warmer and relatively snowfree aspects, such as on south-, southeast-, or southwest-facing slopes—and to areas with accessible winter forage. Slopes of 15 to 40 percent are generally preferred, and slopes steeper than 75 percent receive little use. Winter range is used from late fall until early spring, with the period December through April typically the most critical. During mild winters, deer and elk are scattered throughout the winter range and transitional range (i.e., habitats between winter and summer ranges). In severe winters, colder temperatures and deeper, more persistent snow cover may force the animals to areas that are warmer and drier but often provide poor forage.

The availability of winter range is generally considered a limiting factor for big game populations (i.e., a factor that directly and strongly influences numbers in a given area), and in this context is considered by CDOW to be "critical" habitat. This RMPA/EIS uses the term "crucial" to describe habitat types and areas of special importance to the maintenance or recovery of wildlife populations. In this usage, "crucial" is roughly synonymous with "critical" in normal parlance, but the latter term is not used here to avoid confusion with formal designation by USFWS of "critical habitat" for species Federally listed as threatened or endangered.

Winter range mapped by CDOW includes overall winter range, severe winter range (the only available habitat during severe winters), and winter concentration areas that support unusually high population densities. While any loss, degradation, or fragmentation of winter range would be expected to directly affect deer and elk populations, impacts to crucial habitats such as severe winter range and winter concentration areas would have disproportionately greater consequences. However, the impact analysis in Chapter 4 assumes that all winter range below the rim is important to the maintenance or recovery of mule deer populations, and that all summer range atop the plateau is important for elk.

Other crucial habitats for deer and elk include fawning and calving ("production") areas, security (seclusion) areas, and migration routes. Production areas typically consist of habitats that provide the combination of thermal and hiding cover, lush forage, water, and gentle terrain needed during the birthing and early rearing periods. Where such habitats are very limited in an area, CDOW often maps specific calving or fawning areas. In other situations—such as within the Planning Area—no specific areas are mapped, because these uses are more widely dispersed through expanses of suitable habitat. Security areas provide refuge for animals during the hunting season, such as areas of rugged terrain or deep timber.

Migration corridors may include a variety of shapes and types but within the Planning Area consist of the few points where deer and elk (and other large mammals) are able to find access routes through the otherwise impassable Roan Cliffs. These points are critical for allowing animals to move between summer and winter ranges, as well as to/from security areas.

The following subsections provide more specific information on mule deer and Rocky Mountain elk within the Planning Area. Table 3-13 provides summary information on deer, elk, and combined winter range within the Planning Area and selected regional GMUs.

Table 3-13. Deer and Elk Winter Range in the Planning Area and Surrounding Region [1,2]

Area Analyzed	*Total Area*	*Deer Winter Range [3]*	*Elk Winter Range [3]*	*Combined Total [3]*
Planning Area – Federal	73,602 ac	31,265 ac 42%	5,769 ac 8%	34,668 ac 47%
Planning Area – Private	53,405 ac	27,355 ac 51%	13,047 ac 24%	33,557 ac 63%
GMU 32	192,811 ac	76,582 ac 40%	34,280 ac 18%	90,568 ac 47%
Deer data analysis unit (DAU) 41 (GMU 31 + 32)	642,395 ac	289,571 ac 45%	161,282 ac 25%	386,274 ac 60%
Elk DAU 10 (GMU 21-22, 30-32)	2,360,532 ac	-- [4]	1,482,934 ac 63%	-- [4]

[1] Includes winter range, severe winter range, and winter concentration areas (source: NDIS online database).

[2] Percents relate the acres of winter range to the total acres in the area analyzed.

[3] Numbers for deer and elk Include area of overlap; combined total does not double count area of overlap.

[4] Data for DAU 10 limited to elk, because deer herds do not range across such a large area.

Mule Deer — Mule deer occur throughout the mountains and valleys of western Colorado. Historically, mule deer populations have fluctuated due to natural factors such as drought and severe winter weather. Deer populations in the Planning Area and throughout Colorado have reflected this pattern of periodic fluctuations, with a population high in the early 1980s followed by a major decline following the severe winter of 1983-84 (deep and protracted snow cover and extremely cold temperatures). Over the past 10 years, CDOW's post-hunt population estimates have remained relatively stable, and data for the past 3 years indicate continuing recovery in DAU 41, which includes GMUs 31 and 32, as follows: 2003 – 10,980; 2004 – 11,700; and 2005 – 12,530.

CDOW's current long-term objective for the mule deer population in DAU 41 is 16,500 animals. This population objective may be revised during the DAU planning process scheduled during the spring and summer of 2006, so comparison of existing population sizes to the current long-term objective may not be valid. However, the discrepancy between recent population estimates and the long-term objective as of the date of this document suggest that mule deer may be below sustainable long-term numbers.

Mule deer harvests reported by CDOW for GMU 32 in the 1990s ranged from 1,163 animals at the start of the decade to 117 animals at the close. In comparison, the annual harvest from 2000 through 2004 averaged 169 animals. This indicates a slight rebounding but continues to reflect more restrictive hunting regulations set by CDOW in 1999 in response to the lower deer population. These restrictions include issuing permits on a lottery basis and limiting the hunt to male deer in an attempt to aid recovery.

Many theories have been suggested for lower deer populations than those of the early 1990s and previous years. Possible causes mentioned have included habitat loss and fragmentation related to increased human population and related development and OHV travel, increased competition from growing elk populations, increased predation from growing predator populations, poor habitat quality due to protracted drought, poor habitat quality due to lack of wildfires, and over-harvest. A crippling

neurological disorder, chronic wasting disease, has been documented in some deer herds in Colorado in recent years but is not believed by CDOW to be a significant factor in deer numbers.

A typical annual pattern in the Planning Area begins with deer moving onto irrigated hay fields and sagebrush flats during green-up in early spring. Irrigated pastures, where available, may receive heavy use due to the much more palatable and nutritious forage than typically present on winter range at the end of the winter season. As green-up of native vegetation progresses to higher elevations, deer follow and arrive atop the plateau during May. They remain on the summer range throughout the summer months, during which time they bear and raise their young. Fawning and other summer uses for deer are dispersed across the top of the plateau. Site-specific studies indicate that Gambel's oak and mountain sagebrush communities receive the heaviest use by deer. Stands of quaking aspen or conifers provide ideal hiding and thermal cover for fawns, while streams and springs provide water and lush forage. Bitterbrush, mountain-mahogany, and serviceberry receive preferential use when present due to higher palatability and nutritive value. The selective use of bitterbrush and serviceberry is exhibited by extreme clipping (hedging, pruning) of the branches. These three shrub species are also present in some winter habitats within the Planning Area, although not in the lowest and therefore warmest and driest areas.

In late September, deer begin moving off the plateau and onto transitional habitat and winter range in the pinyon/juniper, mountain shrub, and sagebrush zones, including most of the area below the rim (Map 18). These areas, including Magpie Gulch, Sharrard Park, and sideslopes along the Parachute Creek valley, provide some of the best remaining winter habitat in GMU 32. Historically, winter use also included the Colorado River corridor, which provided water, cover, and forage. Access to the river is now largely denied by the intervening barrier of I-70.

The winter diet of mule deer consists primarily of twigs and shoots of the abundant shrubs and what little herbage may be found in moist sites along drainages. Winter is a time of nutritional depletion; deer use much or all of their fat reserves by late winter and are especially vulnerable to the stress of late-season cold snaps, snowfall, delayed green-up due to drought or cold, stress due to disturbance from human activity, and fatigue from being chased by dogs or wild predators.

As shown by the data in Table 3-13, approximately 31,265 acres (42 percent of the BLM portion of the Planning Area) is mapped as deer winter range. This includes nearly all of the BLM lands below the rim, with only densely forested slopes of Douglas-fir, areas too steep to support vegetation (including cliffs and talus cones), and severe badlands not supporting this use. Note that a higher percentage of private lands in the Planning Area is mapped as mule deer winter range—i.e., 51 percent. This reflects the fact that larger portions of the private lands are below the cliffs.

The data in Table 3-13 show that BLM lands contain 41 percent of the deer winter range in GMU 32 and 11 percent of that in GMU 41. Similarly, the BLM lands represent 38 percent of the total area of GMU 32, and 11 percent of DAU 41. Thus, the BLM lands are typical of the larger region in terms of relative amount of deer winter range.

An important feature of the Planning Area relative to movements and use by mule deer is the barrier to seasonal (elevational) movement posed by the sheer Roan Cliffs. Even sure-footed deer (and elk) are unable to penetrate this barrier except for a few places where breaks in the cliffs provide passages. Only six such areas ("movement corridors") occur within the Planning Area, as shown on Map 18. The migration passages are generally collocated with habitat mapped as wildlife security areas. These areas have been mapped by CDOW because of their importance in providing refuge for big game during the hunting season. The dense cover and steep terrain of the security areas is usable by wildlife including myriad non-game species, but mostly too steep and rugged for use by people and inaccessible to OHVs.

Rocky Mountain Elk — This large ungulate is also prone to natural population cycles and, like the mule deer, reached a population peak in the region in the early 1980s but declined sharply following the severe winter of 1983-84. However, recovery since that time has been more pronounced, with post-hunt

population estimates in DAU 10 (which includes GMUs 21, 22, 30, 31, and 32) increasing steadily from approximately 6,500 animals in 1983 to 9,950 animals in 2005. As noted above, the increase in elk populations is often cited as a possible reason for declines in deer populations, due to competition for space and forage. The current long-term objective for elk populations in DAU 10 (established by CDOW in 2005) is for 7,000 to 9,000 animals. The elk harvest has also been more consistent than for deer. For example, the number of elk harvested in GMU 32 was 140 in 1991 and 160 in 2001. This reflects the relatively stable elk populations and the fact that CDOW has not needed to stricter hunting regulations for this species.

Elk have several competitive advantages over mule deer in areas of sympatry (geographic overlap). These include the following: (1) larger bodies allow them to withstand colder temperatures, decreasing vulnerability to winter mortality from temperature stress; (2) longer legs enable them move more easily through snow, increasing the area available to them in winter; (3) larger adults are less vulnerable to predators and more able to defend their young; (4) elk are able to consume a wider range of plants, and since grazing (consumption of herbaceous species) is a more important part of their diet, they are better adapted to exploit the grasses and hay species planted by ranchers for livestock forage; (5) elk are behaviorally more flexible, often moving readily onto private property to graze alongside cattle during fall and thus avoiding hunters.

Unlike the pattern for deer, most of the elk herd in the Planning Area migrates northward from summer range atop the plateau to winter range along Piceance Creek and Roan Creek. This may reflect a combination of the difficult access routes through the cliffs but is probably more associated with the relative poor quality (for elk) of the dry, grass-impoverished habitats south of the cliffs. Some of the elk that summer in the Planning Area spend winter months on slopes along Parachute Creek and Government Creek near the western and northeastern edges of the Planning Area, respectively (Map 19). This pattern of use results in little competition between deer and elk for the habitats south of the cliffs. Further, while much of the lower elevation habitats south of the cliffs are classified by CDOW as mule deer severe winter range or winter concentration area, most of the elk winter range in the Planning Area is not given either of these special designations.

Table 3-13 reflects the lesser importance of the Planning Area for elk winter range than described above for deer. For example, elk winter range covers only 8 percent of the BLM lands, compared to 24 percent of the private lands. In the case of elk, the higher proportion of winter range on private lands is related not only to the prevalence of lower elevation areas, but also of areas along Parachute Creek that receive substantial use by elk that summer on top of the plateau (see Map 19). As noted above, most of the remaining portion of the summering elk population moves northward out of the Planning Area instead of to areas south of the cliffs.

The data in Table 3-13 also show that BLM lands consist of a smaller proportion of elk winter range than the larger region. This can be seen by the fact that BLM lands represent 38 percent of the total area of GMU 32 but only 17 percent of the elk winter range. Similarly, the BLM lands represent 11 percent of the total area of DAU 41 but only 4 percent of the elk winter range. (Note that deer DAU 41 is used for this comparison rather than elk DAU 10, because DAU 41 is more relevant to the Planning Area.

Summer range is considered crucial for elk in DAU 10 due to the limited amount of mesic, high-elevation habitats as compared to most of the more mountainous areas of Colorado. Because much of the region is xeric, particular importance is ascribed to areas of predictable water, patches of aspen and conifers for hiding and thermal cover, and meadows for forage. Therefore, while the Planning Area provides a disproportionately small portion of the elk winter range in GMU 32 and DAU 41, the high-quality summer range atop the plateau provides a disproportionately large share of the summer range in these areas. For example, the Federal lands on top of the plateau represent 51 percent of the amount in the Planning Area, 32 percent of the amount in GMU 32, and 9 percent of the amount in DAU 41. In comparison to the entire DAU 10, the total private plus Federal lands atop the plateau provide more than

8 percent of the total elk summer range but less than 3 percent of the total land area. More extensive summer range occurs at the generally higher elevations of nearby mountainous portions of the White River National Forest, but these areas are not within DAU 41 and DAU 10.

CDOW has not mapped specific production areas for elk in the Planning Area. However, the lack of mapped production areas does not mean that this use does not occur. On the contrary, essentially the entire top of the plateau is suitable for calving and rearing of young due to the mosaic of aspen and conifers for cover, meadows and sagebrush shrublands for forage, relatively gentle topography, and ample surface water. In contrast, specific calving areas are typically mapped by CDOW only when limited areas of suitable habitat are available within a larger area of unsuitable habitat.

As with mule deer, six passage points through the steep Roan Cliffs (Map 19) provide the only migration routes by which some of the elk population summering atop the plateau can move to/from winter range below the cliffs. However, as described previously, most of the elk population moves northward to winter ranges in the Piceance Creek and Roan Creek drainage basins, and most of the portion that winters within the Planning Area does so either along Parachute Creek or Government Creek (Map 19).

The seasonal movement corridors are made doubly important by their location in areas also mapped by CDOW as wildlife security areas. Thus, they not only accommodate seasonal vertical migration but also provide areas where elk can find refuge during the hunting season. Security areas are generally heavily wooded, rugged, and steep, which precludes OHV travel and most other human use.

Large Carnivores

Mountain Lion — The mountain lion and black bear (see below) are the two common large carnivores in Colorado, and the black bear is a big game species. Along with deer and elk, black bears provide a recreational as well as an ecological resource within the Planning Area.

Mountain lions typically follow their primary food source, which in the Planning Area includes deer, young elk, smaller mammals, and upland gamebirds with the same general elevational pattern as the ungulates. Mountain lions are generally dispersed throughout the summer but may make more intensive use of smaller areas during winter, when deer are concentrated on winter range. Populations are cyclical, reflecting cycles in their prey. When big game numbers are low, mountain lions shift to other prey, including domestic livestock. Damage complaints by ranchers about mountain lion predation on domestic sheep are common in the eastern portion of the Planning Area. In 2001, CDOW reported a harvest of two lions during five recreation days in GMU 32.

Black Bear — This large species, an omnivore in terms of diet, inhabits the top of the Roan Plateau, transitional habitat on rugged slopes, and riparian habitats along major drainages. The more xeric shrub and pinyon/juniper habitats receive little use due to sparse cover and lack of food. Black bears make heavy use of acorn and berry crops in mountain shrub habitats in fall and aspen buds in spring. Throughout the summer, bears feed on a variety of plants and small animals (rodents and ground-nesting songbirds) as well as carrion. Black bears typically seek dens in rocky areas, small caves, or tunnels under tree roots to hibernate. CDOW reported a harvest of five black bears during five recreation days in GMU 32 in 2001.

Other Mammals

Small Carnivores — Other predators in the Planning Area include the bobcat, coyote, red fox, American badger, long-tailed weasel, short-tailed weasel, and mink. The coyote occurs throughout the Planning Area, while the similarly sized bobcat is mostly limited to rugged or wooded areas. The red fox, long-tailed weasel, and short-tailed weasel prefer mosaics of wooded and open terrain and are mostly associated with habitats atop the plateau and along the main streams. The badger occurs in expanses of grassland or sparse, low-growing shrubs. The mink prefers riparian woodlands and is likely to occur along the Colorado River and Parachute Creek. Raccoons, ringtails, striped skunks, and western spotted

skunks probably also occur—raccoons and striped skunks mostly along the major drainages and spotted skunks and ringtails in canyons on the margins of the site.

Two special status carnivores that occur in the general region are the lynx, a Federally listed threatened species that had recently been reintroduced into Colorado, and the American marten, designated as a sensitive species by USFS. Neither of these species is known to occur in the Planning Area, and potentially suitable subalpine habitat atop the plateau is both limited and isolated. Section 3.3.4 discusses these and other special status species.

Small Mammals — The diverse habitats of the Planning Area support a variety of other mammals. Although of limited recreational or economic importance, these species are important components of the ecosystem. They provide a food source for predators, both actively and passively affect plant communities, and in some cases (e.g., the beaver) can have profound influences on the physical habitat. Their presence also contributes in a large way to the overall biodiversity of the Planning Area.

Lagomorphs (rabbits and hares) documented or likely to occur in the Planning Area include the white-tailed jackrabbit and desert cottontail in semi-desert shrublands and grasslands at lower elevations and the snowshoe hare and mountain cottontail in mixed forest habitats atop the plateau (TRW 1982, Fitzgerald et al. 1994).

Rodents occurring onsite include the beaver and muskrat along streams, porcupine in woodlands at all elevations, and several sciurids (members of the squirrel family). The latter include the yellow-bellied marmot on talus slopes and rock outcrops; the red squirrel, golden-mantled ground squirrel, and least chipmunk in mixed forests atop the plateau and along the cliffs; the rock squirrel and Hopi chipmunk in rocky areas and lower elevation woodlands; and the Wyoming ground squirrel and thirteen-lined ground squirrel in open grasslands and sparse shrubs in the upper and lower elevations of the Planning Area, respectively. The white-tailed prairie dog (another regional sciurid) is present in arid grasslands and semi-desert scrub farther west in Colorado but is not known to occur within the Planning Area.

Other rodents observed or expected include the northern pocket gopher in mountain grasslands, western jumping mouse in riparian wetlands, and other widespread species such as the bushy-tailed woodrat (packrat), deer mouse, canyon mouse, pinyon mouse, northern grasshopper mouse, long-tailed vole, and "Apache" (*c.f.* plains) pocket mouse. Non-rodent ground-dwelling small mammals documented or expected include Preble's shrew (CNHP 1997a) and the masked shrew, montane shrew, dwarf shrew, and water shrew (Fitzgerald et al. 1994). Several bat species also occur or would be expected. These include four BLM sensitive species (fringed myotis, Yuma myotis, Townsend's big-eared bat, and spotted bat, as described in Section 3.3.4) as well as the California myotis, western small-footed myotis, long-eared bat, long-legged myotis, little brown myotis, big brown bat, hoary bat, and western pipistrelle (Finley et al. 1983; Armstrong et al., undated). Bats are likely to be associated with wooded areas atop the plateau, along the cliffs, and along major drainages, as well as alcoves, ledges, and caves along the Roan Cliffs.

Bird

Raptors — The avifauna of the Planning Area, including raptors, also reflects the wide range of habitats present and the location in the transitional zone between the Southern Rocky Mountain and Colorado Plateau provinces. The descriptions are arranged by taxonomic and trophic groups.

Raptors known to occur or potentially present in the Planning Area include two species of eagles, three species of falcons, several species of hawks and owls, and the turkey vulture. Specific use areas for specific raptors are shown on Map 20. Three of these species (the peregrine falcon, ferruginous hawk, and northern goshawk) are BLM sensitive species, and one (the bald eagle) is Federally listed as threatened. Apparently suitable habitat for another raptor Federally listed as threatened, the Mexican spotted owl, is also present in wooded canyons of the Planning Area, but the known geographic range of this species does not included Garfield County. Special status species are discussed in Section 3.3.4.

Other raptors known to occur in the Planning Area, or potentially present based on location and available habitats, include golden eagles and prairie falcons nesting along the Roan Cliffs and hunting in open terrain; great horned owls, red-tailed hawks, and potentially Swainson's hawks nesting along cliffs and forest edges or open woodlands; flammulated owls, western screech-owls, Cooper's hawks, and sharp-shinned hawks in medium-density woodlands and riparian forests; northern saw-whet owls, northern pygmy-owls, and boreal owls in higher elevation aspen and conifer forests (along with northern goshawks); and northern harriers in open grassland, sagebrush, or agricultural habitats. Turkey vultures are seen throughout the Planning Area and probably nest in wooded terrain below the cliffs.

Gallinaceous Birds — Upland fowl (upland gamebirds) within the Planning Area include the chukar, blue grouse, and wild turkey. Another galliform, the greater sage-grouse, is known to occur west and north of the Planning Area and probably historically occurred in sagebrush habitats atop the plateau and below the cliffs. BLM and CDOW are cooperating in an upcoming greater sage-grouse recovery plan that was not available at the time of preparation of this Draft RMPA/EIS. This species and another BLM sensitive species, the Columbian sharp-tailed grouse are discussed in Section 3.3.4, as is the Gunnison sage-grouse, a candidate for Federal listed as threatened or endangered.

The chukar, a non-native gamebird, occurs in small populations on steep slopes and talus areas in xeric canyons, especially Wheeler Gulch northeast of Parachute. The ephemeral drainage on the floor of the gulch provides water and nesting sites. The blue grouse occurs in aspen/conifer forests and mixed mountain shrubs atop the plateau. The wild turkey is the most important of the gallinaceous species onsite as a gamebird. Turkeys use riparian habitats and nearby mountain shrub and pinyon/juniper habitats for nesting and wintering. The two main production (nesting and brood rearing) areas for wild turkeys are along Parachute Creek and Government Creek (Map 20). Mountain shrub habitats that contain oakbrush are critical during fall and winter, when the acorn crop is a major food source.

Waterbirds — Waterfowl, wading birds, and shorebirds in the Planning Area are limited by the minimal amount of aquatic habitat. The areas of greatest use by waterbirds are the Colorado River, Parachute Creek, Government Creek, perennial portions of tributaries to these streams, and Fravert Reservoir. Common waterfowl (ducks, geese, and allies) on the major streams and impoundments include the Canada goose; common merganser; puddle ducks such as the mallard, gadwall, American wigeon, blue-winged teal, and green-winged teal; and diving ducks such as the common golden-eye, lesser scaup, ring-necked duck, redhead, and canvasback. The mallard, blue-winged teal, and green-winged teal are the most common species on smaller streams and ponds atop the plateau. A special status duck, Barrow's golden-eye, is discussed in Section 3.3.4.

The most common wading bird in the area is the great blue heron, which nests in mature cottonwoods along the Colorado River and main tributaries and may fly considerable distances to hunt for fish in the shallows of streams and ponds. Another wading bird, the white-faced ibis (a special status species, Section 3.3.4), also occurs in the area, primarily along the shallow edges of the Colorado River, the shoreline of Fravert Reservoir, and similar areas. The two most common shorebirds in the Planning Area are the spotted sandpiper, which may nest along portions of Parachute Creek, Government Creek, and higher elevation tributaries, and the killdeer, a ground-dwelling shorebird often associated with barren areas around stockponds and on gravel flats along rivers. Other wading birds and shorebirds use the Colorado River and tributaries during migration.

Small Birds — Perching birds (songbirds and flycatchers), woodpeckers, and other small bird species documented or expected in the Planning Area also reflect the wide range of habitats present. The following listing of species likely to breed onsite does not include all potential species. Many of the species listed for aspen/conifer forest may occur in lower elevation habitats during winter. The listing is organized by major portion of the Planning Area or habitat type in which the species is most commonly found:

- *Semi-desert Scrub and Sagebrush Shrubland* — Western kingbird, eastern kingbird, horned lark, western meadowlark, sage thrasher, Brewer's sparrow, vesper sparrow, and lark sparrow.
- *Pinyon/Juniper Woodland* — Common poorwill, Say's phoebe, gray flycatcher, ash-throated flycatcher, pinyon jay, violet-green swallow, juniper titmouse, common bushtit, Bewick's wren, blue-gray gnatcatcher, western bluebird, mountain bluebird, Northern mockingbird, loggerhead shrike, plumbeous vireo, gray vireo, black-throated gray warbler, and house finch. Clark's nutcracker occurs as nomadic individuals during years with heavy pinyon-nut production.
- *Mountain Shrubs* — Dusky flycatcher, western scrub-jay, MacGillivray's warbler, Virginia's warbler, spotted towhee, and green-tailed towhee. The band-tailed pigeon occurs as nomadic flocks during years of heavy acorn production.
- *Riparian Forest* — Northern flicker, red-naped sapsucker, downy woodpecker, Cordilleran flycatcher, willow flycatcher, black-billed magpie, purple martin, house wren, black-capped chickadee, gray catbird, American robin, Swainson's thrush, veery, Bullock's oriole, warbling vireo, yellow warbler, orange-crowned warbler, yellow-breasted chat, fox sparrow, lazuli bunting, American goldfinch, and lesser goldfinch.
- *Aspen/Conifer Forest* — Broad-tailed hummingbird, northern flicker, American three-toed woodpecker, hairy woodpecker, Williamson's sapsucker, red-naped sapsucker, western wood-pewee, olive-sided flycatcher, Hammond's flycatcher, Steller's jay, violet-green swallow, tree swallow, American robin, Townsend's solitaire, hermit thrush, mountain bluebird, house wren, mountain chickadee, white-breasted nuthatch, red-breasted nuthatch, brown creeper, warbling vireo, yellow-rumped warbler, western tanager, chipping sparrow, dark-eyed junco, pine siskin, Cassin's finch, and evening grosbeak.

Other species include the white-throated swift and rock wren around rock outcrops and cliffs; the belted kingfisher, northern rough-winged swallow, bank swallow, barn swallow, and cliff swallow along low-elevation streams; and the common nighthawk, American crow, common raven, Brewer's blackbird, and brown-headed cowbird throughout.

Reptiles and Amphibians

As throughout most mountainous portions of Colorado, the herpetofauna of the Planning Area is somewhat depauperate owing to relatively high elevations and associated cool summer temperatures and long, cold winters. In general, however, the Planning Area is more diverse than many comparably sized areas due to the wide elevational range and diversity of habitats. Amphibian species known to occur include the tiger salamander in stockponds and other small reservoirs; northern chorus frog in seasonal wetlands atop the plateau; and Woodhouse's toad, Great Basin spadefoot and northern leopard frog (both BLM sensitive species, Section 3.3.4) in the vicinity of Parachute Creek. The boreal toad, listed by BLM as a sensitive species and by CDOW as endangered in Colorado (Section 3.3.4), occurs in wetlands, abandoned stream meanders, and beaver ponds throughout the subalpine zone of Colorado. However, it is not documented to occur near the Planning Area (e.g., Hammerson 1999), probably due to extreme isolation of the limited subalpine habitat atop the plateau.

Lizards known or likely to occur include the short-horned lizard in semi-desert grassland and shrubland north of I-70; the collared lizard, sagebrush lizard, plateau (fence) lizard, tree lizard, and side-blotched lizard in rocky areas of pinyon/juniper and cliffs; and the western whiptail and plateau striped whiptail in river bottoms.

Snakes in the Planning Area and vicinity include the milk snake, smooth green snake, and western terrestrial garter snake along streams (the last being found above as well as below the rim); and the striped whipsnake, yellow-bellied racer, and gopher (bull) snake in most of the area below the cliffs. All of these are rather common in their ranges, except that the regional subspecies of the milk snake (Utah milk snake)

is classified as a BLM sensitive species. If present, this subspecies would be most likely in riparian habitats and lush floodplains. The only pit viper (rattlesnake) known to occur in the Planning Area is the western rattlesnake, found in all habitats below the rim except riparian habitats. The midget faded rattlesnake, listed as a BLM sensitive species and a species of special concern in Colorado (Section 3.3.4), is currently classified as a subspecies of the western rattlesnake.

Fish

The Planning Area and vicinity support several special status fish species, including genetically pure populations of the Colorado River cutthroat trout atop the plateau and five species of non-game large-river fishes in the Colorado River near and downstream from the site. These are discussed in Section 3.3.4.

Other fishes native to the Colorado River system that are known or expected to occur in the Planning Area or vicinity include the speckled dace, roundtail chub, bluehead sucker, flannelmouth sucker, and mottled sculpin. These species are important both for their intrinsic value as indigenous species and for their importance as prey species to the recreationally important but mostly non-native gamefish. Other species that are native to Colorado but not the Colorado River system are also known to occur in area streams. These include the fathead minnow, red shiner, sand shiner, white sucker, and longnose sucker. Non-native gamefish species in area streams include the green sunfish, brook trout, brown trout, rainbow trout, and non-native subspecies of the cutthroat trout.

One of the non-natives, the brook trout is mostly a fish of small streams and was introduced to the East Fork Parachute Creek drainage sometime during the early 1970s. An electrofishing survey in 1980 indicated a dense population of brook trout in the East Fork drainage but none in the East Middle Fork (Trapper/Northwater) drainage, indicating that other introductions of this species did not occur or failed. Proliferation of brook trout when introduced into small mountain streams is a common situation in the region. This species, being a type of char, spawns in fall rather than spring as do true trout such as the Colorado River cutthroat. The resultant "head start" for a given reproduction class gives the young brook trout an advantage over young cutthroat trout when competing for food during the following summer growth season. Another non-native gamefish, the rainbow trout, is reported to have been introduced into Northwater Creek at least once (Behnke 1979), but the lack of subsequent observations (including the electrofishing survey a year later) indicates that the species did not become established. The presence of non-native gamefish in streams currently or potentially supporting Colorado River cutthroat trout is considered by BLM and CDOW to be undesirable, and future management may include steps to eradicate the non-natives (BLM 2001d).

3.3.2.4 Current Condition and Trends

The quality and availability of suitable habitats in the Planning Area reflect both the natural physical and biotic environments of the site and the influence of human presence and land uses. Areas below the cliffs have been subjected to prolonged agriculture, primarily grazing of cattle, oil shale exploration and limited development, more recent oil and gas exploration and development, and increasing use by destination recreationists and residents of nearby communities. Areas above the rim have also been subjected to most of these uses, although the remoteness of the area and the lack of significant oil and gas exploration to date have resulted in fewer impacts overall.

Historic and recent uses of the Planning Area have contributed to the creation of a network of roads and smaller routes with a combined length of 259 miles. These roads have resulted in approximately 10,000 acres of direct habitat loss, fragmented formerly unbroken habitats, created zones of disturbance associated with motorized travel, and allowed human access into otherwise inaccessible areas. In the 1970s, the construction of I-70, and of a parallel 8-foot-high game fence to reduce vehicle-wildlife collisions, created a major barrier to historic cross-valley movement by deer, elk, and other large mammals.

Land Health Assessments

Lands atop the Plateau — Grazing allotments in portions of the Planning Area were assessed for land health in the Roan Cliffs Landscape Unit (BLM 2001d), Rifle Creek Landscape Unit (BLM 2002b), and Rifle-West Landscape Unit (BLM 2005c). These concluded that, overall, these lands were meeting Land Health Standards. The results of the assessments are described in detail in the appropriate resource sections. Synopses for individual standards are as follows:

- *Standard #1 (Upland Soils).* This standard was being met at all of the sites assessed. Some areas across the Rifle-West watershed exhibited accelerated soil erosion. In particular, Cottonwood Gulch has experienced soil erosion from adjacent roads where maintenance activities have pushed soil into the channel.
- *Standard #2 (Riparian Systems).* In 1999, this standard was continuing to be met (PFC) at all sites rated as PFC during the previous land health assessment in 1994 (BLM 2001d), and all but one of the sites rated as FAR during the previous assessment were showing an upward trend. The improvements were mostly related to changes in the grazing rotation and distribution of salt licks to reduce the tendency for livestock to tarry for too long, and in too high a number, along stream reaches. The exception to the upward trend for riparian areas rated as FAR in 1994 was JQS Gulch through JQS Pasture, which continued to be rated FAR based on impacts from concentrated use by livestock. Limiting the duration of livestock use along this riparian zone, or fencing the stream and providing an alternative water source, would probably restore this stream to PFC. More use of fences and development of alternative water sources would also benefit most other riparian habitats rated as FAR atop the plateau.
- *Standard #3 (Healthy Productive Plant and Animal Communities of Native and Other Desirable Species).* This standard was also being generally met in 1999. Plant communities were in good to excellent condition. Weeds were identified as a problem in some areas, especially along riparian areas due to concentrated livestock use. Selective spraying or other control of problematic infestations would benefit the system by reducing these plants as a seed source for further invasions and allowing recovery of displaced native species. Another issue identified in the 1999 land health assessment above the rim was that many stands of aspen forest are becoming decadent and lack age-class diversity. Active management, such as prescribed fires, could be used to improve age-class diversity but should not be overdone due to the generally good condition. Efforts to improve age-class diversity should include a focus on ensuring the long-term presence of aspen forest rather than merely providing improved forage quantity and quality for ungulates. While deer and elk would benefit from returning some aspen to a younger stage, and while these species are recreationally important, they are more abundant and widespread in the Planning Area and the region than are several species of forest-dwelling raptors and small birds that would be adversely affected by loss of trees.

  Streams atop the plateau were also found to be generally healthy in the 1999 land health assessment and to support productive and healthy fish populations in reaches with adequate year-round flows. However, Standard #3 is not being met relative to the Colorado River cutthroat trout in JQS Gulch or East Fork Parachute Creek due to an inability to compete with non-native brook trout (see Section 3.3.2.3). Measures to reduce or eliminate the brook trout were discussed in the land health assessment report (BLM 2001d). Optional approaches would either be very slow (selective angling regulations to encourage removal) or costly and complex (use of rotenone or seining). However, some type of management agreement with CDOW appears necessary if preserving and restoring Colorado River cutthroat trout populations in these streams remains a priority.
- *Standard #4 (Special Status Species and their Habitats).* This standard is mostly being met, except for the decline of Colorado River cutthroat trout populations in JQS Gulch and East Fork Parachute Creek (see above). Measures described previously (for Standard #2) to improve the riparian

vegetation along JQS Gulch in JQS Pasture, and similar measures (reduced grazing use or fencing) to reduce the impact of livestock along other streams would benefit the trout and special status species associated with riparian communities throughout the Planning Area.

- *Standard #5 (Water Quality).* This standard was being met for all streams sampled as part of the 1999 land health assessment. This is based on water quality criteria being met for the particular existing or potential water use classes assigned to each stream by the State of Colorado (CWQCC). These include Aquatic Life Cold Water 1 and 2, Recreation 2 (includes fishing), Water Supply (potable, standard treatment but not necessarily a water supply), and Agriculture (irrigation and stock watering).

Lands below the Rim — BLM conducted a land health assessment on a portion of the lands below the rim, from Hubbard Mesa to the north (see BLM 2002b). While not specifically listing the different standards as in the 1999 assessment for the area above the rim, the 2002 assessment addressed Standard #2 (Riparian Systems) and #3 (Plant and Animal Communities) as follows:

> Riparian areas were generally in good condition. Portions of Government Creek are in less than desirable condition due to OHV use within the stream channel, and limited water supply.
>
> Much of the lower elevation lands are not in good condition. Sagebrush is old, decadent, and unproductive. Decades of fire suppression have allowed pinyon and juniper trees to encroach into sagebrush parks. Sagebrush density is increasing and herbaceous cover is declining. In many of these lower elevation areas, sagebrush, mountain mahogany, and serviceberry are severely hedged. In some areas, cheatgrass has become dominant or poses a significant threat of invasion. OHV use in some areas has severely fragmented habitats and resulted in increased erosion, weeds, trash, soil compaction, and loss of vegetation.

An assessment of the Rifle-West Landscape Unit included lands below the rim to the west in 2004 (BLM 2005c). Conditions noted for this area by BLM in 2001 (2002b) were observed in 2004 as well. These include habitat loss and fragmentation associated with oil and gas development, abundant cheatgrass in some areas, sagebrush parks becoming decadent and being invaded by pinyon/juniper, and a very poor herbaceous understory in the semi-desert scrub communities at the lowest elevations of the Planning Area. Very few riparian areas exist in this part of the Planning Area, although conditions appear to be good given the potential of these small drainages, with the exception of some soil erosion into Cottonwood Gulch where maintenance activities along adjacent roads have pushed soil into the channel.

Habitat below the rim has been mapped by BLM from an ecological perspective using four criteria: High Value Habitat, Moderate Value Habitat, Lesser Value Habitat, and Security areas. These are described in the 1999 FSEIS.

Resource Capabilities

Several trends have direct or indirect effects on wildlife resource capabilities, both regionally and locally. These trends, which include existing types of use and recent or current management, are summarized below.

Habitat Loss and Alteration — The natural environment of the Planning Area and region has been altered and fragmented by construction of roads, oil and gas pads, utility corridors, rural subdivisions, and individual homesites. Disturbance associated with increased human activity and operation of motorized vehicles has further decreased the amount of available habitat as a result of wildlife avoidance of areas with intolerable levels of disturbance. Even in situations where wildlife continue to use a critical habitat subject to disturbance, such as when it is the only habitat available, increased stress can affect survivorship of the population.

While some "edge species" and "generalists" may actually benefit from habitat fragmentation, other "habitat-interior species" and "specialists" may be adversely affected by fragmentation to a degree that

exceeds the amount of habitat loss *per se*. Edge species and generalists include such common wildlife as the mule deer, Rocky Mountain elk, coyote, red fox, American robin, and black-billed magpie. Habitat interior and specialist species include the American marten, northern goshawk, and most of the small mammals and songbirds associated with specific plant communities.

Since I-70 was constructed in the 1970s, big game populations in the Planning Area have been largely isolated from habitats along and south of the Colorado River valley. This has forced changes in historical patterns of seasonal use and movement. The barrier created by I-70 is exacerbated by the presence of an 8-foot-high fence constructed to reduce the amount of wildlife mortality (and risk to humans) from collisions with vehicles.

Oil and gas development has directly impacted approximately 1,800 acres of habitat to date, but the associated traffic and other intrusions have indirectly impacted more than 10,000 acres (1999 SEIS). The overall number and density of wells continues to grow. The result is more forage loss and increased habitat disturbance in previously undisturbed areas. As a result, the importance of habitats that have not yet been impacted has increased. Construction and daily management activity also causes time-specific disturbances that are especially detrimental to wildlife in critical habitats or during critical time periods.

Loss of vegetation cover deprives wildlife of direct and indirect sources of food and of sites for hiding, resting, and breeding. It also results in increased runoff (amount and speed), which increases erosion and subsequent downstream sedimentation, leading to downcutting and the resultant loss of riparian habitat, decreased water quality, and reduced stream productivity. Much of the Planning Area is composed of fragile soils and steep slopes that are difficult to reclaim, ranging from long-term impacts (>2 years) to essentially permanent impacts (>50 years) in areas of vegetation removal.

Fire Suppression and Habitat Condition — Fire suppression throughout the region has allowed many plant communities to move into late-seral condition, resulting in over-mature and decadent stands of vegetation. These stands are typically less productive as wildlife habitat. Most notably affected are the semi-desert shrub, scrub, sagebrush, mountain shrub, and pinyon/juniper habitat types. On top of the plateau, the role of long-term plant succession and changes in plant communities are less obvious and the effect on deer and elk forage quality not as clear. Animal condition, reproduction, growth rate, and survival are all potentially affected.

Riparian Vegetation Condition — Riparian vegetation is critical to many wildlife populations and has generally been affected by disturbance associated with excessive livestock use, intensive recreational use, changes in flow regimes and groundwater tables, and road or pipeline crossings. Restoring riparian structure and function is a long, difficult, and often impossible process. Fencing of portions of the stream and riparian habitat along Trapper Creek is having a positive effect on fish and wildlife habitat.

For example, electrofishing of Trapper Creek by BLM in August 2002 yielded a total of 42 Colorado River cutthroat trout in a 0.5-mile reach within a grazing exclosure, but only 6 fish in a 1-mile reach outside the exclosure. This result is especially dramatic given that the unfenced, low-yield reach was downstream from the exclosure and had consistently higher flows. Compared to the exclosure, the unprotected reach was characterized by unstable banks, sparse vegetation cover, and a wider, shallower condition.

Weeds — Noxious weeds are spreading rapidly in the Planning Area and region, lowering overall site condition and quality (Section 3.3.1). Weeds displace native plants, provide poorer forage and cover for wildlife, and are generally less attractive than native grasses and wildflowers. Weeds are particularly common along roads, drainages, and other areas of concentrated livestock use (e.g., near salt licks and stockponds).

Recreational OHV Use — Recreational use of public and private lands continues to increase. Of greatest concern is OHV use, especially cross-country use by All Terrain Vehicles (ATVs). This has

resulted in a loss of seclusion, increased wildlife harassment, soil disturbance, creation of additional trails, and loss of vegetation or microbiotic (cryptogamic) crusts.

Hunting — Private land has historically blocked access to large parcels of public land. In some areas, this makes control of big game populations more difficult and increases game damage to other private lands in the vicinity. The Planning Area provides the largest block of land available to the public in GMU 32. With the proliferation of roads and trails and increased popularity of ATVs, the increased noise and frequency of encounters with humans may be moving some species off the top of the plateau and into steeper, more rugged terrain that provides seclusion from hunters but also offers lower quality habitat.

Grazing — Livestock grazing has affected some stream segments by decreasing plant cover and diversity in the adjacent riparian habitat, increasing the potential for sediment transport into streams, making banks more susceptible to erosion, creating conditions favorable for invasion by weeds, and impeding natural succession by the selective consumption of young shrubs or trees that would otherwise become established. Winter livestock grazing still occurs in some areas that provide winter range for deer, resulting in direct competition for forage and space.

Not all livestock grazing is detrimental to big game. The removal of old growth on perennial grasses and forbs can improve the palatability and availability of new growth the following spring and summer. The shape and vigor of shrubs can also be enhanced by proper levels of livestock grazing. The most critical factors are managing the timing, duration, and intensity of grazing to ensure vigor and reproduction of desirable plant species and not creating conditions for invasion by weeds or other undesirable species.

While grazing is often assessed in relation to deer and elk, which compete with cattle and sheep for forage, livestock can have more profound effects on less wide-ranging wildlife such as small mammals and reptiles, on habitat-specific species such as many types of songbirds, and on aquatic or semi-aquatic species such as fish and amphibians. These impacts occur either directly or indirectly from excessive consumption or trampling of vegetation, with resultant decreases in plant cover, forage quantity and quality, soil stability, and bank stability. Water quality can also be affected due to destruction of riparian vegetation, disturbance of the substrate, and contribution of organic matter from feces.

3.3.2.5 Current Management and Desired Future Conditions

Management Plans and Documents

The terrestrial habitat management objective in the 1984 GSRA RMP is "to provide approximately 57,933 animal unit months (AUMs) of big game forage (the amount needed to meet CDOW big game population goals in 1988), to improve existing wildlife habitat conditions, and to increase wildlife species diversity." An AUM consists of one animal unit (an adult female and one young) for one month.

The aquatic habitat management objective for the GSRA RMP for public lands below the rim is "to increase fish production and recreational fishing use on streams having more than 0.5 mile of continuous flow across public land and on lakes surrounded by at least 40 acres of public land. Only streams and lakes with existing or easily obtainable public access and either an existing or potential fishery qualify for management." The Colorado River is the only stream below the rim that meets these criteria.

Big game management objectives in the 1997 WRRA RMP are to "(1) ensure that big game habitats provide components and conditions necessary to sustain big game populations at levels commensurate with multiple use objectives and [CDOW's] population objectives; (2) maintain or enhance the productivity and quality of preferred forages on all big game range; (3) provide the forms, distribution, and extent of vegetation cover and forage [to] satisfy the physiological and behavioral requirements of big game and encourage efficient use of available forage supplies; and (4) reduce the duration, extent, and intensity of manageable forms of animal harassment during crucial timeframes, and avoidance-induced disuse of suitable habitats considered limited in supply and/or critical in fulfilling special functions."

The management objective for raptors (birds of prey) in the 1997 WRRA RMP is to "maintain the short-term utility and promote the continued long-term development and availability of suitable raptor habitats…[including] prey base, nest sites, and other special habitat features necessary to help stabilize or allow increases in regional raptor populations."

The management objective for grouse in the WRRA is to "restore, maintain, or enhance habitat conditions and features conducive to the maintenance or expansion of native grouse populations [and] reduce disruption of important seasonal use activities associated with production and recruitment."

The fisheries management objectives for the WRRA are to "(1) promote improvement and recovery of current, historic, and potential stream fisheries to help increase populations of sport and native fishes; (2) develop and maintain facilities capable of supporting warm-water fisheries; and (3) [provide] increased recreational fishing opportunities within the Resource Area."

The *Naval Oil Shale Reserve Aquatic Habitat Management Plan, 1982, Environmental Assessment Number CO-070-GSI-167* outlines management of Second Anvil Creek, Parachute Creek, Northwater Creek, and Trapper Creek. This supplemental plan was needed to increase the quantity and quality of Colorado River cutthroat trout habitat and provide a recreational fishery.

DOE's operational management plan for NOSRs 1 and 3 specified the following wildlife management objectives: "(1) [allow] hunting and fishing … only to the extent that they do not interfere with DOE programs or DOE custodial management objectives, and (2) [maintain] cooperation … with [USFWS and CDOW], as appropriate, to control and protect wildlife, and to prevent or minimize wildlife damage to other resources."

Management Direction

The wildlife and fisheries management direction for the Planning Area must meet or exceed the upland vegetation Land Health Standard (#3):

> "Healthy productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species' and habitats' potential. Plants and animals at both the community and population level are productive, resilient, diverse, vigorous, and able to reproduce and sustain natural fluctuations, and ecological processes."

For NOSR 1 atop the Roan Plateau, decisions on stipulations to be applied were deferred to the Planning Area land use planning process, including this RMPA/EIS. Fish and wildlife standards in the remaining GSFO portion of the Planning Area (below the rim) are met through the application of the measures identified in the 1999 FSEIS. These stipulations, developed to help meet the management objectives for sensitive species (and, in some cases, comply with Federal laws), include the following NSOs, CSUs, and TLs to protect fish and wildlife resources:

- NSO for Major River Corridors – Establishes a 0.5-mile protective buffer along either side of the Colorado River.
- NSO and TL for Raptor Nesting Areas – Avoid a 0.125-mile buffer around nest sites year-round, and avoid a 0.25-mile seasonal buffer around active nests from February 1 through August 15.
- NSO for Wildlife Security Areas – Avoid areas that provide important security for wildlife, especially deer and elk, in high value habitats along and below the base of the Roan Cliffs.
- TL for Big Game Winter Range – Ensure continued use of winter habitat for big game by avoiding construction activities (including oil and gas drilling, road construction, and other major sources of disturbance) from December 1 through April 30.
- TL for Waterfowl and Shorebird Nesting Areas – Avoid a 0.25-mile seasonal buffer around the nesting and production (brood-rearing) area of Fravert Reservoir from April 15 to July 15.

Additional NSO, CSU, and TL stipulations apply specifically to special status wildlife (Section 3.3.4) but also provide benefits to other wildlife. These include and NSO and TL for bald eagle nesting and roosting areas, an NSO and TL for the peregrine falcon cliff-nesting complex, an NSO for threatened or endangered species, and a CSU for BLM sensitive species. Some stipulations aimed at protecting vegetation resources also benefit wildlife: viz., an NSO and a CSU for riparian/wetland vegetation and buffer zone, respectively. Several other restrictions related to vegetation, such as limitations on livestock in certain sensitive communities that are within specified distances of rare plant populations (Section 3.3.3), will also benefit wildlife by enhancing the density, quality, and production of vegetation cover.

Another measure in the 1999 FSEIS is a TL for critical elk production (calving) areas from April 16 through June 30. However, no critical calving habitat has been mapped by CDOW in the Planning Area, reflecting the fact that calving is dispersed throughout suitable habitat across a large portion of the site rather than concentrated in a few specific areas. Therefore, this TL is not incorporated into the RMPA/EIS for the Planning Area under any of the alternatives analyzed.

For the portion of the Planning Area within the WRRA, specific wildlife-related use restrictions include an NSO and TL for raptors, TLs for elk production areas (none mapped within the Planning Area by CDOW) and deer/elk winter range, and a CSU for the Colorado River cutthroat trout. Big game forage allocations in the WRRA remain the same as specified in the 1981 Grazing Management EIS and subsequent Rangeland Program Summary (BLM 2002a). Rangelands and grazable woodlands with a downward trend in quality would be reevaluated for forage reallocations. Developing water sources, vegetation manipulations, and animal redistribution techniques are normally integrated with range improvement or riparian restoration activities. Monitoring is conducted to determine which rangelands are healthy, at risk, or not functioning properly. Existing information on raptor nest locations is verified, and supplemental surveys are conducted on a project-specific basis. Protective stipulations and conditions of approval, determined through the NEPA process, are applied as appropriate. Habitat conditions for grouse populations are being restored, maintained, and enhanced. Habitat management guidelines for grouse are also applied during the NEPA process. Fisheries are improved, recovered, and maintained to increase fishing opportunities. Impacts by projects and authorizations are assessed during the NEPA process, with appropriate mitigation applied.

CDOW sets population and management goals for both game and non-game species and manages game species through hunting and fishing licenses and regulations. BLM collaborates with CDOW in helping to meet these goals by providing an appropriate amount and quality of habitat on public land, consistent with multiple use management. State big game management objectives are set through a public involvement process, with final decisions set by the Colorado Wildlife Commission. Current management focus is on protecting crucial habitats and improving habitat condition. Over the years, BLM has implemented site-specific projects to improve habitat condition for wildlife, utilizing such management tools as prescribed fires and upland water developments.

As noted above, CDOW's long-term management plan for DAU 41, which includes GMU 32 and encompasses nearly all of the Planning Area, is for 16,500 deer based on current amount and quality of habitat. The post-hunt population in 2005 was approximately 12,530 animals, indicating that continued rebound from the population decline of the early 1990s would be required to meet the objective. However, CDOW's population objective may be revised during the DAU planning process scheduled during the spring and summer of 2006, so comparison of existing population sizes to the current long-term objective may not be valid. However, the discrepancy between recent population estimates and the long-term objective as of the date of this document suggest that mule deer may below carrying capacity.

In contrast, the post-hunt population estimate for elk in DAU 10 (which includes GMU 32) in 2005 was essentially at the upper end of the population objective of 7,000 to 9,000 animals.

Future Management

Future management will focus on maintaining or improving areas rated as PFC in the 1999 Land Health Assessment and on restoring FAR areas to PFC. The two major needs are to:

1. Continue to improve riparian and aquatic habitat atop the plateau, particularly in stream reaches that provide sufficient flows to support Colorado River cutthroat trout, or upstream reaches that may affect habitat in the occupied reaches. Measures may include continued reductions in the number and duration of livestock grazing, construction of more fences to exclude livestock (coupled in some areas with development of alternative watering sources), and weed management and revegetation in severely affected areas.
2. Work with CDOW to develop and implement a strategy for reducing or eliminating non-native brook trout from streams atop the plateau, some of which have shown serious declines in regionally important, genetically pure populations of Colorado River cutthroat trout.

These measures would be combined with the protective stipulations described above. Other management opportunities identified by BLM (2002b) include increasing turkey populations, increasing the amount and productivity of wildlife winter range, using prescribed burns to improve some decadent habitats, controlling or eliminating cross-country OHV use, and maintaining largely natural conditions.

3.3.3 Special Status Plants and Significant Plant Communities

3.3.3.1 Introduction

BLM is directed to ensure that no action that requires Federal approval should contribute to the need to list a species as threatened or endangered under the ESA. The same protection also applies to species that are proposed or candidates for listing and to species designated by each State Director as sensitive. BLM Manual 6840 (IM No. 97-118) provides BLM with sensitive species criteria, policy, and guidance for the conservation of special status species of plants and animals and the ecosystems upon which they depend. The manual directs that "conservation of special status species means the use of all methods and procedures which are necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted."

A number of surveys for rare or sensitive plants and significant plant communities have been conducted within the Planning Area (TRW 1981, BLM 1991, CNHP 1997a and 2001). A list of species considered for inclusion in this analysis was compiled from these studies Table 3-14). Species that are known to occur, or highly likely to occur within the Planning Area based on habitat considerations and considered rare, are included in the analysis of impacts and are referred to as special status species in this RMPA/EIS. Botanical nomenclature follows current CNHP lists.

Significant plant communities within the Planning Area are listed in Table 3-15 (CNHP 1997a). These include communities that are (1) globally rare, (2) rare within Colorado, or (3) substantially unaltered by human activity. The first two categories include plant communities in which the individual species may not be rare, but the particular combination of species is rare or uncommon. The third category includes native plant communities that are relatively undisturbed and contain few non-native species.

Known locations of special status plant species and significant plant communities are shown on Maps 21 and 22, created using spatial data collected by the CNHP. Additional known occurrences were located from recorded coordinates as well as hand-mapped estimations in survey reports.

3.3.3.2 Current Condition and Trends

Current conditions and trends for most special status plant species and significant plant communities are described in BLM (2002a) and summarized below.

Table 3-14. Special Status and Other Potentially Sensitive Plant Species in the Planning Area

Common Name	*Scientific Name*	*Agency Status*	*CNHP Rank* [1]	*Notes*	*Probability of Occurrence*
DeBeque Milkvetch	*Astragalus debequaeus*	BLM Sensitive	G2/S2	Colorado endemic. Restricted to fine-textured, seleniferous or saline soils, Wasatch Formation – Atwell Gulch Member: 5,100 to 6,400 feet.	Definite
DeBeque Phacelia	*Phacelia submutica (Phacelia scopulina* var. *submutica)*	Federal Candidate	G2/S2	Colorado endemic. Ephemeral annual. Restricted to sparsely vegetated, steep slopes on clays of Atwell Gulch and Shire members of Wasatch Formation. Soils often have large cracks due to shrink-swell potential of the clays: 4,700 to 6,200 feet.	Definite
Hanging Garden Sullivantia	*Sullivantia hapemanii* var. *purpusii*	USFS Sensitive, Former BLM Sensitive	G3T3/S3	Colorado endemic. Restricted to calcareous seeps, often derived from Green River Formation. Known only from five counties in western Colorado; 62% of all known populations occur in the Planning Area.	Definite
Harrington's Beardtongue	*Penstemon harringtonii*	BLM Sensitive	G3/S3	Open sagebrush, roadcuts, or pinyon/juniper. Rocky loams and clay loams derived from calcareous materials: 6,800 to 9,200 feet.	Highly unlikely
Dragon Milkvetch	*Astragalus lutosus*	Former BLM Sensitive	G4/S3S4	Restricted to shale barrens of the Green River Formation. Primarily in the Piceance Basin in Colorado, but some in Utah as well. BLM Sensitive Species designation dropped with discovery of several populations. Not considered as a sensitive plant species for this analysis.	Definite
Naturita Milkvetch	*Astragalus naturitensis*	BLM Sensitive	G2G3/S2S3	Mesas, ledges, crevices, and slopes with shallow soils over exposed bedrock in pinyon/juniper: 5,000 to 7,000 feet.	Highly unlikely
Osterhout's Penstemon	*Penstemon osterhoutii*	none	G3G4/S3S4	Sandy to clay soils in wide range of habitats. Limited range, but common in four counties where known. Not considered as a sensitive plant species for this analysis.	Definite
Parachute Penstemon	*Penstemon debilis*	Federal Candidate	G1/S1	Colorado endemic. One of rarest plants in North America, known from five locations, two of which are in Planning Area. Restricted to sparsely vegetated south-facing talus in Mahogany Zone of Green River Formation: 7,800 to 9,000 feet.	Definite
Piceance Bladderpod	*Lesquerella parviflora*	BLM Sensitive	G2G3/S2S3	Colorado endemic. Restricted to shale outcrops of the Green River Formation on ledges and slopes of canyons in open areas: 6,200 to 8,600 feet.	Likely

Table 3-14. Special Status and Other Potentially Sensitive Plant Species in the Planning Area

Common Name	*Scientific Name*	*Agency Status*	*CNHP Rank* [1]	*Notes*	*Probability of Occurrence*
Piceance twinpod	*Physaria obcordata*	Federal Threatened	G2/S2	Occurs on barren outcrops and steep slopes of the Parachute Creek Member of the Green River Formation: 5,900 to 7,800 feet.	Unlikely
Roan Cliffs blazingstar (Southwest stickleaf) (Arapien stickleaf)	*Mentzelia rhizomata* *(Nuttallia argillosa)* *(Mentzelia argillosa)* *(Mentzelia rhizomata)*	BLM Sensitive	G3/S2	Restricted to steep, shale talus or scree slopes derived from the Parachute Creek member of the Green River Formation: 5,570 to 9,100 feet.	Definite
Sun-loving meadowrue	*Thalictrum heliophilum*	Former BLM Sensitive	G3/S3	Colorado endemic. Restricted to sparsely vegetated, steep south-facing shale talus slopes derived from the Green River Formation. Currently being considered for listing as Sensitive Species by BLM and USFS.	Definite
Uinta Basin Hookless cactus	*Sclerocactus glaucus*	Federal Threatened	G3/S3	Rocky hills, mesa slopes, and alluvial benches in desert shrub communities: 4,500 to 6,000 feet.	Unlikely
Utah fescue (Sedge fescue)	*Argillochloa dasyclada* *(Festuca dasyclada)*	Former BLM Sensitive	G3/S3	Regional endemic, perennial grass. Restricted to barren scree slopes or in sparse Douglas-fir on soils derived from oil shales, especially Green River or Uinta sandstone: 6,500 to 9,300 feet. Dropped from BLM Sensitive Species list, but still tracked by CNHP.	Definite
Wetherill milkvetch	*Astragalus wetherillii*	Former BLM Sensitive	G3/S3	Occurs on sandy clay soils derived from shale or sandstone on slopes, canyon benches, and talus under cliffs. Often the only plant found on dry washes on rocky clay hillsides. Known in seven Colorado counties and in Utah. Dropped from BLM Sensitive Species list due to increased number of known occurrences. Not considered as a sensitive plant species for this analysis.	Definite

[1] *G = Global rarity, S = State rarity, G1 or S1 = 5 or fewer occurrences, G2 or S2 = 5 to 20 occurrences, G3 or S3 = 20 to 100 occurrences.*

Table 3-15. Significant Plant Communities in the Planning Area

Community	*Scientific Name* [1]	*CNHP Rank* [2]	*Notes*	*Status in Planning Area*
Quaking Aspen/Rocky Mountain maple forest	*Populus tremuloides/Acer glabrum*	G1G2/S1S2	Few locations in Colorado	Present
Boxelder riparian forest (Boxelder/ narrowleaf cottonwood/red-osier dogwood)	*Acer negundo (Negundo aceroides)/ Populus angustifolia/Cornus stolonifera (Swida sericea)*	G2/S2	Rare in Colorado and globally	Present
Great Basin grassland (Beardless bluebunch wheatgrass community)	*Pseudoroegneria spicata (Agropyron spicatum)* ssp. *inermis*	G2/S2	Three locations in Colorado	Present
Great Basin montane grassland (Beardless bluebunch wheatgrass/Sandberg bluegrass community)	*Pseudoroegneria spicata (Agropyron spicatum)* ssp. *inermis/ Poa secunda*	G4/S1	A single occurrence in the Planning Area on Gardner Peak	Present
Montane riparian forest (blue spruce/red-osier dogwood)	*Picea pungens/Cornus stolonifera (Swida) sericea*	G1G2/S1S2	Rare in Colorado and globally	Present
Old-growth Douglas-fir forest	*Pseudotsuga menziesii*	NA	Considered a remnant and exemplary occurrence of type in region.	Present
Sagebrush bottomland shrubland (Mountain big sagebrush/Great Basin wildrye)	*Artemisia tridentata* ssp. *vaseyana (Seriphidium vaseyanum)/ Leymus (Elymus) cinereus*	G4/S2	Limited in Colorado	Present
Western slope grassland (Indian ricegrass shale barrens)	*Oryzopsis hymenoides (Achnatherum hymenoides)([Stipa] hymenoides)*	G2/S2	Rare in Colorado and known globally from only three counties in Colorado	Present

[1] *Synonymies in parentheses. Nomenclature follows CNHP (1997a and 1998)*

[2] *G = Global rarity, S = State rarity, G1 or S1 = 5 or fewer occurrences, G2 or S2 = 5 to 20 occurrences, G3 or S3 = 20 to 100 occurrences*

Eight special status plant species, as defined above, are known or thought likely to occur in the Planning Area. These include two candidate species for listing under the ESA, three BLM sensitive species, and three species formerly considered by BLM as sensitive. Two of these species, DeBeque milkvetch and DeBeque phacelia, are Colorado endemics and are restricted to Wasatch Formation outcrops. These outcrops occur below the rim and extend from the vicinity of DeBeque to Sharrard Park (about 25 miles).

Five of these species are endemic to Colorado or the region and restricted to particular oil shale outcrops, where they have often been found to occur together in a community. These include Parachute penstemon, Roan Cliffs blazingstar, sun-loving meadowrue, Piceance bladderpod, and Utah fescue. Although more common and therefore not included as sensitive species for this analysis, dragon milkvetch and Osterhout's penstemon are also often found in these areas as well. This shared restriction to a specific and limited substrate creates an unusual plant community in that it is not representative of a widespread ecological system dominated by a few common species, but is spatially restricted with a high diversity of very uncommon species (McMullen 1998).

Federally Listed, Proposed, or Candidate Threatened or Endangered Species

DeBeque Phacelia (*Phacelia submutica*) — This small, ephemeral plant is a Federal candidate species with a global distribution from approximately 10 miles northwest of DeBeque to 6 miles west of Rifle. It is restricted to steep slopes on clays of the Atwell Gulch and Shire Members of the Wasatch Formation. These soils often have large cracks because of high shrink-swell potential of the clay. This plant is a pioneer species, specifically adapted to an environment where most plants cannot grow (CNHP 1995). It was first documented in the Planning Area in 2001 in several locations on the slopes above the Garfield County landfill. The population sizes are not known and there is no information on current conditions or trends for this species. However, it has been noted that the annual habit of the species allows it to respond dramatically to environmental conditions. In some years several thousand plants may be observed and in other years the same site may produce no plants (CNHP 1995). This dynamic must be considered when assessing potential impacts to this species.

Parachute Penstemon (*Penstemon debilis*) — A Colorado endemic, this is one of the rarest plant species in North America. Only five populations of this species are known. Of these, two populations (including the largest) are on private land. All three populations on public lands occur within the GSRA, two of these are within the Planning Area. Parachute penstemon is a candidate species for Federal listing as threatened or endangered, as listing priority number two. The species is considered critically imperiled (G1/S1) by the CNHP based on its very few occurrences, narrow global distribution, and current and potential threat to all of its known populations. Unless strong protective measures are taken, it is believed that Federal listing of Parachute penstemon as a threatened species may be necessary to prevent extinction (O'Kane 1987, CNHP 1997a).

This species is restricted to soils classified as Parachute-Irigul-Rhone channery loams on steep slopes of decomposing shale. The geology of known locations all occur just above the Mahogany Zone of the Parachute Creek Member of the Green River Formation (CNAP 1997). It is finely adapted to steep and constantly moving talus slopes. The soils in these areas comprise thin shale fragments and clay. The stems of parachute penstemon plants elongate downslope from their initial rooting point, the leaves often becoming buried by shifting shale shards. When these stems encounter a surface sufficiently stable, they may develop a tuft of leaves, flower, and set seed.

One of the two populations in the Planning Area—on a steep open slope adjacent to the Anvil Points Rim Road—is quite small and has diminished steadily over the past decade. The location of this population was first recorded in 1991. Nearly 300 individuals were observed in this population in 1994. Seven plants were found in 1997. By 1998, only three individuals were observed (McMullen 1998). The cause of this decline has not been determined. Livestock grazing is not thought to be a factor as the area is so

steep and sparsely vegetated. The steepness of these slopes also limits OHV use and subsequent infestation by noxious weeds.

In 1998, 53 small seedlings of Parachute penstemon were transplanted into this population after being used in germination trials (McMullen 1998). At the time only three individuals of the natural population were found. Most recent observations of the area found ten of these transplanted plants survived, although none of the original plants were evident. The observed transplants were very small and appeared weak and with the exception of one plant, none appeared any larger than when they were first transplanted (Scheck 2002).

The other population of Parachute penstemon in the Planning Area occurs on a bench below the plateau rim and above portals of the Anvil Points mine. This population appears to be stable and comprises approximately 500 to 1,000 individuals. Scattered plants occur above the Anvil Points Mine Road and a few occur in the fill below. It may be that the road itself, being a flat, packed gravel surface, is limiting recruitment and establishment of additional individuals in this area. Maintenance to this road would pose a severe threat to some of these plants, as well as a number of Roan Cliffs blazingstar and Utah fescue in the same vicinity.

Research on the biology of Parachute penstemon (McMullen 1998) has found that it requires a pollinator for reproduction, but there is no indication that this limits its survival. Seeds of the species do not require native shale soils for germination, nor do seedlings require shale soils for growth and early establishment. Soil analyses suggest that soil chemistry is probably not a direct factor in the endemism of this species either.

The results of the limited transplant trial in 1998 were qualified in that although approximately 20 percent of the transplants survived, they did not thrive and only one showed substantial increase in size, suggesting successful establishment (Scheck 2002). More research is required to investigate whether this species may successfully be transplanted into new, suitable areas as a conservation measure to improve the condition of the species or as mitigation for disturbance to existing plants.

All known locations of this species share a number of characteristics that result from natural erosion processes and promote relatively continual disturbance. These include very steep slopes, unstable shale surface layers, and no surface soil. It has been noted that two of the largest populations, one being the Anvil Mines population, occur in the vicinity of human-caused disturbances that date to the decade previous to the populations' discovery (McMullen 1998). However, with no information about condition of the populations prior to this disturbance, it is not clear how the species is responding to these disturbances except to note that they continue to persist.

BLM Sensitive Species

DeBeque Milkvetch (*Astragalus debequaeus*) — This BLM sensitive species is found only on outcrops of Wasatch Formation between DeBeque and Rifle, Colorado. Ten occurrences are known on the Atwell Gulch Member of this formation, near the bottom of the Roan Cliffs in the central part of the Planning Area (Maps 21 and 22). These populations are at the eastern edge of the species' range. Little is known about its habitat needs and life history requirements. Protection has been recommended to prevent Federal listing as a threatened species (CNHP 1997b).

The populations of DeBeque milkvetch occur within and immediately adjacent to an area being developed for natural gas. In this areas, surface-disturbing activities such as construction of roads and well pads may impact DeBeque milkvetch populations by destroying individual plants as well as fragmenting habitat. Nearly 90 percent of the occupied habitat is already leased. Many of these leases (approximately 2,400 acres) are old with standard stipulations that allow the relocation of a pad, road, or other source of surface disturbance up to 200 meters to protect resources at risk. The other leases (2,573 acres) were issued under the terms and conditions of the 1999 ROD and RMP Amendment that provides a CSU

stipulation. Other potential threats to this species in this area include OHV travel, activities associated with oil shale extraction and processing, incursion of noxious weeds, and trampling by livestock

Piceance Bladderpod (*Lesquerella parviflora*) — This species is endemic to talus slopes of the Green River Formation. This species occurs in Rio Blanco, Mesa, and Garfield counties and has been found in areas contiguous to the Planning Area, but has not been documented there. As it is very likely to occur, and is often found with other rare oil shale species, it is considered to be appropriate for consideration in further analysis.

Roan Cliffs Blazingstar (*Mentzelia rhizomata*) — This species represents a recent taxonomic reclassification (Reveal 2002) for the species formerly referred to as Roan Cliffs blazingstar (*Nuttallia argillosa*)(Weber and Wittman 2001). Under this new classification, the species is considered a Colorado endemic, widely distributed but edaphically restricted to steep, shale talus or scree slopes derived from the Parachute Creek member of the Green River Formation. Its known range includes the general vicinity of the Roan Plateau, north of the towns of DeBeque and Parachute, as well as the ridge and plateau north of the Book Cliffs and the city of Grand Junction (Reveal 2002). It often occurs with other species restricted to the same substrate. Like some other oil shale endemic species, this plant appears to be an early pioneer species, adapted to the steep slopes and constant shifting talus and scree slopes of the Green River Formation. There is some concern that if such areas eventually stabilize and are revegetated with other, later seral species, the Roan Cliffs blazingstar may be locally exterminated (CNHP 1997a). Potential causes of reduced slope instability, aside from the geologic time scale, could include burial by fines associated with future mining, oil and gas construction, or misguided reclamation effort.

Populations of Roan Cliffs blazingstar occur in the Planning Area on talus slopes along the forks of Parachute Creek, along the south rim of the Roan Cliffs, and on steep drainage slopes below the cliffs where Green River shale has been deposited by washout from the cliffs above. The populations above the rim and near the falls on the East Fork Parachute Creek are small, but appear to be healthy and self-sustaining. The populations along the drainages at the base of the cliffs are also small and more exposed to anthropogenic disturbance.

Other Potential Special Status Plant Species

Dragon Milkvetch (*Astragalus lutosus*) — The dragon milkvetch is restricted to Green River Formation oil shale and is frequently found with other oil shale endemic species. It is primarily found in the Piceance Basin of Colorado; including four locations in the Planning Area on shale outcrops at the top of the Roan Cliffs, as well as a few locations in Utah. It was formerly listed as a BLM sensitive species. However, the BLM designation was dropped as several more populations have been found. Because this species is now considered relatively common, it will not be considered in further analysis.

Hanging Garden Sullivantia (*Sullivantia hapemanii* var. *purpusii*) — Another Colorado endemic, this species is restricted to "hanging gardens" with a substrate of Green River Formation shale. These gardens occur where moisture seeps between layers of shale or in proximity to waterfalls. This species is most abundant on East Fork Parachute Creek and its tributaries as well as in Northwater Creek Canyon. These populations appear stable and secure because their relative inaccessibility on steep cliffs protects them from surface disturbances, grazing, and noxious weed invasion. However, any physical disruption to the cliffs, or changes to the local hydrological processes that support the species' habitat, could have severe effects on these populations.

Although the hanging garden sullivantia currently has no BLM status, the USFS considers it a sensitive species. While it is known from several occurrences in five counties in western Colorado, 32 of the 52 known locations (62 percent) occur on the Planning Area. Therefore, negative impacts to any of these 32 occurrences would result in impacts to, or the loss of, a major potion of the global population. This species is therefore sensitive and included in the impact analysis.

Osterhout's Penstemon (*Penstemon osterhoutii*) — Indigenous to western Colorado and eastern Utah, this species is usually found in gulches and canyons in sandy to clayey soils in a wide range of habitats including sagebrush, semi-desert shrub, pinyon/juniper, and mountain shrubland communities. Within the Planning Area it is found on south-facing sparsely vegetated slopes adjacent to creeks. Although limited in range to four counties, this species has been found to be relatively common since early surveys and is not considered a special status plant species in this RMPA/EIS.

Sun-loving Meadowrue (*Thalictrum heliophilum*) — This Colorado endemic was listed by USFWS as a category 2C species in 1985. The species is restricted to sparsely vegetated, steep south-facing shale talus slopes derived from the Parachute Creek Member of the Green River formation in the Piceance Basin. It is frequently found with other oil shale restricted species such as dragon milkvetch, Parachute penstemon, Roan Cliffs blazingstar, and Utah fescue (O'Kane 1987, Reveal 2002). Because of limited suitable substrate, this species tends to occur in three population clusters. One known cluster occurs in the vicinity of Roan and Parachute Creeks. This plant is considered a pioneer species because of its ability to colonize unstable, environmentally severe sites. In fact, it is quite likely that the sites it occupies may never host other vegetation types due to unstable substrate and very steep slopes. The ability of the species to withstand human-caused disturbance is not known (O'Kane 1987). Sun-loving meadowrue is known from only 36 locations in Garfield, Mesa, and Rio Blanco Counties, four of which occur in the Planning Area.

Utah Fescue (*Argillochloa dasyclada*) — This perennial grass is an oil shale endemic. It is restricted to barren scree slopes or sparsely vegetated Douglas-fir communities on soils derived from oil shales, especially the Green River Formation or Uinta Formation sandstone at elevations of 6,500 to 9,300 feet, where it often co-occurs with other oil shale endemics. This species was dropped from the BLM list due to increased number of known occurrences. However, it is still being tracked by CNHP and is included in this analysis.

Wetherill Milkvetch (*Astragalus wetherillii*) — The Wetherill milkvetch occurs in sandy clay soils derived from shale or sandstone on slopes, canyon benches, and talus under cliffs. It is often the only plant found in dry washes on rocky clay hillsides. Populations are known in seven Colorado counties and in Utah. This species has been dropped from the BLM Sensitive Species list due to discovery of additional occurrences and is not considered in this analysis as a sensitive species.

Significant Plant Communities

Fifteen relatively rare plant communities tracked by the CNHP have been identified in the Planning Area (CNHP 1997a). Of these, eight are considered to have global rarity ranks of G1 or G2 and State rarity ranks of S1 or S2 and are managed by the BLM to maintain the current excellent condition. These communities are listed in Table 3-15 and described below. Locations are noted on Maps 21 and 22. Significant plant communities are referred to by descriptive names below. Specific plant species that define the communities are provided in parentheses.

Aspen/Rocky Mountain Maple Forest (*Populus tremuloides/Acer glabrum*) — This community type is dominated by two relatively common mountain species that rarely co-occur to form communities. As such, they are only known from a few scattered locations in Colorado (CNHP 1997a). In the Planning Area, this community occurs in two 40-acre stands near the headwaters of First Anvil Creek and Second Anvil Creek. These areas appear to be healthy, climax stands with good regeneration of both aspen and Rocky Mountain maple. The understory in these areas is productive and diverse. The Anvil Points Rim Road cuts through one of these stands, and weeds invading along the roadsides could potentially degrade overall community health.

Boxelder Riparian Forest (*Acer negundo/Populus angustifolia/Cornus [Swida] sericea*) — Although all of these species are common in Colorado, this combination is restricted to few sites in western Colorado. One high-quality example is located in the Planning Area along the box canyon below the falls

in East Parachute Creek. No noxious weeds have been documented along this reach of the stream. Noxious weeds in adjacent areas pose a concern for the continuing health of this community.

Great Basin Grassland (*Pseudoroegneria spicata* subsp. *inermis*) — Great Basin grassland is dominated by beardless bluebunch wheatgrass, and has only been recorded in three locations in Colorado in the Piceance Basin, specifically in Rio Blanco and Garfield counties (CNHP 1997a). The rarity of this community may be due to heavy grazing pressures throughout much of its historical natural range (Baker 1983). It occurs on slopes or on broad ridge tops and plateaus that often gently slope to the south or southwest. In the Planning Area this community occurs along the eastern rim of the cliffs from East Anvil Point to the vicinity of the JQS trail. Several spurs off of the Anvil Points Rim Road dissect portions of the area, causing fragmentation of the grassland community and increasing the potential for noxious weed invasion. Otherwise, this grassland community is currently in good condition and is subject to only light grazing pressure at this time because of restricted water availability.

Great Basin Montane Grassland (*Pseudoroegneria spicata* ssp. *inermis/Poa secunda)* — This grassland assemblage reaches its southern limit in Utah and Colorado. It is more widely distributed in Idaho, Montana, Wyoming, and eastern Washington and Oregon. It occurs on extremely dry windswept knolls and exposed slopes with grades of 2 to 10 percent. In the Planning Area, this community occurs only once, on Gardner Peak. The community is currently in good condition and is subject to only light grazing pressure at this time because of restricted water availability.

Montane Riparian Forest (*Picea pungens / Cornus [Swida] sericea*) — Considered globally rare, this combination of species is only found in western Wyoming, northern New Mexico, Arizona, and a few locations in western Colorado, including along East Fork Parachute Creek above the falls. Noxious weeds such as houndstongue and Canada thistle are threats to this community as they are increasingly common along riparian habitats in the Planning Area and can out-compete native vegetation. This results in changes to community composition and reduced bank stability.

Old-growth Douglas-fir (*Pseudotsuga menziesii*) — Douglas-fir is relatively common along north-facing drainages in Colorado. However, mature ("old-growth") stands are becoming increasingly rare. The Planning Area encompasses several small but excellent examples of old-growth Douglas-fir forest covering approximately 1,600 total acres on the cliffs north of the JQS Road. This community occurs as a number of stringers and large patches along north-facing slopes. It is considered an excellent example of its community type by the CNHP and comprises a healthy mosaic of dense and open areas. Some small areas exhibit signs of beetle infestation. There is no human development within or immediately adjacent to this community type.

Sagebrush Bottomland Shrubland (*Artemisia tridentata* ssp. *vaseyana [Seriphidium vaseyanum]/Leymus cinereus*) — This association is known from Idaho, Nevada, and northwestern Colorado. Its limited distribution may be explained by an unusual combination of habitat characteristics: moist, but not saturated, deep soils along flat to gently sloping areas, in a narrow elevation range of 7,000 to 8,800 feet. It may also be rare due to livestock grazing, as wild rye is very palatable to cattle and is quickly utilized. This community is found in three locations in the Planning Area: two near Anvil Points and one along Bull Gulch. All are considered to be in fair to moderate condition. All are subject to only light grazing pressure at this time due to restricted water availability. However, several roads dissect these communities, causing fragmentation and increased risk of noxious weed infestation.

Western Slope Grassland (*Achnatherum [Stipa] hymenoides*) — Also referred to as shale barrens (TRW 1981), this sparse grassland community (often less than 25 percent vegetation cover) is extremely limited in distribution. It occurs only in three counties in western Colorado. It is restricted to south-facing slopes with soils derived from shales or mudstones. Within the Planning Area, this community is found on south-facing slopes of East Fork Parachute, Northwater, Trapper, and Ben Good Creeks.

3.3.3.3 Current Management and Desired Future Conditions

The 1984 GSRA RMP contains no specific objective for managing special status plant species, because few such species and locations were known to exist within the Resource Area at that time.

For NOSR 1 (on top of the plateau), the 1999 ROD and RMP Amendment deferred decisions on surface-use stipulations to the Planning Area land use planning process (including this RMPA/EIS). Standards for special status plants and significant plant communities in the remaining GSFO portion of the Planning Areas below the rim are met through the application of an NSO for Federally listed threatened or endangered species and the habitat needed for their maintenance or recovery, and a CSU for BLM sensitive plants and significant plant communities.

Special status plant species within the Planning Area should be managed to meet or exceed the special status species Land Health Standard (#4)(Appendix F). This includes the requirement "that there are stable and increasing populations of endemic and protected species and that suitable habitat is available for recovery of endemic and protected species."

BLM policy and guidance for the conservation of special status species is outlined in BLM Manual 6840, which directs BLM to consider these species to be those "which are proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions of the Endangered Species Act (ESA); those listed by a State in a category such as threatened or endangered implying potential endangerment or extinction; and those designated by each State Director as sensitive." Actions authorized by BLM are to be consistent with the conservation of such species and should not contribute to the need to list any special status species under the provisions of the ESA. The manual further directs that: "Conservation of special status species means the use of all methods and procedures which are necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted."

The 1997 WRRA RMP contains specific objectives for threatened and/or endangered plant species and sensitive plants and remnant vegetation associations (BLM 1996a). Within the WRFO portion of the Planning Area vegetation resources are managed to enhance and maintain sustainability for ecological conditions within plant communities. To help meet these objectives, the WRRA portion of the Planning Area may apply its existing NSO, TL, and CSU stipulations.

3.3.4 Special Status Fish and Wildlife

3.3.4.1 Introduction

BLM is directed to ensure that no action requiring Federal approval contributes to the need to list a species as threatened or endangered under the ESA. This protection also applies to species that are proposed or candidates for listing and to species designated by each State Director as sensitive. BLM Manual 6840 (IM No. 97-118) provides BLM sensitive species criteria, policy, and guidance for the conservation of special status species of plants and animals and the ecosystems upon which they depend. The manual directs that "conservation of special status species means the use of all methods and procedures which are necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted."

3.3.4.2 Current Conditions and Trends

Current conditions and trends for most special status fish and wildlife species are summarized in the AMS (BLM 2002a). The discussion below and information presented in Table 3-16 address Federally listed or candidate threatened or endangered fish and wildlife species, Federally listed birds of conservation concern (BCC), BLM sensitive species, USFS sensitive species, Colorado state-listed threatened or

endangered species, and Colorado state-listed species of special concern (SSC) that are known to occur, or that could occur, in the Planning Area and vicinity.

Table 3-16. Special Status and Other Potentially Sensitive Animal Species, Planning Area Vicinity [1]

Common Name [2]	*Scientific Name*	*Status* [3]	*Agency* [4]	*Primary Habitat or Location in Area*
INVERTEBRATES				
Great Basin Silverspot	*Speyeria nokomis nokomis*	Sensitive	USFS	wet meadows, seeps
FISHES				
Bluehead Sucker	*Catostomus discobolus*	Sensitive	BLM	Colorado River
Flannelmouth Sucker	*Catostomus latipinnis*	Sensitive	BLM	Colorado River
Razorback Sucker	*Xyrauchen texanus*	Endangered	USFWS CDOW	Colorado River
Humpback Chub	*Gila cypha*	Endangered	USFWS CDOW	Colorado River, not in GSRA
Bonytail Chub	*Gila elegans*	Endangered	USFWS CDOW	Colorado River, not in GSRA
Roundtail Chub	*Gila robusta*	Sensitive SSC	BLM CDOW	Colorado River
Brassy Minnow	*Hybognathus hankinsoni*	SSC	CDOW	Colorado River
Colorado Pikeminnow	*Ptychocheilus lucius*	Endangered	USFWS CDOW	Colorado River
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	Sensitive SSC	BLM, USFS CDOW	Parachute Creek tributaries
AMPHIBIANS				
Great Basin Spadefoot	*Spea intermontana*	Sensitive	BLM	seasonal pools
Boreal Toad	*Bufo boreas*	Sensitive Endangered	BLM CDOW	ponds, marshes
Northern Leopard Frog	*Rana pipiens*	Sensitive SSC	BLM CDOW	ponds, streams
REPTILES				
Smooth Green Snake	*Liochlorophis vernalis*	Sensitive	USFS	riparian, shrublands
Utah Milk Snake	*Lampropeltis triangulum taylori*	Sensitive	BLM	woodlands and riparian areas
Midget Faded Rattlesnake	*Crotalus viridis concolor*	Sensitive SSC	BLM CDOW	rocky, arid areas
BIRDS				
Barrow's Goldeneye	*Bucephala islandica*	Sensitive	BLM	lakes, rivers
White-faced Ibis	*Plegadis chihi*	Sensitive	BLM	marshes, shores
Greater Sandhill Crane	*Grus canadensis tabida*	Sensitive	BLM	marshes, fields
American Peregrine Falcon	*Falco peregrinus anatum*	Sensitive SSC	BLM CDOW	cliffs, rivers
Prairie Falcon	*Falco mexicanus*	BCC	USFWS	cliffs, grassland
Northern Harrier	*Circus cyaneus*	Sensitive BCC	USFS, USFWS	grassland, pasture
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	USFWS CDOW	rivers, lakes
Ferruginous Hawk	*Buteo regalis*	Sensitive SSC	BLM CDOW	cliffs, open land
Swainson's Hawk	*Buteo swainsoni*	BCC	USFWS	woods, grassland

Table 3-16. Special Status and Other Potentially Sensitive Animal Species, Planning Area Vicinity [1]

Common Name [2]	*Scientific Name*	*Status* [3]	*Agency* [4]	*Primary Habitat or Location in Area*
Golden Eagle	*Aquila chrysaetos*	BCC	USFWS	cliffs, grassland
Northern Goshawk	*Accipiter gentilis*	Sensitive	BLM, USFS	aspen, spruce/fir
Gunnison Sage-Grouse	*Centrocercus minimus*	SSC	CDOW	sagebrush
Greater Sage-Grouse	*Centrocercus urophasianus*	Sensitive SSC	BLM, USFS CDOW	sagebrush
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	Sensitive	BLM	sagebrush, mountain brush/grassland
Flammulated Owl	*Otus flammeolus*	BCC	USFWS	montane forest
Burrowing Owl	*Athene cunnicularia*	Sensitive Threatened	BLM, USFS CDOW	prairie dog towns
Mexican Spotted Owl	*Strix occidentalis*	Threatened	USFWS CDOW	dense old-growth conifers, canyons
Boreal Owl	*Aegolius funereus*	Sensitive	BLM, USFS	conifers, aspen
Black Swift	*Cypseloides niger*	Sensitive BCC	USFS USFWS	waterfalls
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Candidate SSC	USFWS CDOW	riparian forests
Lewis's Woodpecker	*Melanerpes lewis*	Sensitive BCC	USFS USFWS	pinyon/juniper, riparian
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Sensitive BCC	USFS USFWS	aspen, spruce/fir
American Three-toed Woodpecker	*Picoides tridactylus*	Sensitive	USFS	spruce/fir, aspen
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Endangered	USFWS CDOW	not in area
Olive-sided Flycatcher	*Contopus cooperi*	Sensitive	USFS	spruce/fir
Purple Martin	*Progne subis*	Sensitive	USFS	riparian, aspen
Brown Creeper	*Certhia americana*	Sensitive	USFS	conifers
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive	USFS	open woodlands, low shrubs, grassland
Pinyon Jay	*Gymnorhinus cyanocephalus*	BCC	USFWS	pinyon/juniper
Gray Vireo	*Vireo vicinior*	BCC	USFWS	pinyon/juniper
Virginia's Warbler	*Vermivora virginiae*	BCC	USFWS	mountain brush
Black-throated Gray Warbler	*Dendroica nigrescens*	BCC	USFWS	pinyon/juniper
Brewer's Sparrow	*Spizella breweri*	Sensitive	USFS	sagebrush
Sage Sparrow	*Amphispiza belli*	Sensitive BCC	USFS USFWS	sagebrush
MAMMALS				
Spotted Bat	*Euderma maculata*	Sensitive	BLM, USFS	caves, cliffs, trees
Townsend's Big-eared Bat	*Corynorhinus townsendii pallescens*	Sensitive	BLM, USFS	caves, cliffs, trees
Fringed Myotis	*Myotis thysanodes*	Sensitive	BLM, USFS	caves, cliffs, trees
Yuma Myotis	*Myotis yumanensis*	Sensitive	BLM, USFS	caves, cliffs, trees
Big Free-tailed Bat	*Nyctinomops macrotis*	Sensitive	BLM	caves, cliffs, trees
American Marten	*Martes americana*	Sensitive	USFS	conifers
River Otter	*Lutra canadensis*	Sensitive Endangered	USFS CDOW	rivers, streams

Table 3-16. Special Status and Other Potentially Sensitive Animal Species, Planning Area Vicinity [1]

Common Name [2]	*Scientific Name*	*Status [3]*	*Agency [4]*	*Primary Habitat or Location in Area*
Wolverine	*Gulo gulo*	Sensitive Endangered	USFS CDOW	conifer forest
Lynx	*Lynx lynx*	Threatened Endangered	USFWS CDOW	conifer forest

[1] *Based on BLM (2003), USFS (2002), and USFWS (2002).*

[2] *Bold type indicates Federally listed, proposed, or candidate threatened or endangered species.*

[3] *BCC = Birds of Conservation Concern (USFWS 2002), SSC = Special Concern (CDOW 2006).*

[4] *All Federal threatened or endangered species are also State-listed by CDOW.*

Inclusion in Table 3-16 of species not documented to occur onsite but considered potentially present is based on the types of habitats present and proximity to the known geographic range. Species with only a remote potential for transitory occurrence are not included. This table also lists species designated as sensitive by the USFS in the White River National Forest and potentially present in the Planning Area. While BLM is not mandated to manage for species listed as sensitive by USFS, this RMPA/EIS includes selected USFS-listed species in recognition that much of the area of the Planning Area atop the plateau consists of habitats more similar to National Forest lands than typical BLM lands in the region.

Some of the species listed in Table 3-16, and some additional species not listed, are considered by CNHP to be of global or statewide concern based on declining numbers, imperiled habitat (including habitats used during seasons when the species is not present in the region, low numbers in some areas such as on the edges of the range, or occurrence as geographically restricted subspecies). The CNHP database is available online at www.cnhp.colostate.edu.

Federally Listed, Proposed, or Candidate Threatened or Endangered Species

Colorado River Fishes (Endangered) — Four members of the minnow and sucker families that occur in the Colorado River in western Colorado and eastern Utah are Federally listed as endangered. Designated Critical Habitat for both the Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) occurs within the Colorado River and its 100-year floodplain along the southern boundary of the Planning Area, downstream from the town of Rifle. Designated Critical Habitat for the humpback chub (*Gila cypha*) and bonytail chub (*G. elegans*) occurs in the Black Rocks area near the Colorado-Utah border more than 80 miles downstream from the Planning Area.

All of these species require a diversity of habitats within a large river. Low-velocity side channels, backwaters, oxbows, sloughs, and flooded bottomlands are important habitats for spawning and survival of young fish, particularly for the pikeminnow and razorback sucker. Populations of Colorado pikeminnow are low but relatively stable in the upper Colorado River Basin, while numbers of razorback suckers are smaller. Recovery efforts are ongoing and include releases of hatchery-reared fish.

The decline of these fishes is mostly attributed to changes in the Colorado River resulting from the impoundment of large portions of the main stem and its tributaries. In addition, irrigation use and dams have dewatered, cooled, and otherwise altered much of the river system. The "controlling" of the river has resulted in loss of habitat and interference with natural function such as flooding. Many of these changes in the river system have resulted in more favorable conditions for non-native fishes introduced into tributary streams or lakes to provide a recreational fishery. These non-native fishes can compete for food, space, cover, and physical habitat, and may prey on young stages of the native fishes.

Other threats to survival or recovery of the Colorado River fishes include the introduction of chemical pollutants and the further depletion of streamflow associated with consumptive use of water for a variety of purposes.

Bald Eagle (Threatened) — The bald eagle (*Haliaeetus leucocephalus*) is the only other listed species known to occur within the Planning Area. Bald eagles winter along portions of the Colorado River and Parachute Creek, and possibly along East Fork Parachute Creek (BLM 2002a), generally from mid-November to mid-April. Wintering numbers vary annually depending on climatic conditions. Large cottonwoods along the Colorado River and Parachute Creek are used as roosting and perching sites, and the waterways provide the main food sources: fish and waterfowl. Upland habitats adjacent to the waterways are used as scavenging areas, primarily for winter-killed mule deer and elk and other carrion. Bald eagles prey on small mammals to some extent but are especially prone to stealing the prey captured by smaller raptors such as buteo hawks.

Although the bald eagle historically nested along the Colorado River in the project region, it is not currently known to nest in the area. With continued recovery, future use of the area for nesting is not unlikely. Because the bald eagle is doing well throughout its range—mostly associated with bans on certain pesticides but also related to aggressive enforcement of intentional shooting by ranchers—its status has been lowered from endangered to threatened, and it is being considered for delisting.

Mexican Spotted Owl (Threatened) — This Federally listed subspecies (*Strix occidentalis lucida*) is typically found in moist, mature forests in canyons of the southwestern U.S. Its documented geographic range does not include the Planning Area or surrounding portions of Colorado (Kingery 1998). However, BLM has mapped suitable habitat in the first mile extending downstream from the East Fork Parachute Creek waterfall. Potentially suitable habitat also occurs on private land in lower portions of the East Fork and East Middle Fork drainages and the Magpie Gulch area. Specific surveys for sensitive species (e.g., CNHP 1997a, 1998) have not resulted in observations of this secretive owl.

Western Yellow-billed Cuckoo (Candidate) — This candidate subspecies (*Coccyzus americanus occidentalis*) nests in extreme western Colorado, where it occurs primarily in old-growth riparian forests with dense undergrowth. Potentially suitable riparian forests occur in the vicinity of the Planning Area along portions of Parachute Creek, Government Creek, and the Colorado River, as well as some tributary drainages. However, the Planning Area is outside the known geographic range of this species in Colorado (Kingery 1998), and it is therefore not considered further in this RMPA/EIS.

Southwestern Willow Flycatcher (Endangered) — As described in Section 3.3.4, this endangered subspecies (*Empidonax traillii extimus)* is known to occur in riparian willow and tamarisk habitats of extreme western and southwestern Colorado, but the Planning Area is outside its known geographic range (Kingery 1998), and it is therefore not considered further in this RMPA/EIS.

Black-footed Ferret (Endangered) — The black-footed ferret (*Mustella nigripes*) historically occurred throughout much of the western United States in association with large colonies of prairie dogs. The historic range of black-footed ferrets, or of prairie dogs on which they depend, does not include the Planning Area (Fitzgerald et al. 1994). Ferrets have recently been introduced into Moffat County in northwestern Colorado and in eastern Utah, near the Colorado State line. The USFWS has determined that, at a minimum, potential habitat for the black-footed ferret in western Colorado (i.e., in association with the white-tailed prairie dog) includes a single prairie dog colony greater than 200 acres, or a complex of smaller colonies within a 4.3-mile radius (USFWS 1989). Because these conditions do not occur in the Planning Area vicinity, and because the site is outside its historic geographic range, the black-footed ferret is not considered further in this RMPA/EIS.

Lynx (Threatened) — This species (*Lynx [Felis] lynx*), also known as the Canada lynx (*L. l. canadensis*), has recently been reintroduced in Colorado as part of a recovery program. Although the species has not been documented within the Planning Area, it should be noted that no systematic surveys have been conducted. The 2,600 acres of mixed aspen/conifer habitat atop the plateau appears suitable in terms of plant species composition and community structure. Additionally, the Planning Area is known to support a population of a favorite prey species, the snowshoe hare, as well as other suitable prey (blue grouse, mountain cottontail, and the young of deer and elk). Reintroduced lynx have begun to reproduce

in Colorado and are gradually moving into areas outside those where releases occurred. Overall, however, the potential for dispersal of lynx into the Planning Area is reduced by the limited amount and patchiness of the suitable habitat and by its isolation from more suitable, more extensive habitats in the White River National Forest.

BLM and USFS Sensitive Species, Colorado Threatened or Endangered Species and Species of Special Concern, and USFWS Birds of Conservation Concern

Native Non-game Fishes — The flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*C. discobolus*), and roundtail chub (*Gila robusta*) are BLM sensitive species found in the mainstem of the Colorado River along the southern boundary of the Planning Area and potentially present in lower portions of Parachute Creek. These species are experiencing declines throughout their range, and numbers of individuals in the region near the Planning Area are not known. Declines in these species are mainly attributed to changes in the Colorado River resulting from changes in the flow regime and water quality associated with impoundments and diversions for agriculture. The "controlling" of the river has resulted in loss of habitat and natural function such as flooding. In addition to loss of habitat function, many of these changes in the river system have resulted in more favorable conditions for non-native fishes, which are now common and compete with native fishes for resources such as food, space, cover, and physical habitat. They are also known to prey on the young of native fishes.

The same general riparian protection stipulations described previously for the Federally listed endangered fishes also provide some habitat protection for these species.

Colorado River Cutthroat Trout — This subspecies (*Oncorhynchus clarki pleuriticus*) is the only indigenous salmonid (member of the salmon family) in the Upper Colorado River Basin. It was petitioned for listing on December 9, 1999, but the USFWS concluded that listing is not warranted. The determination not to list the Colorado River cutthroat trout was based in part on the presence of 286 conservation populations and 221 core conservation populations in approximately 1,010 and 684 stream miles, respectively, in addition to populations in lakes. A conservation population is defined by the Colorado River Cutthroat Trout (CRCT) Task Force (2001) as a "reproducing and recruiting population of native cutthroat trout that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristic within specific populations within geographic units. In general, a conservation population is at least 90 percent [pure](i.e., <10 percent introgression of genes from other subspecies)…." A core conservation population is defined similarly, except that the threshold of purity is 99 percent.

Although UFWS has determined that Federal listing as threatened or endangered is not currently warranted, the Colorado River cutthroat trout is nonetheless of special concern wherever it occurs. It was once common throughout the Colorado River drainage, including portions of Wyoming, Utah, Arizona, and New Mexico as well as Colorado (Behnke 1979) but has shown a continued decline in distribution and abundance. Less than 1 percent of its historical range is currently occupied (Behnke and Zarn 1976, Binns 1977, Behnke 1979, Martinez 1988, Young 1995).

Remaining populations, including those in the Planning Area, share at least two of the following three characteristics: (1) they escaped intentional releases of non-native rainbow trout or non-native subspecies of cutthroat trout, with which the Colorado River subspecies interbreeds; (2) if these other trout were introduced, conditions were not suitable for their establishment; and (3) the occupied habitat is isolated from waters in which these other trout were stocked, such as by the presence of a waterfall or other barrier, that prevented dispersal of the non-native forms into reaches occupied by the local subspecies.

Most of the occupied habitat throughout the range of the subspecies consists of small, isolated streams or lakes in headwaters areas. Because of the small size of these water bodies, and the resultant small population sizes, Colorado River cutthroat trout inhabiting them are subject to deleterious events such as periodically going dry during drought or being impacted by release of a pollutant that harms the fish

directly or destroys the macroinvertebrate prey base. The isolation of occupied streams or lakes from each other also prevents gene flow and prevents or impedes natural recolonization of any segment in which a population is lost due to a deleterious event.

Streams within the Planning Area that currently contain populations of Colorado River cutthroat trout include portions of Northwater Creek, Trapper Creek, East Fork Parachute Creek, East Middle Fork Parachute Creek, mainstem Parachute Creek, JQS Gulch, First Anvil Creek, and Second Anvil Creek (Map 20). Portions of five of these streams—JQS Gulch, East Fork, East Middle Fork, Northwater, and Trapper—with a combined 15.5 miles of habitat are considered conservation populations (CRCT Task Force 2001). A subsequent DNA assessment by Evans and Shiozowa (2004) confirmed a genetic purity greater than 90 percent for samples of ten fish taken from East Fork Parachute Creek in 2001.

Segments of two Planning Area streams—viz., 4 miles each of Northwater Creek and Trapper Creek—are designated as core conservation populations (CRCT Task Force 2001). This designation, based on a genetic purity greater than 99 percent, was also confirmed by the DNA assessment of Evans and Shiozawa (2004). Their study combined results for samples of 24 fish from Northwater Creek in 2001 with data samples from the same creek in 1998 (Shiozawa and Evans 2000).

Given the results of the DNA analyses, the Roan Plateau populations of Colorado River cutthroat trout are considered nationally and regionally significant. The Roan Plateau contains one of only a few remaining watersheds where genetically pure, reproducing populations of Colorado River cutthroat trout are found in all streams capable of sustaining a fishery. Maintaining or expanding these populations would play an important role in the overall recovery of this subspecies.

Current or potential risk factors to the subspecies include damage to stream channel morphology and riparian vegetation by livestock, impacts from OHV travel, sediment deposition, chemical pollution, loss of hydrology (water depletions), and unsanctioned releases of non-native trout. Features that characterize high-quality trout habitat include healthy riparian vegetation (with trees and shrubs present for temperature moderation, seclusion, and enhanced bank stability), a high pool-riffle ratio (for spawning, temperature moderation, and seclusion); a suitable and diverse substrate, low erosion potential, and good physicochemical conditions (water quality, including temperature, pH, hardness, alkalinity, salinity, total dissolved solids, total suspended solids, and specific metals and ions).

The conservation agreement and strategy for Colorado River cutthroat trout (CRCT Task Force 2001), of which BLM was a contributor and signatory, discusses risks to this species and describes measures that could be undertaken to conserve (maintain and restore) both it and its habitat. These include protecting existing populations and occupied habitats, ecosystem components that are crucial to these populations and habitats, and restoring degraded ecosystems both to reduce ongoing risks associated with the damaged ecosystem components and to increase potential habitat for future expansion. Measures implemented by BLM in the Planning Area as a result of the conservation agreement and strategy include the following (strategy numbers are those used in the conservation agreement and strategy (CRCT Task Force 2001):

- Strategy 20 (Complete Genetic Analyses on Known or Potential Populations) – In 2002, CDOW collected fin clips from Colorado River cutthroat trout from East Fork Parachute Creek and Trapper Creek for genetic testing. Test results confirmed that fish from both streams are genetically pure and meet the definition of a core conservation population (greater than 99 percent genetic purity).
- Strategy 11 (Improve Lake/Stream Habitat) – In 2004 and 2005, BLM planted 150 containerized (5-gallon) willow shrubs and 20 containerized (10-gallon) cottonwood trees along a 2-mile segment of Trapper Creek to improve streamside cover. All of the plants were fenced to prevent damage by livestock or native ungulates (deer and elk), and most had survived and were thriving as of May 2006. A similar project on East Fork Parachute Creek in 2005 included planting 30 containerized (5-gallon)

willow shrubs along a 1-mile reach to improve streamside cover of that stream. As on Trapper Creek, the plants were fenced and were mostly thriving as of May 2006.

- Strategy 6 (Monitor Lake/Stream Habitats to Detect Change) and Strategy 10 (Improve Watershed Conditions) – BLM is monitoring, on an ongoing basis, the two areas of riparian plantings described above. On an as-needed basis, BLM performs maintenance on the fencing installed to protect the habitat from livestock.
- Strategy 14 (Remove Non-native Fish Species) – In 2004 and 2005, BLM, in coordination with CDOW and USFS, electrofished portions of the East Fork of Parachute Creek to remove non-native brook trout. All Colorado River cutthroat trout captured were measured (length and weight) and returned to the creek. Brook trout are not known to occur in the Trapper Creek drainage. Electrofishing consists of generating an electrical field by immersing positive and negative electrodes into a stream or lake. The electrical field temporarily stuns the fish, causing them to float to the surface where they are captured in nets. After a short time, the effect wears off, and the fish are generally unharmed.
- Strategy 9 (Implement Interpretive and Educational Programs – In 2006, BLM is placing new, updated educational and interpretive signs at major public access points to East Fork Parachute Creek and Trapper Creek.

Amphibians — The boreal or western toad *(Bufo boreas boreas)* was formerly a candidate for Federal listing under ESA. In September 2005, USFWS withdrew the Southern Rocky Mountain population from the list of candidate species because it does not constitute a distinct population segment as defined by the ESA. However, the Southern Rocky Mountain population is listed by BLM as a sensitive species and by CDOW as a State-listed endangered species. Historically, the boreal toad was widespread in Colorado in beaver ponds, oxbows, and isolated ponds at elevations between approximately 8,500 and 11,500 feet. In recent decades, however, the species has undergone a significant decline in terms of both numbers and sizes of populations. Although potentially suitable habitat occurs along drainages at higher elevations in the Planning Area, no populations have been documented there, nor is it known whether the species was ever present. A baseline study report prepared for DOE (TRW 1982) does not include the boreal toad among the amphibians and reptiles observed during surveys of NOSRs 1 and 3 in 1975, 1976, or 1980. The disjunct (isolated) nature of the upper montane/lower subalpine habitats of the Planning Area may have prevented colonization of potentially suitable habitats from occupied habitats elsewhere in the region.

Two other anurans (tailless amphibians) that occur in the general region and have special status as BLM sensitive species are the Great Basin spadefoot (*Spea intermontana*) and northern leopard frog (*Rana pipiens*). Few suitable sites are present in the Planning Area for either species. The Great Basin spadefoot, like other members of its genus, breeds in seasonal pools and spends most of the year buried in the mud. Spadefoots have adapted to arid and semi-arid regions by evolving a very short reproductive cycle. Although this species is generally found farther west (as the name implies), it is known to occur in the Planning Area. Suitable ponds and pools along ephemeral drainages are usually located in pinyon/juniper, sagebrush, and semi-desert scrub zones such as occur at lower elevations of the Planning Area. Population status is largely unknown.

The northern leopard frog ranges across much of the northern United States and southern Canada and has also been found in the Planning Area. This is an aquatic species, meaning that it requires permanent water such as that found along the margins of reservoirs, perennial ponds and pools, perennial springs, and persistent marshes. As with many species of amphibians, populations have been declining throughout the range for unknown reasons, although a fungal infection is considered a major contributor. Habitat loss, pollution, and predation by introduced non-native bullfrogs are also threats to specific populations.

The protective NSO and CSU stipulations for riparian and wetland corridors provide some benefit for the leopard frog and, to a lesser extent, the spadefoot. However, because the spadefoot occupies small, seasonal pools not necessarily associated with riparian habitat *per se*, it is more likely to benefit from relocation of ground-disturbing activities by more than 200 meters (CSU 3) to protect specific breeding habitats.

Reptiles — The midget faded rattlesnake (*Crotalus viridis concolor*) is a subspecies of the western or prairie rattlesnake, the most common viper in the region. The midget faded subspecies is both smaller and more pallid than the main species. It ranges across Utah and portions of Wyoming into west-central Colorado and is known to occur along rock outcrops below the Roan Cliffs. The subspecies is of concern in Colorado because of the small number of records and restricted range. Population trends within Colorado are unknown. The CSU stipulation for BLM sensitive species provides a mechanism for protecting any dens that may be found (this snake, like other rattlers, hibernates communally in small caves and rock niches).

Another special status serpent in the region is the Utah milk snake (*Lampropeltis triangulum taylori*). The milk snake is a brightly colored species widely known for its apparent mimicry of the similarly colored but poisonous coral snake. The Utah subspecies ranges from Utah and portions of Wyoming into west-central Colorado. It occurs in western Colorado and could occur in the Planning Area, where it would most likely be found in moist or lush habitats such as riparian shrublands and moist meadows. Population trends within Colorado are unknown. The NSO and CSU stipulations for protection of riparian and wetland habitats would benefit this species as well.

Raptors — The northern goshawk (*Accipiter gentilis*) is rare to uncommon throughout its range; suitable habitat consists of unfragmented aspen or conifer forests in the upper montane and subalpine zones. This is a forest species that nests in tall trees and hunts for small birds and diurnal small mammals (e.g., squirrels) by darting through the forest and flushing its prey. It may winter at lower elevations, including pinyon/juniper woodland, adjacent to its breeding range. The species is not documented to occur atop the plateau, possibly because the conifer forest is too limited in extent or too linear in configuration (i.e., with too much edge for this large species).

The ferruginous hawk (*Buteo regalis*) is the largest breeding buteo in the region. Although this species is not documented to nest in the Planning Area, suitable nest sites occur along rock ledges and cliffs and in trees—with pinyon/juniper being the wooded type most likely to support the species onsite. This is a hawk of open country; potential hunting habitats are present in all of the lower elevation areas below the cliffs, and in expanses of xeric shrubland on ridges atop the plateau. Although apparently not breeding onsite, the ferruginous hawk definitely occurs during winter and migration seasons.

Another special status raptor, the American peregrine falcon (*Falco peregrinus anatum*), was previously listed under ESA as endangered, downgraded to threatened, and then delisted following successful recovery, mostly associated with bans on certain types of pesticides. The peregrine is known to nest on the Roan Cliffs (at least two pairs have been reported) and to hunt for its preferred prey—waterfowl—along the Colorado River. Peregrines may also take other birds, including rock doves, band-tailed pigeons, and grouse. The proximity of high cliffs to a large river that remains at least partially ice-free during the winter is ideal for this species. The location provides secure nest sites, and the river supports waterfowl, a good source of prey year-round. The Planning Area contributes substantially to the regional recovery of the species.

The small boreal owl *Aegolius funereus* is listed as sensitive by USFS in the nearby WRNF. This species is a year-round resident in subalpine conifer forests such as occur to a limited extent atop the plateau, and was found on the Planning Area during CNHP (1996) inventories. Areas of mature old-growth Douglas-fir along the cliffs provide potential habitat but are below the usual elevational range for this species.

Another small owl, the burrowing owl (*Athene cunnicularia*) is listed by BLM and USFS as sensitive, and by CDOW as threatened in Colorado. This species is associated primarily with prairie dog colonies and uses abandoned prairie dog burrows for nesting. Because of the lack or limited occurrence of prairie dogs in the Planning Area, this species is assumed to not occur onsite currently, although it could use open habitats at lower elevations for feeding during migration. The species could occur onsite in the future if prairie dogs become established in greater numbers.

Waterbirds — One species of special status waterfowl (Barrow's goldeneye, *Bucephala islandica*) and one species of special status wading bird (white-faced ibis, *Plegadis chihi*) are known to occur as migrants in the Planning Area. Both species are most likely to occur along major water bodies, including the Colorado River and Fravert Reservoir. A TL stipulation provides some protection of nesting and brood-rearing in the Fravert Reservoir Watchable Wildlife Area within the Planning Area.

Gallinaceous Birds — The greater sage-grouse (*Centrocercus urophasianus*) occurs in areas of extensive sagebrush habitat in the region. Although the species is not currently known to occur in the Planning Area, historic records exist for the Hubbard Mesa area. Occupied habitat is present north of the Planning Area in Rio Blanco County and west of the Planning Area in parts of Garfield County and extends northward through much of northern and northwestern Colorado. The species is hunted in some portions of the State but is also listed by CDOW as a Colorado SSC.

The Gunnison sage-grouse (*Centrocercus minimus*) was formerly considered a subspecies of *Centrocercus urophasianus*, the common species throughout northwestern Colorado and adjacent States. Although specific surveys for this species have never been conducted for the Planning Area, the Gunnison sage-grouse is believed to occur only as eight populations in central and southwestern Colorado, and in southeastern Utah. This species is therefore not considered further in this RMPA/EIS. Until recently classified as a candidate for Federal listing, USFWS has determined that listing is not warranted. The species is listed by CDOW as a Colorado SSC.

The Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) is a species of mixed habitats including mountain shrub, grassland, and riparian components. Cultivated fields of alfalfa and small grains are important at certain times of the year, as are aspen and small stands of conifers with open grassy parks. An unconfirmed sighting of this species was made during CNHP surveys in 1996, but its status in the Planning Area is unknown.

Small Birds — No small birds in the Planning Area are currently listed as BLM sensitive species for the GSRA. However, several species, including neotropical migrants, are known to occur or likely to occur within the Planning Area. Among these are a number of birds of conservation concern (BCCs) identified by USFWS (2002) and the subject of a Memorandum of Understanding (MOU) between UFWS, BLM, and USFS. Species included on the BCC list for the Southern Rockies/Colorado Plateau (the region that includes the Planning Area) are shown in Table 3-16.

All of the native birds in the Planning Area, with the exception of upland gamebirds, are protected by the Migratory Bird Treaty Act of 1918, as amended (MBTA). The MBTA protects individual birds from being harassed, injured, or killed and also protects active nests and eggs. The protection of nests, eggs, and young extends to human activities that lead to nest failure, such as by interfering with brooding of the eggs or feeding of the young or by causing one or both adults to abandon the nest.

Bats — Four bat species listed by BLM are potentially present in the GSRA (BLM 2002a) and either known or likely to occur in the Planning Area: Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), fringed myotis (*Myotis thysanodes*), and Yuma myotis (*M. yumanensis*). Three additional species—the long-legged myotis (*M. volans*), long-eared myotis (*M. evotis*), and big free-tailed bat (*Nyctinomops macrotis*)—are listed in the 1999 FSEIS as potentially occurring in the region. The last species is a BLM sensitive species listed as occurring in the Grand Junction resource area, while the other two are not on the current list of BLM sensitive species (BLM

2002a). All of these bats roost in abandoned mine shafts, caves, rock niches, overhangs, trees, or buildings. The cliffs and the cave area provide a plethora of roosting sites within the Planning Area.

Carnivores — Two species listed as sensitive by USFS and endangered in Colorado by CDOW are the river otter (*Lutra canadensis*) and wolverine (*Gulo gulo*). The river otter was previously listed as sensitive by BLM. This highly mobile, wide-ranging species has been introduced at various locations around the State and could eventually disperse along the Colorado River and major tributaries adjacent to the Planning Area (e.g., Parachute Creek). However, river otters are not currently known to occur in or near the site. The wolverine is similar to the lynx in terms of habitat requirements, preferring unfragmented expanses of remote subalpine forest. The limited area of conifer forest on top of the plateau may be too small and isolated to support this species.

3.3.4.3 Current Management and Desired Future Conditions

Section 7 of ESA requires BLM to ensure that any action authorized, funded, or implemented is not likely to jeopardize the continued existence of any species that is Federally listed, or proposed for listing, as threatened or endangered and does not reduce the likelihood of recovery of any affected species. Species proposed for Federal listing are managed with the same level of protection as for listed species. BLM policy also ensures that no action contributes to the need to list a species as threatened or endangered (BLM 1997a). This policy applies to candidate species under ESA and to BLM sensitive species.

The 1984 GSRA RMP contained no specific objective for managing special status species but identified monitoring, maintaining, or improving habitat for threatened or endangered species as a priority for implementation. For NOSR 1 (on top of the plateau), the 1999 ROD and RMP Amendment deferred decisions on surface-use stipulations to the Planning Area land use planning process (including this RMPA/EIS). For areas below the rim, the following stipulations have previously been developed to help protect special status species and their habitats:

- Major River Corridors – Avoid a 0.5-mile buffer on either side of the Colorado River (NSO 3).
- Riparian and Wetland Zones – Avoid ground-disturbing activities inside the zone of riparian vegetation (NSO 2). Additionally, activities within 500 feet may require special design, and BLM may require relocation of a proposed activity by more than 200 meters to protect the resource (CSU 2).
- Raptors (general) – Avoid a 0.125-mile buffer around raptor nests year-round (NSO 7) and a 0.25-mile buffer from February 1 through April 15 (TL 6).
- Bald Eagles – Avoid a 0.25-mile buffer around a nest or roost site year-round (NSO 8), a 0.5-mile buffer around nest sites from December 15 to June 15 (TL 10), and a 0.5-mile buffer around roost sites from November 15 to April 15 (TL 11).
- Peregrine Falcons – Avoid a 0.25-mile buffer around the cliff-nesting complex year-round (NSO 9) and a 0.5-mile buffer from March 15 to July 31 (TL 12).
- Threatened or Endangered Species – Avoid occupied habitat and any habitat required for the maintenance or recovery of the specific species (NSO 12).
- Waterfowl and Shorebird Nesting – Avoid a 0.25-mile buffer around the nesting and brood-rearing habitat of Fravert Reservoir (TL 13).
- BLM Sensitive Species – Special design of proposed ground-disturbing activities or relocation by more than 200 meters may be required to protect the resource (CSU 3).

For the small portion of the Planning Area in Rio Blanco instead of Garfield County, the 1997 WRRA RMP listed the following management goals for special status species: "(1) contribute to the recovery of special status animals (i.e., listed, proposed, or candidate threatened or endangered or BLM sensitive) in

an effort to ultimately remove these species from special status consideration; (2) maintain or restore special status animal populations, and the suitable extent and/or utility of important habitats on public lands; (3) ensure that Federally authorized actions do not adversely disrupt or compromise important biological activities or contribute to increased mortality or depressed production or recruitment into a breeding population, and (4) maintain or improve, to proper functioning condition, bank, channel, and floodplain processes associated with designated critical habitats for listed and candidate fishes of the Upper Colorado River Basin."

Regarding birds of conservation concern, the MOU between USFWS, BLM, and USFS states, "BLM will identify management actions that potentially affect migratory birds [and] develop, in coordination with USFWS and other agencies, conservation measures that are consistent with the agencies' missions to avoid or minimize take of migratory birds populations and/or that will provide habitat to benefit migratory bird populations." For birds protected by the MBTA, including neotropical migrants, BLM has not yet developed specific management measures. However, when considering a specific project or management activity, BLM will evaluate the species and habitats to be affected, the type and intensity of the disturbance, and the timing and duration of the disturbance to determine an overall population effect. If a significant population effect would result, BLM may require that the project or activity be postponed, relocated, or mitigated to avoid or minimize the adverse impact or, if necessary, could deny the request.

3.3.5 Wild Horses and Burros

No managed populations of wild horses (*Equus caballus*) or wild burros (*Equus asinus*) occur in the Planning Area or GSRA. Therefore, these non-native ungulates are not discussed in this RMPA/EIS.

3.4 HUMAN ENVIRONMENT

3.4.1 Visual Resources

3.4.1.1 Landscape Character and Scenic Quality

The overall landscape of the Planning Area is highly diverse and contains many outstanding features which are visible from many key viewing areas. The Roan Cliffs serve as a prominent backdrop in the scenery for the communities of Parachute, Battlement Mesa, Rifle, Silt, and New Castle and to travelers on I-70 and SH 13. Public sensitivity to landscape modifications is high.

The topographic relief is considerable, with the skyline rising 3,000 to 4,000 feet above the Colorado River valley floor. The dramatic contrast of the vertical shale cliffs giving way to the heavily vegetated slopes accentuates its rugged and scenic qualities which are highly unusual.

Deep canyons carved into a rolling upland offer outstanding views both within and outside the Planning Area. NOSRs 1 and 3 were identified as one of six high-quality scenic areas in the 1984 GSRA RMP. Scenic quality is defined as the degree of harmony, contrast, and variety that influences the overall impression of a landscape. Scenic quality was rated Class A in visual resource inventories conducted by the BLM. East Fork Parachute Creek Canyon was determined to contain high scenic quality and is a significant visual resource, not only locally but regionally.

Lands on top of the Plateau

Areas at higher elevations atop the plateau consist of a diverse vegetation cover typical of the region. Spruce/fir and Douglas-fir dot the north facing slopes, while aspen woodlands dot the higher elevations along with mountain sagebrush. Mountain grasslands and shale barrens dominate the south-facing slopes. The plateau consists of long ridgelines that are dissected by headwater valleys of several drainages that turn into spectacular canyons dissecting the plateau. East Fork Parachute Creek creates a deep and scenic

canyon where a 200-foot-high waterfall near the western boundary plunges over white shale cliffs into a box canyon of National Park-quality scenery.

Overall, the landscape maintains a natural setting. The presence of management activities is less intrusive than below the cliffs. Land use modifications from management activities have been moderate. To date most modifications are the result of livestock developments, which includes roads, four cabins, ponds, stock tanks, and/or fence lines. The topography and vegetation screen a limited amount of management activities along the top of the main ridges and on north-facing slopes. However, man-made intrusions extending off ridgelines on sparsely vegetated slopes draw attention and can dominate the landscape.

Lands below the Rim

Visual qualities have been maintained to date due to the topography and ruggedness of the cliffs and slopes. However, private lands within the immediate foreground from I-70 and SH 13 have been visually impacted by commercial activities, oil and gas activities, roads, and urbanization.

Public lands within the foreground have limited visual impacts related to oil and gas activities, utility corridors, and recreational uses. Two roads currently dominate the landscape. The Anvil Points Oil Shale Mine access road dominates the southern viewshed as it winds across the steep, barren shale slopes. In addition the new JQS Road and evidence of the old JQS route are still visible on the southeastern cliffs.

3.4.1.2 Viewing Distance Zones and Visual Sensitivity

Viewing distance zones and visual exposure were evaluated to determine sensitivity from the selected key viewsheds. Viewing distance zones, expressed in terms of miles from the viewer, are:

- Close Range – Less than 0.25 mile
- Near Foreground – 0.25 to 1 mile
- Foreground – 1 to 3 miles
- Midground – 3 to 5 miles
- Background – Greater than 5 miles

In general, landscape features become more visible at decreasing distance from the observer due to the increase in visual size and greater ability to discern the details of form, color, texture, and line. Objects viewed at a distance of less than 0.25 mile generally have the highest degree of visual sensitivity, and views in distances up to 5 miles are of decreasing importance. Views greater than 5 miles are typically of lowest importance in visual resource management. However, these generalizations about the importance of distance do not necessarily hold in the case of landscape features or modifications that are large, located in a topographically prominent area, or have a high degree of contrast with their surroundings.

Landscape features visible from many locations are also considered more important than those seen from only a few places. Elevated significant topographic forms can dominate the landscape and attract attention, even at considerable distances. Features are also more visually sensitive if they are large or contrast significantly with surrounding features. Presence or absence of intervening obstructions such as vegetation also affects visual exposure. The Roan Cliffs within the Planning Area exemplify all of these: the cliffs are large, stand high above the valley floor, are generally unobstructed, and contrast starkly in terms of color and texture from the vegetated foothills below.

While distance, location, and physical characteristics of a landscape modification are one aspect of visual sensitivity, another is related to the degree of public concern for the visual resources and scenic quality of a given site or region. Factors determining sensitivity levels include (1) types of users, (2) amount of use, (3) amount of public interest, (4) adjacent land uses, and (5) management objectives for special resources such as the WSR-eligible streams and areas having wilderness character.

A viewshed analysis was conducted for key transportation corridors using a USGS DEM at a cell size of 28.5 meters. The DEM is based on the 7.5-minute topographic quadrangle, which accounts for topography and allows the computer to analyze actual views that can be seen from the transportation corridors. The viewshed analysis is limited to lands within the Planning Area and was used to analyze possible impacts to visual values by alternative in Chapter 4.

3.4.1.3 Key Viewsheds

Based on major transportation routes, three key viewsheds receive the greatest amount of public viewing:

Interstate 70 Viewshed

The I-70 viewshed includes all visible portions of the Planning Area along 16.5 miles of highway between Rifle and Parachute (Map 24). Actual annual traffic count data in 2002 on this segment of I-70 is more than 5.5 million cars (CDOT 2002). This viewshed area provides open, fully exposed views of the Roan Cliffs and Anvil Points and most of the south-facing landscape within the unit.

This viewshed is considered to be the most important as this landscape is viewed by the largest number of people, including the adjacent communities of Battlement Mesa, Holms Mesa, and Morrison Mesa. While the prominent Roan Cliffs vary from 2 to 4 miles away in the landscape, its stark and unique character dominates this part of the Colorado River Valley.

The foreground slopes subtly downward away from the cliffs. Therefore, the vegetation and few overhead utility lines do not interfere with many views of the Planning Area. The composition of this viewshed is significantly varied in form and texture. The foreground includes multiple roads and existing landscape modifications, mostly occurring on private lands. Although these man-made impacts are highly visible, their relative low topographic position and small size compared to the plateau and cliffs diminishes their negative visual impact. Additionally, most impacts to date exist on generally flat, smooth terrain, minimizing topographic disturbance. Existing gas facilities and supporting infrastructure such as roads and pipelines are mostly discernible by the removal of vegetation, creating a substantial contrast in color, line, and texture.

State Highway 13 Viewshed

The SH 13 viewshed includes all visible portions of the Planning Area from 21.5 highway miles extending north from Rifle to Rio Blanco County (Map 25). This eastern-most edge of the Roan Cliffs becomes progressively less prominent toward the north and essentially ends at the northeastern edge of the Planning Area. Most of the intervening views are of private land.

The near foreground view composes more than half of the view of the landscape. Additionally, the natural landscape characteristics are repetitive and create few contrasts within the near foreground, foreground, and background. The most dominant natural forms are the cliffs in the background due to stark contrast in color, texture, and form. The most dominant man-made feature is a continuous power line between the highway and cliffs. The JQS Road is also visible. Although smaller in visual composition, it creates significant color and line contrasts in the landscape.

Rim Road Viewshed

The Rim Road consists of 18 miles of sinuous road that enters the northern boundary of the Planning Area along Cow Creek and heads eastward to the edge of the plateau (Map 26). The road follows the rim of the cliffs southward and then westward to Anvil Points and beyond. This is the main transportation route atop the plateau and provides outstanding views of the Flat Tops Wilderness on the east and Battlement Mesa and Mount Sopris to the south.

The top of the plateau as viewed from the Rim Road is characterized by diverse plant cover typical of the region. Spruce/fir and Douglas-fir stands cover north-facing slopes, aspen woodlands and mountain sagebrush dot the higher elevations, and mountain grasslands and shale barrens dominate south-facing

slopes. Most of the near foreground and foreground views appear natural with limited landscape modifications.

Other Viewsheds Considered but Not Analyzed

The three viewsheds selected for VRM analysis were chosen because they represent the most highly traveled corridors along and within the Planning Area. Two other viewsheds, along CR 215 (Parachute Creek Road) and JQS Road, were also considered for analysis. CR 215 provides some views of the cliffs northeast of Parachute. Views near the southern end of CR 215 overlap broadly with those from I-70. Areas farther north along CR 215 provide different views, but the Roan Cliffs are either obscured by intervening low hills on private land or 4 miles distant. The JQS Road viewshed overlaps broadly with both the I-70 and SH 13 viewsheds. It also provides different views as it climbs westward through the area between SH 13 and the cliffs. This viewshed was not selected for analysis because of the much lower volume of travel than either I-70 or SH 13.

3.4.1.4 Current VRM Classes and Visual Resource Management

Current VRM objectives were established in the 1984 GSRA RMP and 1997 WRRA RMP. VRM objectives are generally aimed at protecting the most scenic public lands, especially those most often viewed by the public. Objectives for the different VRM inventory and management classes are described in Appendix D and summarized as follows:

- Class I – Preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- Class II – Retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- Class III – Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Class IV – Provide for management activities that require major modifications of the existing character of the landscape.

Current VRM classes for the Planning Area are shown on Map 23. The assignment of visual resource classifications serves two purposes within the planning process: (1) it provides the basis for considering visual values in a RMP process, and (2) it reflects resource allocation decisions made in the planning process.

Visual Resource Management

Visual resource management objectives do not apply to non-BLM lands, but visual concerns may be addressed on split estate where Federal minerals occur. VRM Classes shown for non-public lands are an indication of the visual values for private lands. Private land values are protected by landowner discretion.

VRM Class II was assigned to the uppermost portion of the Roan Cliffs, East Fork Parachute Creek Canyon, and lands north of Trapper Creek. Modifications to the landscape in VRM Class II is occurring now and is expected to occur into the future, due to ongoing oil and gas activities on both public and adjacent private lands. A stipulation is in place for lands available for lease for Class II lands. However, this mitigating stipulation does not account for the cumulative effects of management actions. Most of the VRM Class II areas to date have maintained visual integrity and scenic qualities.

Minimal surface disturbance has occurred on the landscape above the rim in the VRM Class III area. These areas have maintained their visual integrity and scenic qualities. No protective visual stipulations are in place for lands above the rim as decisions relating to surface uses were deferred to this land use planning process.

Large portions of the lands above the rim were designated as Class III in the GSRA RMP and are inconsistent with the WRRA lands managed as Class II. These lands currently have very similar values and scenic qualities. The different classification for similar landscapes reflects that the two resources areas (GSRA and WRRA) were classified on two separate occasions several years apart. The remaining lower lands are Class IV. To date, these public lands have had very little visible landscape modifications except within Hubbard Mesa and the utility corridor along SH 13.

BLM Manual H-8410-1 (*Visual Resource Inventory*)(BLM 1986) states that VRM Class V areas (i.e., areas for which visual enhancement is the management objective) are no longer treated as a management category. This RMPA/EIS addresses the three Class V areas identified in the previous RMP for the Planning Area and amends them for conformance with current BLM guidance.

Current Protective Visual Stipulations

Visual standards in the GSRA on lands available for oil and gas development are met through the application of mitigation measures identified in the 1999 FSEIS. Two stipulations currently in place for visual resources are an NSO for the visually highly sensitive I-70 viewshed and a CSU for VRM Class II areas.

Within the WRRA, visual resources are protected through the application of stipulations and mitigation measures listed in Appendices B and C, respectively, of the 1997 WRRA RMP. While these include no specific stipulations to protect visual values, an NSO for landslide areas and a CSU for fragile sols would apply to all surface uses.

3.4.2 Cultural Resources

3.4.2.1 Introduction

Archaeological and ethnographic sources indicate extensive prehistoric and historic use of the lands in the Planning Area. The following section summarizes the known prehistoric and historic resources in the Planning Area. A detailed discussion and analysis of previous cultural resource investigations and the prehistoric and historic background of the Planning Area is found in Hoefer et al. (2002).

3.4.2.2 Prehistoric and Historic Context

The prehistoric occupation of western Colorado began approximately 11,500 years ago (Table 3-17) and ended in 1881 with the removal of the Ute people to reservations. The prehistoric temporal sequence is divided into the Paleoindian, Archaic, Formative, and Protohistoric eras. The Paleoindian era in western Colorado began around 11,500 B.C. and extends to 6400 B.C. The Paleoindians represent the first inhabitants of the North American continent beginning in the late Pleistocene. The first 2,000 years of this era encompass the Clovis, Goshen, and Folsom traditions. The dominant attributes of early Paleoindian assemblages are the use of lanceolate projectile points and the hunting of megafauna, including mammoth and extinct forms of bison by highly mobile residential groups.

The Archaic Era (6400 – 400 B.C.) follows the Paleoindian era. During the Archaic, projectile point styles changed to include a wide variety of stemmed and notched forms for use with an atlatl. The use of ground stone became more common and hunting shifted from the large Pleistocene megafauna to a wide variety of animals. Other Archaic era attributes included use of pit and basin structures for habitation, subsistence practices that included a greater use of lower caloric return foods, and greater material culture variability.

Table 3-17. Northern Colorado River Basin Prehistory Chronology

Era	*Tradition/Period/Phase*	*Dates*
Paleoindian	Clovis Tradition	11,500 - 6400 B.C.
	Goshen Tradition	11,500 - 10,500 B.C.
	Folsom Tradition	10,800 – 9500 B.C.
	Foothill-Mountain Tradition	9500 – 6400 B.C.
Archaic	Pioneer Period	6400 – 4500 B.C.
	Settlement Period	4500 – 2500 B.C.
	Transitional Period	2500 – 1000 B.C.
	Terminal Period	1000 – 400 B.C.
Formative	Anasazi Tradition	900 – 1100 A.D.
	Fremont Tradition	200 – 1500 A.D.
	Gateway Tradition	400 B.C. – 1300 A.D.
	Aspen Tradition	400 B.C. – 1300 A.D.
Protohistoric	Canalla Phase	1100 – 1650 A.D.
	Antero Phase	1650 – 1881 A.D.

Source: Reed and Metcalf (1999)

The Formative Era (400 B.C. – A.D. 1300) follows the Archaic and is the time when a horticultural subsistence pattern became established in parts of western Colorado. This era also includes non-horticultural groups who lived in the mountains and higher elevations unsuitable for horticulture. The Aspen Tradition (Reed and Metcalf 1999:140-145), which applies to the Planning Area, is proposed for the non-horticultural foraging archaeological occupations dating between 400 B.C. – A.D. 1300. Characteristics of this tradition include replacement of the atlatl by the bow and arrow, use of ceramics, intensification in subsistence (particularly seed procurement), major use of pit features with associated ground stone, and a general increase in the number of sites.

The Protohistoric era begins around A.D. 1100 – 1300 when Numic groups, such as the Ute, enter western Colorado. The Protohistoric is divided into two periods: the pre-contact Canalla phase and the post-contact Antero phase (Reed and Metcalf 1999). Attributes of Canalla phase occupations include the use of Uncompahgre brown ware ceramics, Desert side-notched and Cottonwood projectile points, wickiups and other brush structures, and a pedestrian hunting and gathering subsistence pattern. The Antero phase began with Ute and Euroamerican contact and is characterized by the use of the horse and Euroamerican artifacts, along with Uncompahgre brown ware and Desert side-notched and Cottonwood projectile points. The precise date the Utes entered western Colorado is unknown, but is generally acknowledged that it could have been as early as A.D. 1000. The Protohistoric era ends with the removal of the Ute peoples to reservations in 1881.

Western Colorado was one of the last areas of the western United States to be settled by Euroamericans and the Planning Area is no exception. The difficult access into the area and the presence of the Ute peoples inhibited development for some 30 to 40 years after the Front Range of the Rockies was settled. The first Euroamericans in the area consisted of Spanish explorers, followed by fur trappers and government-sponsored scientific expeditions.

The initial settlement of the area was by miners from the mountains to the east, who decided to take up farming or ranching in western Colorado. These settlers claimed most of the good lands along the rivers and streams and, by the time the railroad arrived in Rifle in 1889, the majority was occupied. Prior to the

arrival of the railroad, the population of the area was sparse and towns had yet to develop. The railroad did open up the region and lead to the establishment of towns and new industries.

Rifle was initially settled in 1882 by Abraham Maxfield and developed into a trade center for local farms and ranches. Rifle was incorporated in 1905. What would become the town of Parachute was settled by Mike Callahan in 1882, followed in the same year by J.B. Hurlburt. In 1904 the name was changed to Grand Valley and incorporation occurred in 1908. The town was renamed Parachute in 1980.

The main economic pursuits in the early days were sheep and cattle ranching. In the early 1880s, sheep ranchers like J.B. Hurlburt grazed their herds on the Roan Plateau. In 1883, the JQS Cattle Company, formed by H.W. Hallett, was running 4,000 head of cattle and the Grand River Ranch and Cattle Company operated another large cattle ranch in the area. In 1885, the JQS stock trail was built by Hallett and William Chadwick to run cattle on plateau.

Settlement of the upper Grand Valley was primarily by ranchers, but irrigated farming was also important. A number of small irrigation systems were built in the late 1800s. The most ambitious attempt at irrigation was undertaken by Arthur and Raymond Havemeyer. Through the Havemeyer Sugar Company, they invested in the Wilcox Canal Company, hoping to provide water for sugar beet crops. They financed the construction of a canal that was intended to irrigate 8,000 acres in the Webster Mesa and Sharrard Park areas. The sugar beet fields envisioned by the Havemeyers never materialized. On June 12, 1912 a flood destroyed the canal system. Attempts were made to repair the canal and pumps, but the irrigation system never watered any fields.

Extraction of fossil fuels is another economic pursuit with a long history in the area. Oil shale is plentiful and attempts to capitalize on this resource began soon after the area was settled. In the 1890s, T.C. Bailey formed the Parachute Mining District for the sole purpose of building a shale retort and selling mining stocks. NOSR 1 was created in 1916, and the first oil shale facility was built by Harry Flynn in 1918 on Dry Fork, a tributary of Roan Creek near DeBeque. By 1920, while over 10,000 claims had been filed, only 500 barrels of oil had been produced. Cheaper sources of fossil fuels in other parts of the nation prevented the development of the Roan Plateau oil shale reserves.

In an effort to experiment with oil shale recovery, the Bureau of Mines, in conjunction with the University of Colorado and Colorado School of Mines, received an appropriation of $90,000 from the Congress to study development of the oil shale reserves for the Navy. A facility was constructed near Rulison in 1925. The experiment was terminated in 1929 when it was determined that recovery of oil from oil shale was not commercially viable. With the onset of World War II, interest in oil shale was revived, and an experimental plant was built at Anvil Points in 1944. The Anvil Points plant was used periodically into the 1970s. In the early 1980s, Exxon began planning for a massive oil shale development project, including establishment of a new community on Battlement Mesa. The towns of Rifle and Parachute attracted many people seeking employment in the oil shale mines and processing plants. In 1982, Exxon pulled out of the project due to the poor economics of oil shale processing, sending the local economy from a period of boom to relative bust.

3.4.2.3 Results of Previous Investigations

Over 200 cultural resource inventories have been conducted on a total of 73,728 acres of the Planning Area (Hoefer et al. 2002). Most of these inventories were on top of the plateau. Table 3-18 lists the survey acreage.

Table 3-18. Survey Acreage and Cultural Resource Density by Location

Subarea	*Total Acreage (% total)*	*Survey Acreage (% subarea)*	*All Resources Density (n = 429)*	*Prehistoric Resources Density (n = 327)*	*Historic Resources Density (n = 102)*
Lowlands	65,536 (51.6)	28,318 (43.2)	1 per 118 acres (5.42 per sq. mi.)	1 per 156 acres (4.10/sq. mi.)	1 per 480 acres (1.33/sq. mi.)
Uplands	61,471 (48.4)	45,410 (73.9)	1 per 242 acres (2.64 per sq. mi.)	1 per 313 acres (2.04/sq. mi.)	1 per 1,056 acres (0.61/sq. mi.)
Total	127,007 (100.0)	73,728	1 per 172 acres (3.72 per sq. mi.)	1 per 225 acres (2.84 per sq. mi.)	1 per 723 acres (0.87 per sq. mi.)

The data used to prepare the Class I overview of the prehistoric and historic cultural resources of the Planning Area were gathered from the GSFO and the Colorado Historical Society Office of Archaeology and Historic Preservation. The Class I overview included data on 429 resources, comprising 327 prehistoric sites and isolated finds and 102 historic sites and isolated finds. These include 241 sites and isolated finds in the lowlands section of the study area and 188 in the uplands section. The lowlands and uplands are separated by the rim of the plateau, at approximately 8,000 feet in elevation. Table 3-19 details site type by location.

The 429 prehistoric and historic resources have been evaluated for eligibility for nomination to the National Register of Historic Places (NRHP) using the criteria listed in 36 CFR 60.4. The sites have been evaluated as eligible for nomination to the NRHP, not eligible for nomination to the NRHP, or as potentially eligible for nomination to the NRHP. Sites listed as potentially eligible require further investigations before a NRHP evaluation can be made. Both eligible and potentially eligible sites are historic properties that must be managed under the mandates of the NHPA and other applicable statutes. Table 3-20 lists the NRHP eligibility of known sites.

3.4.2.4 Traditional Cultural Properties

No traditional cultural properties have been identified for the Planning Area. The following groups were formally contacted during the consultation process for the Class I Overview: the Ute Tribe of the Uintah and Ouray Agency, the Southern Ute Tribe, and the Ute Mountain Ute Tribe. These tribes confirmed that the Ute people occupied the project area, at least in historic times. During the project area site visit, the Ute Tribe of the Uintah and Ouray Agency tribal representatives indicated that the Yampatika band occupied the area around the Roan Plateau. Mr. Jim Jefferson, Southern Ute, indicated that the Uncompahgre Utes occupied the Roan Plateau. No traditional cultural properties, resource gathering areas, or areas of spiritual significance have been identified (Hoefer et al. 2002).

3.4.2.5 Sensitivity Zones

The Class I overview resulted in the delineation of sensitivity zones (Hoefer et al. 2002). These zones rate the area on the probability of locating additional cultural resources in either surface or subsurface contexts. The high-sensitivity zones exhibit a cultural resource density of one per 118 acres. The high-sensitivity zone encompasses 19,576 acres (15.4 percent) of the Planning Area. The moderate-sensitivity zone has a cultural resource density of one per 234 acres and encompasses 26,218 acres (20.6 percent) of the Planning Area. The low-sensitivity zone has a cultural resource density of one site per 538 acres and encompasses 81,215 acres (64 percent) of the Planning Area.

Table 3-19. Cultural Resource Type by Location

Project Location	Lowlands	Uplands	Total
PREHISTORIC			
Isolate	91	49	140
Lithic Scatter	24	29	53
Open Camp	58	67	125
Other	9	0	9
Prehistoric Subtotal	**182**	**145**	**327**
HISTORIC			
Isolate	1	1	2
Habitation	21	9	30
Ranch	6	9	15
Mining	6	0	6
Transportation	4	0	4
Water Control	10	0	10
Aspen Art	0	21	21
Artifact Scatter	4	0	4
Other	7	3	10
Historic Subtotal	**59**	**43**	**102**
Total	**241**	**188**	**429**

Table 3-20. National Register Evaluations by Cultural Resource Type and Location

Resource Type	*Eligible*	*Potentially Eligible*	*Not Eligible*	*Total*
PREHISTORIC				
Isolate	0	0	140	140
Lithic Scatter	3	7	43	53
Open Camp	24	26	75	125
Other	2	2	6	10
HISTORIC				
Isolate	0	0	2	2
Habitation	2	2	27	31
Ranch	2	0	12	14
Mining	1	0	5	6
Transportation	2	1	1	4
Water Control	3	0	7	10
Aspen Art	0	0	21	21
Artifact Scatter	0	0	4	4
Other	0	1	8	9
Total	**39**	**39**	**351**	**429**

3.4.2.6 Use Allocations

A basic management goal is to preserve and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations (BLM Information Bulletin No. 2002-101). The categories of cultural resource use allocations include (a) scientific use, (b) conservation use, (c) traditional use, (d) public use, (e) experimental use, and (f) discharged from management. The use allocations recommended for the 429 known prehistoric and historic sites are presented in Table 3-21 and described below.

Table 3-21. Recommended BLM Use Categories by Cultural Resource Site Type

Use Category	*Prehistoric Sites*				*Historic Sites*									*Total*
	Isolate	Lithic Scatter	Open Camp	Other	Isolate	Habitation	Ranch	Mining	Transportation	Water Control	Aspen Art	Artifact Scatter	Other	
Scientific [1]	0	3	28	3	0	1	0	1	0	0	0	0	1	**37**
Conservation	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Traditional Use	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
Public Education [1]	0	0	0	0	0	1	1	2	2	5	0	0	0	**11**
Experimental	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Discharged from Management	0	0	4	0	0	0	0	0	0	0	0	0	0	**4**

[1] *One site is included in both the scientific and public education categories.*

No Allocation

A total of 378 sites were not allocated to any use because insufficient information is available to make an informed recommendation. Many of the known sites are considered ineligible for nomination to the NRHP. As such, these properties may be candidates for discharge from a management category. However, due to the lack of understanding of the Holocene stratigraphy, and the lack of information in the management area, it is difficult to determine if these properties have additional buried expressions. It is recommended that these properties be reevaluated whenever possible before assigning use allocations.

Scientific Use

Sites in this category are most likely to yield significant archaeological information about the prehistory and history of the region. The method of use is generally archaeological excavation, controlled surface collection, and/or controlled recordation (data recovery). These sites may require long-term preservation and management and will constrain other land uses by necessitating avoidance of ground-disturbing activities until their scientific potential has been realized. Of the 37 sites allocated to this use category, 23 are eligible for the NRHP, and 13 require additional scientific study before their significance can be determined. These sites were judged to have strong research potential based on the information presented in the site forms and their linkage to applicable research questions.

Conservation for Future Use

This category is reserved for any unusual cultural property that, because of scarcity, a research potential that surpasses the current state of the art, singular historic importance, cultural importance, architectural interest, or comparable reasons, is not currently available for consideration as the subject of scientific or historical study. A cultural property included in this category is deemed worthy of segregation from all other land or resource uses. No sites have been allocated to this use category.

Traditional Use

This category is applied to any cultural resource perceived by a specified social and/or cultural group as important in maintaining the cultural identity, heritage, or well-being of the group. Cultural properties assigned to this use are to be managed in ways that recognize the importance ascribed to them and seek to accommodate their continued traditional use. One specific sites has been allocated to this use category.

Public Use

This category may be applied to any cultural property found to be appropriate for use as an interpretive exhibit in place, or for related educational and recreational use by members of the general public. Eleven sites are recommended for allocation to this use category.

Experimental Use

This category may be applied to a cultural property judged well suited for controlled experimental study, which may result in the property's alteration including the possible loss of integrity and destruction of its physical elements. The studies should aim toward understanding the kinds and rates of natural or human-caused deterioration, testing the effectiveness of protection measures, or developing new research or interpretive methods and practical management information. It should not be applied to cultural properties with strong research potential, traditional cultural importance, or good public use potential if doing so would significantly diminish those uses. No sites are recommended for allocation to this use category. However, any site determined not eligible for nomination to the NRHP by the BLM and Colorado State Historic Preservation Officer (SHPO) should be considered for possible placement in this category at a future date.

Discharged from Management

This category is assigned to cultural properties that have no remaining identifiable use. These are generally prehistoric and historic archaeological properties, such as small surface scatters of artifacts or debris, whose limited research potential is exhausted as soon as they have been documented. This category may also apply to sites whose salient information has been collected through mitigation or research, or sites that have been destroyed by natural or human activities. These sites remain in the inventory, but do not require long-term preservation and management and do not constrain other land uses. They do not require avoidance from surface-disturbing activity. Four sites are recommended for placement in this use category. Their integrity has been completely compromised or artifacts completely collected. All of these sites are completely lacking in integrity. Sites and isolated finds determined as not eligible for nomination to the NRHP may be candidates for placement in this category.

3.4.2.7 Data Gaps

The Class I overview identified a number of data deficiencies in the information that have been collected from previous cultural resources investigations in the Planning Area. These include (1) lack of information on subsurface character, (2) lack of information on age of the resources, (3) lack of excavation data including micro and macroflora and fauna, technology, and paleoenvironment that would help analyze the subsistence and settlement patterns in the area, and (4) a bias in NRHP site evaluations that favors prehistoric sites over historic sites (Hoefer et al. 2002).

3.4.3 Socioeconomics

3.4.3.1 Area of Analysis

Socioeconomic impacts resulting from implementation of an alternative developed and selected as part of this RMPA/EIS process would most clearly affect the population living in the vicinity of the Planning Area. This local impact area extends westward along I-70 from New Castle to the Garfield–Mesa County line on the west, and northward from Rifle along SH 13 to the Garfield–Rio Blanco County line. This area is referred to in the following discussion as central Garfield County or the Roan Plateau.

Some socioeconomic impacts would be felt in a more extended area that includes the rest of Garfield County as well as Mesa and Rio Blanco Counties. In particular, public revenues and public expenditures brought about by activities on public land could affect all residents of Garfield County. To a much lesser degree, the same public revenue and expenditure effects could also accrue to Rio Blanco County; 370 acres of Planning Area lie within its boundaries. Mesa County would be affected because a number of people, who work in Garfield County, especially in the oil and gas industry, live in Mesa County. Of course, many people throughout western Colorado and the United States know and make use of the resources in the Planning Area.

3.4.3.2 Population

Population growth in Garfield County between 1990 and 2000 occurred at an annual rate of 3.9 percent. This exceeded Colorado's overall rate of growth, which was one of the fastest in the nation (Table 3-22). Within Garfield County, the population increase was led by growth in the Roan Plateau area where population grew by almost 55 percent. That growth has largely been tied to economic activity in the Roaring Fork Valley.

Throughout the 1990s, the Roaring Fork Valley between Glenwood Springs and Aspen experienced a boom in residential and commercial construction. Much of the work force drawn to Garfield County by this construction boom chose to live in central Garfield County (i.e., in the vicinity of the Planning Area) because of its relatively affordable housing prices. For much of the 1990s, the cost to rent or own a residence in this part of the County was 50 percent or less of the cost for similar housing in the Roaring Fork Valley. Other factors contributing to population growth in central Garfield County were the in-migration of retirees to the area and natural population growth, as a resurgence of economic opportunities allowed many natives to remain in the area rather than migrate to locations with better job prospects. Overall, the construction boom was the largest factor in population growth in the Colorado River Valley.

Table 3-22. Population Change in the Planning Area Vicinity, 1990 - 2000

Geographic Area	*Population*			
	1990	*2000*	*Overall Change*	*Annual Change*
Garfield County	**29,974**	**43,791**	**46.1%**	**3.9%**
Roan Plateau Area	14,893	23,009	54.5%	4.5%
Rifle	4,636	6,784	46.3%	3.9%
Battlement Mesa	1,477	3,497	136.8%	9.0%
Parachute	658	1,006	52.9%	4.3%
Silt	1,095	1,740	58.9%	4.7%
Other	7,215	7,755	7.5%	0.7%
Rio Blanco County	**5,972**	**5,986**	**0.2%**	**0.0%**

Table 3-22. Population Change in the Planning Area Vicinity, 1990 - 2000

Geographic Area	Population			
	1990	2000	Overall Change	Annual Change
Mesa County	93,145	116,255	24.8%	2.2%
Colorado	3,294,000	4,301,000	30.6%	2.7%

Source: U.S. Census Bureau, 1990 and 2000

3.4.3.3 Environmental Justice

Requirements for an environmental justice review as part of the NEPA process were established by Executive Order 12898 (February 11, 1994). That order declared that each Federal agency is to identify "disproportionately high and adverse human health or environment effects of its programs, policies, and activities on minority and low-income populations."

The only minority population of note in proximity to the Planning Area is the Hispanic community of Garfield County. In the 2000 census, persons describing themselves as Hispanic or Latino represented 16.7 percent of the population. This is about the same as the overall figure for Colorado (17.1 percent), indicating that Hispanic or Latino individuals are represented in Garfield County in the same proportion as elsewhere in the State. African Americans, American Indians, Asians, and Pacific Islanders each accounted for less than one percent of the population, below the comparable State figure in all cases.

"Low-income population" in this discussion refers to persons who receive some form of assistance from Garfield County on the basis of Federally determined poverty thresholds. More than 2,000 people were receiving Medicaid and/or financial assistance from the Garfield County Department of Social Services in February 2003. About 390 families were receiving rental assistance from the Garfield County Housing Authority in the same period. Those who receive assistance are dispersed throughout the County, but more tend to be located in the Rifle and Parachute areas because the most affordable housing is located there (George 2003, Powell 2003).

3.4.3.4 Employment and Income

As shown in Table 3-23, the economy of Garfield County is dominated by two sectors: wholesale and retail trade, accounting for 22 percent of County jobs in 2001, and service (ranging from lodging and health care to legal and maid services), contributing over 28 percent. These are followed by construction and government, at 19 and 14 percent, respectively. Manufacturing, agriculture, and mining make relatively small contributions to the economy.

The most notable item in Table 3-23 is the rapid growth described in the construction sector during the 10 years from 1991 to 2001. The 1990s construction boom in the Roaring Fork Valley and central Garfield County brought an additional 3,500 jobs to the area during that period, an increase of 210 percent. Construction has become an important source of economic diversity in the area. Discussions with area businessmen indicate that construction activity in the Roaring Fork Valley and throughout Garfield County has slowed in the last 2 years.

Personal income in Garfield County rose dramatically during the 1990s, growing 120 percent from $513 million in 1990 to more than $1.1 billion in 2000. Annual per-capita income rose by 50 percent during the same period, from $17,024 to $25,560 (U.S. Bureau of Economic Analysis 2002).

Table 3-23. Employment by Sector, Garfield County, Colorado, 1991 - 2001

Economic Sector	*1991*	*1996*	*2001*	*10-Year Change*	*Sector Share*
Agriculture	762	987	1,240	62.7%	4.5%
Mining and Extraction	783	158	471	-39.8%	1.7%
Construction	1,681	2,945	5,218	210.4%	18.8%
Manufacturing	446	476	490	9.9%	1.8%
Transportation, Communication and Utilities	688	953	814	18.3%	2.9%
Wholesale and Retail Trade	3,904	5,147	6,092	56.0%	22.0%
Finance, Insurance and Real Estate	1,069	1,548	1,644	53.8%	5.9%
Services	4,913	6,296	7,858	59.9%	28.3%
Government	2,520	3,021	3,902	54.8%	14.1%
Total	**16,767**	**21,531**	**27,728**	**65.4%**	**100.0%**

Source: Colorado Department of Local Affairs, Demography Section (2003)

Activities on public land in the Planning Area that most clearly have an economic impact are grazing, hunting, and other forms of recreation, and development of oil and gas resources. Each is discussed below in terms of its relative economic importance and in terms of the importance attached to it by the local community. References to public attitudes and perceptions are based on a series of discussions with local residents, business people, and community leaders in preparation for this RMPA/EIS. A summary description of those discussions is found below in Section 3.4.1.6.

Ranching

Ranching is part of the agriculture sector, which in turn is a relatively small part of the local economy, representing less than 5 percent of total employment. The consensus of interviewees was that the ranching industry continues to decline and that the ability to run a profitable family cattle or sheep ranching business has become more difficult. The price of land, cost of labor and forage, distance to markets, and enduring low prices for livestock combine to make ranching in west-central Colorado a marginal economic pursuit. Most people currently ranching have owned their land for some time or have other sources of income.

Nevertheless, ranching remains important to many residents. However small an industry, it is valued as a much-needed element of economic diversity. Moreover, ranching is seen as a link to a way of life that goes back 130 years and remains an important reminder of the region's heritage. Some residents view a viable ranching economy as necessary to limit further subdivision growth and to maintain open space.

Public lands are essential to the local livestock industry, providing grazing land and forage throughout the spring, summer, and fall months. Private lands in the area could not provide enough forage on their own to sustain livestock numbers through those months. In particular, the 16 grazing allotments in the Planning Area provide forage to 20 permittees. The 10,783 AUMs available are grazed by approximately 3,550 cattle and 4,700 sheep. Most permittees have cow/calf and ewe/lamb operations and are highly dependent on the forage resources available on the allotments. On top of the plateau, the allotments serve as summer range; below the rim, the allotments provide grazing year-round. Total employment provided by grazing on public lands in the Planning Area would at most amount to the number of permittees and as many employees on a seasonal or part-time basis, or about 10 person-years.

Permittees who were interviewed agreed that public land grazing permits are essential for their economic survival. They also agreed that oil and gas development, while a problem in the short term, had long-term

benefits and that motorized recreationists, especially during hunting season, were a problem. Attitudes on the potential for wilderness designation were mixed, ranging from only a slight concern about inconveniencing ranching operations to a fear that it would seriously hamper operations.

Hunting and Recreation

Tourism is an important economic force in Garfield County, supporting 14 percent of all jobs in the County in 1999 (Center for Business and Economic Forecasting 2001). It is one of the reasons that the trade and service sectors provide half the jobs in the County. Tourists require lodging, restaurants, sporting goods stores, guide and outfitter services, food, fuel and other types of supplies. In addition to Ski Sunlight, the Hot Springs Pool, and the Glenwood Caverns Adventure Park in eastern Garfield County, the many types of outdoor recreation opportunities throughout the County attract tourists. Hunting, fishing, river rafting, and OHV use draw visitors from throughout the nation.

In central Garfield County, big game hunting in particular is viewed as critical to the economy. In addition to providing economic diversity, hunting gives a seasonal boost to many local businesses that could not otherwise survive. In addition to outfitters and sporting goods stores, restaurants, motels, gas stations, motor vehicle sale and repair shops, and grocery stores all rely to some extent on hunting season sales. Interviews with business people in the Roan Plateau area frequently elicited a comment that the hunting season makes the difference between profit and loss for the year. The contribution of other recreational pursuits is not as evident but may be growing. Motorized recreation outside hunting season appears to be on the upswing, as does mountain biking.

Big game hunting occurs primarily on public lands managed by BLM or USFS. These lands provide year-round habitat for big game species and are open to all. Because CDOW manages big game and the hunting thereof, that agency plays the greatest role in determining hunting opportunities and success, and hence the degree to which hunting contributes to the local economy. However, BLM and USFS manage the habitat and the conditions in which hunting occurs. For these reasons, public land management decisions also influence hunting issues.

The Planning Area is nearly contiguous with CDOW GMU 32, which is a popular hunting destination that includes the top of the plateau. During the 1990s, the number of deer and elk hunters has usually exceeded 2,500. However, the number has declined in recent years due to decreased numbers of deer and changes in hunting regulations. In 2001, the number of hunter-days was less than half the average for the previous 10 years.

At least three outfitters hold BLM permits to provide guide and outfitting services in the Planning Area. The one outfitter interviewed felt that hunting success was poor atop the plateau because the prevalence of motorized vehicle use quickly drove the game to less accessible locations and large tracts of private land to the west. The outfitters employ as many as 20 people for 3 to 4 months each.

Expenditures by hunters in the Planning Area are as much as $1 million annually, with perhaps an additional $1 million of indirect and induced local expenditures (CDOW 1995). The reduction in hunting numbers on the Planning Area in recent years does not appear to have had a noticeable economic effect. This suggests that most of the hunters who were "displaced" from the Planning Area (or chose not to go there) continued to pass through central Garfield County to hunt on nearby public or private lands or use the area for lodging and provisioning.

Oil and Gas

Oil and gas development has become an increasingly important economic factor in the last 10 years. The employment figures for the mining and extraction industry in Table 3-23 are misleading, because some oil and gas employment shows up in the construction sector and a sizeable minority of workers is located outside Garfield County. However, a recent survey of oil and gas operators in the Roan Plateau area indicated that the operators and their primary contractors have required about 600 employees for

construction, drilling, completion, and overhead work in central Garfield County in recent years (Moore 2003).

Despite the relatively small percentage of the resident work force employed in oil and gas extraction, the industry has recently become a more substantial economic presence. The jobs of as many as 600 to 1,000 workers beyond those directly employed in the extraction of natural gas are indirectly tied to the oil and gas industry in Garfield County. Direct and indirect employment associated with oil and gas development represents 4 to 7 percent of total employment in the County. The recent increase in drilling activity has created additional demand for goods and services that helps to offset the recent decline in construction in the neighboring Roaring Fork Valley.

With an assumed average salary of about $48,000 per year, this level of oil and gas industry employment would represent an annual payroll of $30-45 million. Depending on the particular drilling or production activity, 30 to 90 percent of the employees live in Garfield County. Many of the rest live in Mesa County, but some workers who reside in locations throughout the Rocky Mountain region live in Garfield County on a temporary basis.

Drilling for gas has occurred in the Planning Area for at least 10 years, and 524 wells had been drilled by the summer of 2002, representing about 30 percent of total drilling in central Garfield County. About 20 percent has been on BLM lands, including the NOSR 3. Almost all of this drilling has occurred in the southern portion of the Planning Area, below the Roan Cliffs.

3.4.3.5 Public Revenue

The Federal government makes "Payments in Lieu of Taxes" (PILT) to County governments to help offset property tax revenue lost because of nontaxable Federal lands within County boundaries. Although BLM administers the program, payments are based on all Federal acreage in a County, including that managed by BLM, USFS, USFWS, and the National Park Service (NPS). In addition to the amount of Federal lands in a county, payments are based on population, the amount of other Federal funds received, and the amount appropriated by Congress for PILT in any given year. By formula, payments are decreased as other Federal funds, such as mineral royalty payments, increase. PILT received by Garfield County in the last 4 years has been as follows: 1999 – $656,372; 2000 – $768,526; 2001 – $1,097,202; and 2002 – $810,487 (BLM 2003b).

In addition to PILT, BLM shares revenues generated by commercial activities on public lands with State and county governments. Operators of commercial ventures on BLM lands are required to pay fees and rents and, often, a percentage of sales revenues in exchange for the right to use or to extract public resources. The most important such revenue-generating activity considered in this RMPA/EIS is oil and gas development. Lessees pay the Federal government a royalty equal to 12.5 percent of the wellhead value of gas and oil produced from public land. Half of the royalty receipts, less administrative costs, are deposited in the U.S. Treasury, and the other half disbursed to the State of Colorado. In 2002, royalties originating from mineral extraction on public land in Garfield County, virtually all of which was based on oil and gas production, amounted to $5.5 million. In 2001, the figure was $14.1 million.

Although half the Federal royalties would ordinarily be distributed to the State of Colorado, the Transfer Act that shifted jurisdiction over NOSRs 1 and 3 from DOE to BLM created an exception to that rule. The Transfer Act calls for all monies derived from leasing of the mineral estate in the NOSRs to be segregated in a separate fund until the Federal government has recovered all costs associated with DOE's efforts to develop the gas resource and all costs associated with the environmental restoration of the transferred lands. No royalties from leases in the NOSRs will be disbursed to Colorado until those costs are recouped. The actual costs to be recovered will not be known until the restoration work has been completed but are estimated at more than $40 million; more than $12 million has been collected to date.

Colorado uses a complex formula to allocate its share of Federal mineral royalties to the Counties from which the payments were derived, towns within those Counties, the State school fund, local school districts, the Department of Local Affairs, and the CWCB. Royalty payments to jurisdictions in Garfield County for the last 2 years are shown in Table 3-24.

Monies disbursed to the Department of Local Affairs go into a fund along with receipts from the Colorado State severance tax, which is used to provide financial assistance to communities impacted by energy mineral development. In the last 4 years, jurisdictions within Garfield County have received assistance from those funds in amounts varying from $1.3 million to $2.4 million to help finance road improvements, the new County detention center, the communications center, and many other civic improvements. In the last few years, 6 to 9 percent of the Garfield County government's total revenue has consisted of Federal funds from the sources described above.

Table 3-24. Royalty Payments to Jurisdictions in Garfield County, Colorado, 2001 and 2002

Year	*County*	*Schools*	*Towns*
2001	$543,750	$300,000	$356,250
2002	$349,000	$170,000	$161,000

Source: Colorado Department of Local Affairs (2002)

In recent years, property tax revenue from oil and gas development has become the largest source of public revenue in Garfield County. For 2002, the assessed value of oil and gas properties was $257 million, just over 28 percent of the County's total assessed value (Garfield County 2003). Property taxes from oil and gas make up more than half of the revenues for the County's school districts. As the number of wells increases and total gas production increases, the assessed value of gas properties will continue to rise and represent an increasing share of the total assessed value.

3.4.3.6 Quality of Life Considerations

As described in Section 3.4.3.1 of the Draft RMPA/EIS, interviews were conducted with a number of community leaders, public land users, and other nearby residents. Most of the people involved in the interviews had already participated in BLM's scoping process by commenting during one of the scoping periods or by attending the focus group meetings in October 2000. The interviews were not intended to be a scientific or statistical survey, but as a follow-up to some of the scoping comments pertaining to social and economic issues. The interview process had three objectives:

1. Gain insight into the perceived economic impact of increasing oil and gas development and increasing human population on selected public land activities, including hunting, other types of recreation, and ranching.
2. Assist in the environmental justice review by assessing perceptions regarding the extent to which minority or low-income populations are affected by BLM land management decisions.
3. Explore attitudes of locals about their lifestyle and quality of life and assess the role of public lands in general, and the Planning Area in particular, in shaping those attitudes.

A focal point of all the discussions was the concept of change. Area residents have observed or participated in substantial change over the last 10 to 15 years. Population has increased rapidly with an influx of newcomers from throughout the U.S. and other countries. Economic opportunity has waned and then expanded. An oil and gas industry appeared and relatively quickly became a presence in parts of the County. Now, BLM is considering management changes in the Planning Area, an area that had seemed constant for many years.

A theme commonly expressed by many of the interviewees was the perception that dramatically different responses to issues would be given by younger versus older individuals and by newcomers versus long-time residents. In reality, these commonly held perceptions were contradicted by the responses of the interviewees themselves, and the reality was more complex.

Some older, long-time residents were pleased with the new economic climate because it meant that their children would not have to move away to find work. On the other hand, a younger resident and relative newcomer regretted the changes being made to the landscape that might not be reversible. Several "old-timers" were firm in their belief that oil and gas development had just as much right as the more traditional ranching and hunting uses. In general, the interviewees expressed a strong sense that change is something that happens regardless of what they think about it, and that it brings both good and bad.

When queried as to the effect of change on their quality of life, the most common response was that things had definitely improved in recent years. The usual reasons given were that economic opportunities had improved and economic growth had increased both the shopping and entertainment opportunities in the area. The presence of a new "big box" discount retailer was mentioned a number of times. A small but distinct minority felt that the quality of life in the area had declined because a sense of community had been lost.

The contributions of public land to lifestyles and quality of life were appreciated by most of the discussants. The visual quality of the area, open space, and opportunity to recreate in proximity to home were frequently cited as valuable contributions made by BLM and National Forest lands to the quality of life and to the "rural lifestyle" that many people like. The role of the Planning Area itself was featured strongly in comments on visual quality. Some sense was evident, however, that only a few local residents actually used or had even been on top of the plateau. The access routes are considered too risky and too time-consuming. Residents seemed to prefer recreating in more accessible areas of Battlement Mesa or Coulter Mesa. The long drive to enjoy the view of Anvil Points, Colorado River Valley, and more distant vistas from on top of the plateau was generally reserved for entertaining out-of-town visitors.

The impact of oil and gas development was brought up in each conversation. A number of discussants stated that production of gas was a national necessity, some focused on the right of the gas drilling operators to develop their property rights, and a few regretted the too-high cost in other natural resources when gas is developed. The general sense was one of grudging acceptance on the part of a good number of the discussants and a frequent recognition of the economic benefits. However, almost all of the interviewees shared the notion that oil and gas has not been a "good neighbor." Opinions expressed during the interviews included the poor condition of drill pads several years after drilling, the apparently limited effort put into minimizing visual effects, the impact on roads and traffic, the noise and smell, and the failure of the companies to communicate with residents in the vicinity of drilling.

The potential visual impact of gas drilling was one of the greatest fears of residents. This fear is linked to the high value placed on the area's scenic quality and on its open space. As described above, residents value the role public lands play in serving as a reservoir of open space and providing the area's scenic quality. These elements also figure strongly in the perceptions of residents about their "rural lifestyle" and quality of life. The Planning Area was felt to define the area in a certain sense.

Only a few of the discussants ardently supported the notion of designating wilderness in the Planning Area. Others seemed to have little interest in the subject of wilderness designation or felt that it was not a good idea because of the constraints it would put on some uses. Many discussants thought that wilderness designation would be a popular idea locally but that most residents would not actually use any designated areas. None of the participants made the point that wilderness designation could help maintain the visual quality of the area, although visual resource protection was one of their key issues.

3.4.3.7 Growth Scenarios for the Planning Area

Garfield County is one of the fastest growing areas in the U.S., and the impacts of the proposed RMP Amendment must be considered in this dynamic environment. The Colorado State Demography Section anticipates that a high growth rate will continue in Garfield County through 2030 (DOLA 2006a). Recent analysis by regional planners found that these population projections underestimate population growth in Garfield County if employment needs in adjacent Eagle and Pitkin counties are considered (Watershed Collaborative Growth Scenarios Project 2005). Central Garfield County offers some of the more affordable housing in the region, and workers are likely to commute from Garfield County to jobs in Eagle and Pitkin County. Table 3-25 shows the results of these two population forecasts.

Table 3-25. Population Forecasts for Garfield County, Colorado, 2005 – 2025

Source	*2005*	*2015*	*2025*	*Total Increase*
DOLA (2006)	50,194	79,711	114,776	64,582
Watershed Collaborative Growth Scenarios Project (2005)	50,288	90,290	129,674	79,386

One way to reconcile the difference in these forecasts is to look at permanent and peak populations. In 2000, Garfield County had an 18 percent increase in population during peak winter season (LSC 2005a). Estimates for peak winter population in 2025 are about 161,000 for an estimated permanent population of 87,000 (LSC 2005b).

The resident labor force or employment forecast for Garfield County reflects the high rate of population growth and is shown in Table 3-26. Depending on the forecast, employment could double during the next 20 years. Garfield County's unemployment rate is expected remain around 3 percent and almost half of the resident labor force is expected to commute out of Garfield County for their jobs (Watershed Collaborative Growth Scenarios Project 2005).

Table 3-26. Employment Forecasts for Garfield County, Colorado, 2005 – 2025

Source	*2005*	*2015*	*2025*	*Total Increase*
DOLA (2006)	29,841 (actual)	37,840	45,836	16,000
Watershed Collaborative Growth Scenarios Project (2005)	27,311	47,474	62,506	35,200

Total personal income in Garfield County is projected to increase from $1.5 billion in 2005 to almost $6 billion in 2025 (DOLA 2005). Per-capita personal income is forecast to increase from about $29,000 per year in 2005 to $72,000 per year in 2025 (DOLA 2005).

One of the driving forces for the economic growth in Garfield County is the oil and gas industry. Natural gas production in Garfield County has increased more than three-fold during the past 5 years from 70 billion cubic feet (BCF) in 2005 to more than 235 BCF in 2005 (COGCC 2006). Garfield County is experiencing the fastest oil and gas development in Colorado, with 1,800 drilling permits issued in 2005. Approximately 60 drill rigs were operating in Garfield County in 2005, and a new well was being drilled every 15 to 20 days (COGCC 2006).

Regional planners expect that this development will continue in Garfield County because of the high success rate and the 10-acre downhole spacing allowed for natural gas development in the Mesa Verde formation. Long-term forecasts predict that between 10,000 and 20,000 new wells will be drilled in Garfield County over the next 10 to 20 years. The rate at which these wells could be drilled will be

limited, in part, by the number of drill rigs in the area. Estimates range from about 60 to 90 rigs operating in any year. Each operating drill rig corresponds to 45 to 50 full-time jobs (Barrett Corporation 2000). Therefore, this drilling activity could result in about 3,500 to 4,000 jobs in Garfield County. Many of the local jobs in the oil and gas industry are filled by temporary workers and subcontractors instead of residents of Garfield County.

Garfield County and its communities have received significant tax and grant revenues from oil and gas production over the past few years. In tax year 2004, Garfield County collected almost $8 million in property tax revenues from oil and gas properties. This amounted to almost 18 percent of total county revenues in that year (Garfield County 2005). By comparison, in 2000, total property tax from oil and gas was just over $1 million and amounted to only 4 percent of total revenues. In addition to property tax revenues, Garfield County receives a share of the severance taxes collected for oil and gas production on State and federal lands. In 2004, severance taxes paid directly to Garfield County were over $1 million. Garfield County received additional revenue in the form of grants from the Colorado Department of Local Affairs Mineral Impact Assistance Program. In 2005, this amounted to almost $3 million to Garfield County for county road reconstruction and communication system improvements (DOLA 2006b). Communities in Garfield County received an additional $4 million for other infrastructure projects. Continued production growth and high gas prices should increase tax and grant revenues to Garfield County and its communities for the next 10 to 20 years.

3.4.4 Transportation

3.4.4.1 Major Highways and Access Roads

A network of Federal, State, and county roads provides access to the Planning Area and serves to define the area's boundaries. Interstate 70 defines the southern boundary of the Planning Area, bringing traffic to the region from throughout the United States. Colorado SH 13, which forms the eastern boundary of the Planning Area, carries traffic to and from Rio Blanco and Moffat Counties to the north. Garfield CR 215, the road along Parachute Creek, defines the western border of the Planning Area.

US Highway 6, originally the major east-west route through the region, is now essentially a frontage road for I-70. From US 6 and I-70, Garfield CR 246 provides access into the Sharrard Park area and the old Anvil Points mine facility in the southeastern portion of the Planning Area. Access beyond the County road up along the mine portal road is prevented by a locked BLM gate, which limits travel on this poorly maintained, dangerous road to administrative uses.

Garfield CR 215 was paved during the oil shale exploration boom of the 1980s and currently provides access to industrial facilities and private lands along Parachute Creek. The northern terminus of CR 215 is at locked gates at the inactive Unocal oil shale property. Access to the top of the plateau is on four-wheel-drive roads through Unocal and other private properties, whose owners control use of the roads. These routes could potentially be used in conjunction with oil and gas development atop the plateau, but would require a significant construction effort to be usable by drill rig equipment. Public comments during a scoping meeting in Parachute indicated frustration by some members of the public that they could not access the top of the plateau on these roads but instead must drive 2 hours to reach the top of the plateau on publicly accessible routes. Access to public lands in the eastern part of the Planning Area below the rim is from west of Rifle up CR 244, past Fravert Reservoir, and via SH 13 north of Rifle for approximately 2 miles to CR 242 (JQS Road), which allows entry into the lands on Hubbard Mesa.

The two primary routes providing public access to BLM lands atop the plateau are (1) North on SH 13 from Rifle to CR 242 (JQS Road), which crosses Hubbard Mesa and climbs the eastern face of the Roan Cliffs to the Rim Road on top; and (2) farther north on SH 13 to CR 5 (Piceance Creek Road) at Rio Blanco, then west approximately 3 miles to the Cow Creek Road, which travels about 12 miles from the turnoff from CR 5 to the rim. In Rio Blanco County, Cow Creek Road is a BLM road that provides

public access either across BLM land or through easements across private land. When it crosses into Garfield County, it becomes CR 249. A new road is currently being planned to provide access to oil and gas developments on private lands atop the plateau. Whether this road would ever be used for public access, or for access to Federal leases atop the plateau, is not currently known.

While the JQS Road provides the shortest public access to the top of the plateau, it is very steep, narrow, and winding, becomes impassable during inclement weather, and normally requires a high-clearance, four-wheel-drive vehicle. In comparison, access from the north, up Cow Creek Road, is much longer but generally passable to passenger cars during all but the worst weather conditions. This difficult access to the top of the plateau keeps overall vehicle use lower than on surrounding public lands. Traffic on JQS and Cow Creek Roads is mostly for recreation or ranching.

Table 3-27 provides average daily traffic counts for Planning Area access roads at significant locations in and near the Planning Area. It also shows traffic counts projected to occur at the same locations for the year 2023, the last year of the Roan Plateau planning period addressed by this RMPA/EIS.

The traffic counts for I-70 and SH 13 are from Colorado Department of Transportation (CDOT), which counts or estimates Average Annual Daily Traffic (AADT) for all Federal and State highways in Colorado. The AADT numbers represent the average over an entire year (CDOT 2003). The Garfield County numbers are for May to October 2002 (Hykys 2003). Counts for Rio Blanco CR 5 at SH 13 are for the first two weeks of September 2002 (Steele 2003). The CR 5 count shows much less use of Cow Creek Road, even during hunting season.

Table 3-27. Average Annual Daily Traffic (AADT) on I-70 and Other Roads

Highway or Road Segment	*Average Daily Traffic*	
	2003	*Projected 2023*
I-70 at Rifle	11,402	15,393
I-70 at Rulison	15,954	21,538
I-70 at Parachute	11,580	15,633
SH 13 at I-70	11,680	15,768
SH 13 at US 6	2,151	2,904
SH 13 at SH 325	3,049	4,116
SH 13 at CR 5	1,963	2,650
CR 215 (Parachute Creek)	919	1,241
CR 242 (JQS)	84	113
CR 244 (Fravert Reservoir)	317	428
CR 246 (Anvil Points)	366	494
CR 5 (at SH 13)(Rio Blanco County)	300	405

Projected traffic volume increases for 2023 are based on CDOT assumptions. CDOT has projected traffic growth for all roads within its jurisdiction over the next 20 years, using an annual growth rate based on historic population trends. This annual rate of 1.5 percent amounts to a 35 percent increase across a span of 20 years. The cumulative growth rate was applied to the current County road totals to arrive at projected 2023 traffic volumes.

The projections are intended to provide a background scale against which impacts may be measured. However, while the projected 35 percent growth in traffic reflects a number of ongoing trends – growth in interstate traffic, population growth, increase in local industrial and business activity – it may be low. The State Demographer projects a 66 percent growth in the local population for roughly the same period, which could result in substantially higher traffic counts on State and County roads.

Average daily traffic at the Rulison interchange is much higher than either the Rifle or Parachute interchanges, despite that it accesses a relatively small, dispersed population (in addition to oil and gas fields), while the other two access sizable population centers. The high average daily total for SH 13 at I-70 reflects the combination of local traffic and traffic exiting or entering I-70 for access onto SH 13 and US 6. Data for SH 13 at SH 325 are for the first major road juncture intersection north of Rifle, where SH 325 diverges northeastward to the Rifle Gap and Rifle Falls areas.

3.4.4.2 BLM Roads and Trails

The transportation management objective in the GSRA RMP (1984, revised 1988) is "to provide access to public land by acquiring those legal rights on non-public land that are essential to implement BLM planned actions." The access management objective in the WRRA RMP (BLM 1996a) is to "enhance access to public lands and resources." The road management objective in DOE's operational management plan for NOSRs 1 and 3 is to plan "road maintenance and construction to provide adequate administrative access to the NOSRs and to minimize erosion or watershed damage."

BLM roads and trails provide public and administrative (agency and permittee) access to public lands and in-holdings of private land within the Planning Area. Reasonable access is made available to persons engaged in valid uses such as mining claims, mineral leases, livestock grazing, recreation, and other uses. Most use of BLM roads would be described as casual.

Road system management has focused on maintaining major access roads, which generally receive most of the recreation traffic. Corrective maintenance occurs as problems are identified and funds permit. Road construction has been limited to improving or upgrading segments of road to improve access or to alleviate maintenance or environmental problems. The NOSR OMP of 1988 stated that the NOSR road system was maintained and new roads constructed where needed to provide administrative access to the NOSRs. DOE funded road maintenance and construction only as required for DOE programs. Any roads that were abandoned were to be obliterated and revegetated to reduce further use and damage.

Existing roads and trails in the Planning Area are categorized based on the type of use and maintenance they receive (Table 3-28).

Table 3-28. Miles of Roads and Trails in the Planning Area [1]

Road Class	*Characteristics*	*Miles*
3B, 3C	Light-duty, gravel or dirt, constructed, regularly maintained	69.5
4	Unimproved, primitive, constructed or user-created, sedan clearance, not regularly maintained	16.3
5	Four-wheel-drive, primitive, constructed or user-created, high clearance required, not regularly maintained	136.0
6	ATV trail (<52 inches wide) or single-track motorized (dirt bike, horse)	32.8

[1] *Does not include small segments of primary or secondary highways within Planning Area edges (4.5 miles)*

3.5 MANAGEMENT ENVIRONMENT

3.5.1 Lands and Realty

3.5.1.1 Introduction

The land tenure objective in the 1984 GSRA RMP is "to increase the overall efficiency and effectiveness of public land by identifying public land suitable for disposal through public sale (Category I lands) and suitable for continued management under multiple-use concepts (Category II lands)." The utility and communication facility management objective in the 1984 GSRA RMP is "to respond, in a timely manner, to requests for utility and communication facility authorizations on public land while considering environmental, social, economic, and interagency concerns."

The land use authorizations objective described in the 1997 WRRA RMP is "to make public land available for the siting of public and private facilities through the issuance of applicable land use authorizations, in a manner that provides for reasonable protection of other resource values." The land tenure adjustments objective in the 1997 WRRA RMP is "to provide for adjustments in land ownership to acquire important resources/values, meet local needs, resolve unauthorized uses, and improve efficiency" in land management." The objective is "to eliminate unnecessary segregations of public lands."

About 64,000 acres, or 54 percent of the land within the Planning Area, are managed by BLM. Most (about 55,000 acres) were transferred from the jurisdiction of DOE in 1998. Table 3-29 describes land ownership in the Planning Area.

Table 3-29. Land Ownership in the Planning Area

Ownership	*Surface Estate (acres)*	*Percent of Area*	*Mineral Estate (acres)*	*Percent of Area*
Federal (BLM NOSR 1)	34,608	27.2 %	36,213	28.5 %
Federal (BLM NOSR 3)	19,877	15.7 %	20,025	15.8 %
Other Federal (BLM)	12,452	9.8 %	17,364	13.7 %
Subtotal Federal (BLM)	**66,936**	**52.7 %**	**73,602**	**58.0 %**
Private	**60,071**	**47.3 %**	**53,405**	**42.0 %**
Total	***127,007***	***100 %***	***127,007***	***100 %***

In addition to the surface land managed by BLM, the Planning Area includes more than 6,600 acres of split-estate lands in which the surface is privately owned but the Federal government has retained the mineral estate. NOSRs 1 and 3 were created by Executive Order on December 6, 1916, and September 27, 1924, respectively, and were to be managed "for the exclusive use and benefit of the United States Navy" with the intention that fuel produced from oil shale would be for the use of the United States Navy. They were removed from the operation of public land laws, except at the discretion of the Navy, and were managed by the Navy and then by DOE until passage of the Transfer Act that shifted jurisdiction of NOSRs 1 and 3 to BLM.

As described in Chapter 1 of this RMPA/EIS, the Transfer Act directed BLM to manage the transferred lands in accordance with FLPMA and other laws applicable to public lands. The first action required under that directive is this RMP Amendment, the purpose of which is to establish BLM's management direction for the transferred lands.

In northwestern Colorado, a substantial amount of public land was previously withdrawn from mineral entry to protect the oil shale resource. Withdrawal also prohibits any other action, such as a land exchange, that could lead to transfer of title from the U.S.

3.5.1.2 Withdrawals

A withdrawal is an action that removes an area of public land from one or more normal public land uses in order to protect a specific potential use of the land. The most frequent use of this authority is to withdraw an area from mineral entry—that is, to remove it from the normal operation of the Mining Law of 1872, which permits individuals to explore for minerals, "locate" a mineral source, develop the mineral, and eventually "patent" the mineral location and acquire ownership from the Federal government. In northwestern Colorado, a substantial amount of public land was previously withdrawn from mineral entry to protect the oil shale resource. Withdrawal also prohibits any other action, such as a land exchange, that could lead to transfer of title from the U.S.

The Executive Orders that created NOSRs 1 and 3 withdrew them "from settlement, location, sale, or entry." However, as with other oil shale withdrawals in northwestern Colorado (Colorado Public Land Order Number 7516, Revocation of Oil Shale Withdrawals, Colorado [Federal Register 67(51)11706-11707, March 15, 2002]), the NOSR withdrawals have been determined to be unnecessary because current public land laws and regulations provide adequate protection of the oil shale resource.

Oil shale is now a leasable mineral resource (Mineral Leasing Act, Section 21, as amended 1982) like coal or oil and gas, and its development can be managed like other minerals in the context of multiple-use management. Since the Transfer Act shifting jurisdiction of NOSRs 1 and 3 from DOE to BLM did not revoke the original withdrawals, the Secretary of the Interior must revoke the withdrawals upon completion of this RMP Amendment to formally allow "settlement, location, sale, or entry" for purposes other than specified in the Executive Orders that created them (that is, to allow multiple-use management under FLPMA).

3.5.1.3 Land Tenure Categories

BLM classifies all of its public lands into three categories with regard to their potential for disposal or retention.

- Category I (Disposal) – Judged suitable for disposal by sale, usually because they are small, isolated tracts that cannot be effectively managed.
- Category II (Exchange) – Managed for multiple use and cannot be sold but can be exchanged for other properties or made available for disposal under the terms of the Recreation and Public Purposes Act. Applications under this Act are considered on a case-by-case basis. Applications under the Desert Land Act or General Allotment Act of 1887 are rejected in Category II lands.
- Category III (Retention) – Must be retained to satisfy a specific management requirement. Public land designated as a WSR or ACEC would be placed in this retention category.

The 1984 GSRA RMP classified the 54,485 acres of NOSRs 1 and 3 as Category III lands because the withdrawals that created them made disposal impossible. Approximately 2,240 acres, identified as parcels 11, 12, 13, 14, 15, 20, 21, and 22, were identified as Category I lands. The remaining lands in the Planning Area were classified as Category II.

BLM may acquire land through exchanges with other entities. In-holdings may be acquired if they become available for purchase or exchange. Unocal has proposed an exchange whereby BLM would acquire land in the East Fork Parachute Creek area.

3.5.1.4 Land Use Authorizations

For enduring surface-disturbing uses of public lands that are not within the scope of the mining laws and regulations, BLM issues leases and rights-of-way. Leases are used primarily for the benefit of local governments, special districts, or public groups in accordance with the terms of the Recreation and Public Purposes (R&PPA). The Rifle Sportsmen's Club currently has expressed an interest in an R&PPA lease on about 40 acres of BLM land behind their target range west of the town of Rifle.

The most common form of authorization to permit uses of public lands by commercial, private, or governmental entities is the right-of-way, which is used to permit private and public roads that cross public lands, pipelines not within the boundaries of an oil and gas lease, public utilities, communications facilities, reservoirs, and a variety of other purposes. Pipelines and utilities associated with an oil and gas drill pad are located within the disturbed areas of the existing access road to the greatest extent possible. If that is not possible, they may be located within 50 feet to either side of the centerline of the access road.

Within the Planning Area, most existing rights-of-way are located west of and parallel to SH 13 along the eastern boundary of the study area. These include multiple electric transmission lines and natural gas pipelines. Closer to Rifle, the pipelines leave the SH 13 corridor and proceed south across Hubbard Mesa toward I-70.

The transferred lands include no formal BLM rights-of-way, although two communications sites are located there. A USFS site near the Rim Road may be put under a specific authorization. A Garfield County communication site located near the portal of the oil shale mine at Anvil Points is unauthorized. Its disposition is dependent in part on what happens to the oil shale portal access road.

No rights-of-way have been issued for use of the Rim Road. However, it provides access to existing gas wells on private property and is the only feasible route to those wells.

3.5.2 Onsite Travel Management

3.5.2.1 Plans and Documents

The OHV management objective in the 1984 GSRA RMP is "to protect fragile and unique resource values from damage by OHV use and provide OHV use opportunities where appropriate." The motorized vehicle travel objective in the 1997 WRRA RMP is to "manage motorized vehicle travel on public lands to provide for public need and demand, protect natural resources, provide for the safety of public land users, and to minimize conflicts among various users of public lands." A comprehensive travel management plan was to be initiated upon approval of the 1997 WRRA RMP but has not been completed.

DOE's recreation objective for NOSRs 1 and 3 (DOE 1988) is that "Minimal recreation management measures will be taken to prevent deterioration of the soils and vegetation, habitat for fish and wildlife, aesthetic values of the NOSRs, and to protect DOE property and employees of DOE and DOE contractors."

3.5.2.2 Current Management

Travel management is aimed at providing adequate access to BLM lands for visitor use and for administration of those lands, while regulating travel to protect public safety, prevent damage to resources, and resolve conflicts among users. Central to travel management are OHV designations. All public lands are required to be designated as "open," "limited," or "closed" to OHVs (43 CFR 8342.1). In "open" areas, cross-country travel by motorized or mechanized means is not limited. "Open" designations are used primarily for areas that have been selected for intensive OHV recreation and that do not have compelling resource protection needs, user conflicts, or public safety issues that warrant limiting cross-country use. On lands designated as "limited," cross-country travel is prohibited and travel is limited to specified routes. The network of routes available and the terms and conditions of use on those

roads and trails are usually identified on published maps. In "closed" areas, no motorized or vehicle use is permitted. Cross-country travel by foot or horse is usually permitted in all areas regardless of OHV designation. Snowmobiles traveling over the snow may also be permitted.

The 1984 GSRA RMP designated most lands in the resource area as open to OHVs, including all of the public lands within the Planning Area that were not managed by DOE. Neither the GSRA RMP nor DOE's OMP set travel designations on NOSRs 1 and 3. Following the transfer of jurisdiction from DOE to the GSFO, route inventories were conducted, and the initial Roan Plateau Map and Visitor Guide (BLM 2000a) was published in 1998. Although public comments on the routes available for travel were requested at the time the visitor guide was published, none were received.

In 2000, interim travel designations were formally put in place on the transferred lands and the visitor guide was reprinted (Federal Register 65(128):41081-41082; July 3, 2000). In an effort to curb the expanding use of cross-country travel by OHVs and to prevent further proliferation of unplanned routes, motorized, and mechanized travel was limited to designated routes year-round. The limitation did not apply to foot or horseback travel or to snowmobiles operating on snow.

These interim travel designations are a temporary measure to prevent further damage to resources caused by unplanned cross-country travel and to allow time for open, careful discussion about travel designations through the integrated planning process. Permanent OHV designations for the transferred lands, including specific road and trail designations, will be made as part of this RMPA/EIS process. OHV designations on the other public lands in the Planning Area will be reviewed to ensure compatibility with management objectives.

Within the WRRA, motorized vehicle travel is managed to provide for public needs and demands, protect natural resources, provide safety to users, and minimize conflicts between various user groups. Public lands within the WRRA portions of the Planning Area are included in the interim travel order (Federal Register; July 3, 2000; cited above). Adjacent public lands to the north (Cow Creek/Timber Gulch/Hay Gulch) are closed from August 15 through November 30 each year in order to establish a non-motorized quality hunting area. The travel designations from this RMPA/EIS will be incorporated into the WRRA RMP.

Scoping comments seemed to indicate that the interim travel designations have general public support but that some conflicting issues remain. Participants in the scoping process expressed the desire that BLM would:

1. Reduce the number of vehicle routes in order to enhance the backcountry experience, decrease fragmentation of wildlife habitat, lessen wildlife displacement, and curb riparian impacts.
2. Maintain the current designations since OHV driving is a traditional use and little if any change is needed.
3. Designate the already heavily used areas as open.
4. Designate a mechanized and motorized route system with opportunities for a variety of skill levels since an open cross-country play area is inappropriate.
5. Enhance hunting success by introducing seasonal restrictions or a reduction in the number of routes, thereby reducing motorized disturbance of big game.
6. Reclaim routes that are troublesome, redundant, unneeded, or cause resource damage.
7. Find a way to incorporate a greater level of partner involvement in travel management.

3.5.2.3 Current Use

Lands atop the Plateau

Public access to the Roan Plateau is limited to two routes. From SH 13, visitors can travel the steep and narrow JQS Road, or use the Cow Creek Road via the Piceance Creek Road. The JQS Road is impassable when wet, and both accesses are closed by snow in the winter. This lack of convenient access keeps overall vehicle use lower than on surrounding public lands. BLM currently maintains the JQS Road and the main ridge roads on the Roan Plateau. Other routes are maintained as needed, usually in conjunction with maintaining livestock improvements.

Atop the plateau, travel routes tend to be a mixture of high clearance and four-wheel-drive, two-track routes. Historically, recreational OHV use has benefited from the extensive road system, but nothing was specifically done to enhance travel and access for motorized or non-motorized recreation. Almost all routes are dead ends that terminate at livestock water developments or are user-created and end at a viewpoint or stream access point.

Mountain bikers currently use the existing road system. BLM cooperated with the City of Rifle to develop a mountain biking brochure and map but has done little on the ground to enhance mountain biking. Given the increasing population in the region and the growing popularity of this sport, it is reasonable to assume that mountain bikes will become more common in the Planning Area as the presence of suitable routes and an attractive landscape become better known. Hikers and horseback riders generally travel cross-country or on the few livestock trails. Snowmobile use remains low. Besides recreation, the current motorized route system provides access for livestock management.

Lands below the Rim

Private land and terrain restrict travel and access in the southern foothills of the Planning Area. Vehicle routes tend to be associated with gas production. Only landowners or those with landowner approval can access and travel on public lands.

In contrast, public lands and the open pinyon/juniper vegetation of Hubbard Gulch and Hubbard Mesa allow easy access and cross-country passage for OHVs. Over time, this has resulted in a widespread system of rough and challenging roads and trails.

Because they are so close to the town of Rifle and remain open throughout the winter, the Hubbard Gulch and Hubbard Mesa areas are popular destinations for recreational driving. Many of the routes also cross onto private lands. Private landowners have done little to discourage trespassing, such as erecting fences or signs, and many users probably do not realize when they are on private property. Commingled public and private lands make managing travel difficult.

As the population of the area has grown, so too has mechanized and motorized recreation. BLM has issued several special recreation permits for mountain bike events. Stakeholders and landowners have complained about the open travel designations (cross-country travel) and raised concerns about resource damage to soils, vegetation, wildlife, aesthetics, and conflicts with other recreational users. The trend toward increasing mechanized and motorized use, and the associated problems that have occurred in recent years, are expected to continue.

3.5.3 Recreation

Recreational opportunities in the Planning Area offer quality-of-life enrichments for residents and visitors. Steady population growth has placed an increasing recreational demand on adjacent undeveloped public lands as visitors and nearby residents seek a diversity of recreational opportunities. Recreational settings range from backcountry (e.g., the East Fork Parachute Creek area) to rural (Hubbard Mesa). Recreation management has been primarily custodial, allowing visitors dispersed recreation opportunities.

3.5.3.1 Factors Creating Recreation Management Challenges

Colorado's population has grown significantly in the past 10 years (U.S. Census Bureau 2002), and an increasing number of people are living near or seeking undeveloped public land for recreational use. In addition, Colorado remains a popular destination for tourists, especially those seeking experiences in an undeveloped setting. As a result, public lands administered by the BLM are absorbing increasing recreational use (BLM 2000b). Other factors include:

- Changing population demographics (U.S. Census Bureau 2002).
- Increasing dispersed recreation use, both summer and winter.
- Popularity of public lands as a local recreation destination for local communities.
- Adjacent private lands and in-holdings.
- Economic and social value of recreation and tourism.
- Recent public interest in, and growing awareness of, the area.
- Citizen desire for a greater role in the management of their public lands.
- Budget allocations, which are flat or decreasing despite aging facilities and increasing demands.
- Technological advances, such as all-terrain vehicles and mountain bikes, as well as better outdoor equipment and clothing.
- Integrating recreation use with sustainable management of other resources.
- Trespassing on private lands by OHV users while recreating on adjacent public lands.

3.5.3.2 Administrative Framework

The recreation resource management objective in the 1984 GSRA RMP for non-transferred public lands is "to ensure the continued availability of outdoor recreational opportunities which the public seeks and which are not readily available from other sources, to reduce the impacts of recreational use on fragile and unique resource values, and to provide for visitor safety" (BLM 1988a). The 1984 GSRA RMP did not address recreational use on NOSR lands except for the now-abandoned Anvil Points developed recreation site (camping area).

The recreation objective for transferred lands, as outlined in DOE's operational management plan for NOSRs 1 and 3 (DOE 1988) is for "minimal recreation management measures … to prevent deterioration of the soils and vegetation, habitat for fish and wildlife, aesthetic values of the NOSRs, and DOE property and employees of DOE and DOE contractors."

The recreation objective as described in the 1997 WRRA RMP is to "provide a broad spectrum and diversity of recreation opportunities to meet expected demand by (1) providing services to the visiting public, (2) maintaining high quality facilities to meet public needs and demand; and (3) improving public understanding and support of BLM programs through communication and partnerships" (BLM 1996a).

3.5.3.3 Current Management

From 1935 to 1977, BLM provided custodial surface management of NOSRs 1 and 3 under a cooperative agreement with the Department of the Navy. When DOE assumed jurisdiction in 1977, they requested that BLM continue to manage surface activities like recreation. A 1987 MOU with DOE provided funding for some surface resources but not recreation, resulting in minimal recreation administration.

For other public lands within the GSFO, the management direction stated in the 1984 GSRA RMP is to "manage Extensive Recreation Management Areas (ERMAs) to provide visitor information, minimal sanitation facilities, and access [and] to resolve management issues [of] off-road vehicle use." ERMAs

are areas where limited commitment of resources is required to provide unstructured, dispersed recreation activities. Anything not chosen as a SRMA becomes, by default, part of an ERMA. Visitors who want to avoid areas of intensive recreational activities generally prefer ERMAs.

The entire WRRA portion of the Planning Area is managed custodially as an ERMA to provide unstructured recreation opportunities. Specific management can be developed in project plans, or integrated activity plans. Resources would be managed and monitored to ensure protection of sensitive resources and continued availability of recreation opportunities and experiences.

Since the 1997 transfer of jurisdiction to the BLM, the GSFO has taken a more active role in managing and monitoring recreation in the Planning Area. The GSFO produced a visitor's guide and map for the Roan Plateau, improved signage, sponsored clean-ups, conducted route inventories, and increased visitor patrols. Camping is limited to 7 days between April 1 and August 31, and 14 days between September 1 and March 31.

Additional recreation management guidance was provided to BLM Field Offices by the 2000 Recreation Guidelines to meet Land Health Standards (BLM 2000c)(Appendix F). Since the Land Health Standards relate to all uses of public lands, including recreational use, Colorado BLM has prepared recreation guidelines. The guidelines provide tools, methods, and techniques that can be used by managers to maintain or meet Land Health Standards as they implement various recreation programs.

CDOW regulates hunting and fishing within the Planning Area. BLM works in close coordination with the CDOW and others to assist hunters and anglers.

3.5.3.4 Resource Condition and Characteristics atop the Plateau

Activities

A 1973 report to the Secretary of Defense noted that a large majority of visitors come for the purpose of big game hunting. An increasing number of visitors enjoyed the scenery and natural beauty while camping, scenic driving, rockhounding, and hiking. The report also noted that snowmobiling may become popular as greater recreational demands are anticipated in the near future.

The recreation capability analysis for the 1984 GSRA RMP did include NOSR lands. The NOSR Capability Unit was estimated to receive 3,100 recreation visits annually, mostly associated with hunting. Visitor use was expected to rise as the local communities grew. High values for viewing scenery and moderate values for hunting, wildlife viewing, hiking, sightseeing, and general dispersed recreation were recognized.

Dispersed, unstructured activities such as fishing, hiking, camping, birding, sightseeing, mountain biking, OHV/ATV riding and snowmobiling are all popular today. Big game hunting remains the most popular activity. As a dispersed recreational activity, hunting is not limited to specific areas. However, in some areas such as on top of the plateau and along the rugged side slopes, hunting becomes concentrated because of prime big game habitat.

Public participation indicated that the Planning Area is now an important supplier of all these activities and that people want to see little if any change in the current activity opportunities.

Recreational Settings

The Recreation Opportunity Spectrum (ROS) is both a classification system and a prescriptive tool for recreation planning, management, and research (Clark and Stankey 1979). The recreational settings affect and sometimes determine the activities, experiences, and attainment of other ensuing beneficial and adverse outcomes. The ROS concept recognizes that the attainment of desired recreational experiences is heavily influenced and sometimes actually determined by the physical, social, and administrative settings of a recreational area (BLM 2002a). Appendix E describes the ROS classes.

During the recreation capability analysis for the 1984 GSRA RMP, visitors had expressed a preference for more primitive type settings while hunters were identified to have a preference for a variety of primitive and roaded settings.

The landscape of the Planning Area appears generally natural even though numerous vehicle routes bisect the Roan Plateau. The creek bottoms and forested hillsides offer the best opportunities for solitude. No developed facilities exist, but primitive dispersed campsites abound. The level of visitor management and regulation is low. Visitor services consist of informational signing at a few key locations, route signing, and a visitor brochure/map.

The evidence of other people, including both sights and sounds, remains low. The social setting has become more crowded over time, especially during the hunting season, but remains less crowded than surrounding public lands. This is probably due to its geographic isolation and the existence of only two public access roads: the steep and winding JQS Road from the southeast and, from much farther north, the more accessible Cow Creek Road.

Scoping for this RMPA/EIS indicated a wide and somewhat conflicting desire for recreational settings. Some want to close roads and remove human intrusions to enhance backcountry settings. Other comments suggest that people want little if any change in the current settings, especially if it would involve significant reductions in motorized travel and access.

Experiences and Outcomes

Scoping also indicated that the current recreational settings and activities are desired because they offer opportunities to explore, experience solitude, enjoy natural aesthetics, experience the challenge of driving on rough backcountry roads, rest mentally and physically, relieve stress, renew spiritually, maintain personal health, and maintain an outdoor-oriented lifestyle. Hunting was specifically mentioned for providing positive economic contributions to the local economy (BLM 2000d).

3.5.3.5 Resource Condition and Characteristics below the Rim

Activities

Areas at lower elevations of the Planning Area contrast sharply with the steep Roan Plateau sideslopes. The area is a popular local destination that receives year-round use. Recreational activities are typically dispersed and unstructured, and include OHV riding and mountain biking, camping, hiking, horseback riding, hunting, target shooting, and partying. Motorsports activities are dispersed throughout the area. However, Hubbard Mesa has been the dominant use area, probably because of terrain, accessibility, and proximity to Rifle. Popular trails may lead users to trespass unwittingly onto private land.

Target shooting occurs mostly in the Hubbard Mesa area. Concerns and complaints by visitors and neighbors are often centered on unsafe and indiscriminate shooting and the trash left behind by shooters. The Rifle Gun Club operates a private shooting range 2 miles northeast of Rifle off CR 244 and has requested an expansion of the range to accommodate longer shooting distances.

Recreational Setting

Outside of the areas currently leased for oil and gas production, the foothills of the Roan Plateau have a high degree of naturalness, offer opportunities for solitude, and have only a few public vehicle access points because of terrain and private property (see the Wilderness Suitability section of the AMS [BLM 2002a]). Livestock and game trails offer minimal access into this arduous country, which consequently receives little visitation.

The landscape below the cliffs is visually and physically much more modified by visitor use and traversed by many rough double-track and single-track vehicle routes. Undeveloped, dispersed campsites abound, and no developed facilities exist. The level of visitor management and regulation is low. Informational signing is in place at a few key locations. Interaction among visitors/users is more frequent than on top of

the plateau. Conflicts are emerging between adjacent landowners or livestock operators and motorized or mechanized trail users.

The area continues to experience signs of inappropriate use (trash dumping, litter, partying). In some areas, overuse creates conflicts with other recreational users and adversely affects soils, vegetation, wildlife, and aesthetics.

The physical landscape is now much more developed with increasing numbers of user-created roads and trails. The social setting is more crowded and evidence of people (litter, trash, party spots, etc.) is common. Field observations confirm that visitation peaks during spring and fall weekends. BLM still manages the area for dispersed undeveloped recreational opportunities with minimal investment in facilities or personnel.

Experiences and Outcomes

Scoping for this RMPA/EIS indicated that current recreational settings and activities are desirable because they offer an important recreation amenity close to town where users can escape everyday responsibilities for a while, enjoy physical exercise and outdoor aesthetics, and benefit from the challenges of both motorized and non-motorized recreation. In addition, scoping indicated that motorized sports specifically provide positive economic contributions to the local economy (BLM 2000d).

3.5.3.6 Current and Projected Recreational Use

National visitation is significantly influenced by big game hunting, opportunities for motorized sports and scenic destinations like the East Fork Parachute Creek Falls. These activities and the natural settings with roaded access attract visitors from all over the nation.

Visitors participating in other activities are more local or regional in nature. The Roan Plateau area is viewed as a regional recreational amenity by residents from fast-growing towns along I-70 from Glenwood Springs to Grand Junction. No statistics exist, but stakeholders agree that recreational use will continue to increase with the growing local population, increased marketing, and word of mouth.

The GSFO does not have statistics on dispersed visitor use trends for the Roan Plateau area. Field observations and traffic counters indicate the big game hunting seasons bring most visitors to the top of the plateau in the fall. The adjacent White River National Forest was ranked fifth in 1995 based on total recreation visitor days in the National Forest System (USFS 2002).

3.5.3.7 Tourism

The Planning Area is located in Colorado's northwestern tourism region (Colorado Tourism Office 2002). Tourism is currently centered on hunting and motorized sports. Marketing has generally focused on the White River National Forest and opportunities elsewhere in the region (Colorado Tourism Office 2002).

Local marketing of hunting and wildlife viewing opportunities in the Planning Area is increasing; BLM has not played a role in marketing. Two outfitters offer guided big game hunting in the area, and the City of Rifle publishes a mountain bike guide for the Roan Plateau. The Planning Area also plays host to special recreational events. These activities currently provide positive economic contributions to the towns of Rifle, Silt, New Castle, Meeker, and Parachute, as well as Garfield County. Visitors tend to purchase meals, daily food supplies, fuel, sporting goods, gifts, and some lodging. Future growth in population and recreation presents opportunities for tourism to increase its contribution to the stability of the local and regional economy.

Other regional recreation providers of developed and dispersed recreation opportunities include:

- NPS – Colorado National Monument
- USFS – White River National Forest and Grand Mesa-Uncompahgre National Forest

- BLM – Grand Junction Resource Area
- CDW – Garfield Creek and Christine State Wildlife Areas
- Colorado Division of Parks – Rifle Falls, Harvey Gap, and Rifle Gap State Parks
- City of Rifle – Rifle Mountain Park

Private recreation facilities such as campgrounds and guest ranches operate on nearby private land and public land.

3.5.4 Grazing and Rangeland Management

3.5.4.1 Management Plans and Documents

The 1984 GSRA RMP and 1997 WRRA RMP were amended on February 12, 1997, by the Colorado Standards for Public Land Health for all BLM lands in Colorado. These Land Health Standards describe the conditions needed to sustain public land health, and apply to all uses of public lands.

The GSRA management objective is to provide 56,885 AUMs of livestock forage to accommodate active livestock preference. Active livestock preference is that portion of the total preference for which grazing use may be authorized.

The livestock grazing management objective within the WRRA is to "(1) provide a healthy public rangeland condition capable of supplying forage on a sustained yield to meet the demand for livestock grazing; (2) provide for adequate forage plants growth and/or regrowth opportunity necessary to (a) replenish the plants food reserves and (b) produce sufficient seed to meet the production needs necessary to maintain an ecological presence in the plant community; and (3) manage livestock grazing to maintain or enhance a healthy rangeland vegetative composition, species diversity, and other resource values."

The livestock management objectives as outlined in DOE's operational management plan for NOSR 1 and 3 are that "livestock management will be permitted to provide effective distribution and control of livestock to maintain good watershed conditions and avoid excessive erosion and damage."

3.5.4.2 Current Management

Livestock management was permitted by DOE on the NOSRs, providing it did not interfere with programs or management objectives associated with oil shale exploration and research. Grazing was managed to maintain and prevent deterioration of the NOSR soils, vegetation, watershed, and wildlife habitat. Since 1997, livestock have been managed to meet or exceed Land Health Standards.

Within the WRRA, livestock grazing is managed as described in the 1981 Rangeland Program Summary (BLM 2002a). Forage allocations from the Summary will continue until sufficient data exists to require their modification. Monitoring studies will continue to evaluate livestock grazing levels. Range improvements continue to be used to improve rangeland conditions. Integrated activity plans, including NEPA analysis, will be developed for all allotments within the activity plan boundaries.

Three cow camp cabins are located in allotments above the rim: two in the East Fork Common Allotment and one in the JQS Common Allotment. BLM has title to these cabins since they are facilities built on public lands, but assigns maintenance responsibility to permittees through either cooperative agreements or Section 4 permits.

3.5.4.3 Characteristics and Setting

Characteristics and setting for livestock management and rangeland health are described in the AMS (BLM 2002a) and summarized below. Grazing allotment locations and size are illustrated on Map 28.

Table 3-30 summarizes allotments within the Planning Area in terms of size, current livestock use, and management categories.

Table 3-30. Current Livestock Use on Grazing Allotments in the Planning Area

Allotment Number	*Allotment Name*	*Allotment Category* [1]	*Public Land Acreage*	*Number / Type of Livestock*	*Season of Use*	*AUMs* [2]
08905	Doodlebug	M	947	53 Cattle	05/16 to 06/15	54
08912	Sharrard Park [3]	C	2,424	--	--	--
08913	Mahaffey Summer	I	1,908	400 Cattle	07/06 to 10/15	510
08914	Old Mountain	I	1,308	99 Cattle	06/16 to 10/15	397
08918	Wheeler Gulch [4]	C	551	--	--	--
08924	Cottonwood Gulch	C	9,605	180 Cattle	05/11 to 06/05	132
18901	Magpie Creek	I	2,083	60 Cattle	06/16 to 10/17	56
18902	Webster Park	I	6,155	500 Cattle 500 Cattle	04/20 to 05/25 11/01 to 02/28	118 395
18903	Hubbard Mesa	I	6,760	60 Cattle 500 Sheep 1,500 Sheep 1,500 Sheep 1,500 Sheep	05/16 to 06/15 12/20 to 02/05 02/16 to 02/28 03/01 to 04/07 04/19 to 05/31	61 79 64 187 212
18907	Rees	I	2,023	416 Cattle 416 Cattle	05/01 to 06/01 10/15 to 11/30	162 238
18908	JQS Common	I	10,457	660 Cattle 1,200 Sheep	06/16 to 09/30 06/16 to 09/30	2,607 559
18909	Clough-Alber	I	5,323	1,000 Sheep 134 Cattle	06/20 to 10/01 06/16 to 10/15	547 537
18910	East Fork Common	I	8,461	634 Cattle	06/16 to 10/15	2,542
06015	Gordon Gulch / Naval Oil Shale (WRFO)	I	5,446	1,000 Sheep	05/03 to 06/30 10/01 to 10/25	344 197
06019	Cow Creek (WRFO)	I	10,291	350 Cattle	06/15 to 10/01	795

[1] *Allotment Category: I = improve, M = maintain, C = custodial*

[2] *AUM (Animal Unit Month) = for cattle: one weaned or adult animal for one month; for sheep: five weaned or adult animals for one month.*

[3] *Sharrard Park is not allotted.*

[4] *Wheeler Gulch has not been allotted since 1986. A grazing transfer was initiated in 2001 for four cattle AUMs from 4/16 to 5/31.*

Twenty grazing permittees are authorized on fifteen allotments, including a portion of the Government Creek Common Allotment east of SH 13. Most of these are small family operations. A total of 10,793 AUMs (8,604 cattle, and 2,189 sheep) are available for grazing. Approximately 4,462 cattle and 8,200 sheep graze the area. The amount of revenues received varies from year to year depending on the grazing fee and the amount of active use, with an average of about $14,500 per year.

Most permittees have cow/calf and ewe/lamb operations and are highly dependent on the forage resources available on the allotments. On top of the plateau, the allotments serve as summer range for livestock operation. Below the cliffs, the allotments serve as spring, early summer, fall, and winter ranges for livestock operations. Livestock grazing allotments are administered under three management categories:

- Improve (I) – Managed to improve current unsatisfactory resource conditions and receive the highest priority for funding and management actions.
- Maintain (M) – Managed to maintain current satisfactory resource conditions and actively managed to ensure that resource values do not decline.
- Custodial (C) – Managed custodially while protecting existing resource values.

These categories are designed to concentrate public funds and management efforts on allotments with the most significant resource conflicts and the greatest potential for improvement. In the project area, eleven allotments are in the "I" category, one is in the "M" category, and three are in the "C" category.

3.5.4.4 Resource Condition and Capabilities Evaluation

Allotments atop the Plateau

East Fork Common — A lack of upland water sources has contributed to poor livestock distribution in the past, with livestock grazing concentrated in the riparian habitat along the streams. The 1984 AMP set utilization and basal coverage objectives for key upland areas in the allotment. In 1986, pasture configurations changed from a four-pasture rest rotation system to a three-pasture deferred rotation system. The three-pasture system was preferable because it eliminated the pasture fence that ran down the middle of Ben Good Creek, allowing grazing in the riparian zone from two different pastures. Permit renewals conducted in 2001 established utilization objectives for riparian areas and adjusted utilization objectives for uplands. Monitoring data indicates that utilization objectives have been met with current management with slight to light moderate utilization of key species.

Changes in riding and salting practices, removing fences along creek bottoms, and developing upland water sources have helped to bring about some improvement in upland and riparian conditions. Observations in 1986 and 1990 indicated a static trend in condition. Some evidence of upward trend was apparent in 1992.

The land health assessment indicated that the creeks are either at PFC or FAR with an upward trend. Land health assessment and monitoring data indicate that range conditions have improved since the 1981 Soil and Vegetation Inventory Method (SVIM) assessment for upland and riparian vegetation. Seral stages within the allotment indicate good to excellent condition (late-seral stage).

Mahaffey Summer — Due to limited water sources and the steep drainage topography, proper livestock distribution has been difficult to achieve for this allotment. A series of pit reservoirs constructed in the uplands has helped to improve livestock distribution. The grazing period on the allotment is from July 6 to October 15. The allotment is divided into three to five pastures and season-long grazing on any one area is not allowed. This grazing system should provide for adequate rest and recovery periods to maintain vegetative health. Data from 1992 indicate an upward trend in the allotment. Inspections indicate that utilization levels are within acceptable limits. Land health assessment and monitoring data indicate that range condition has improved since the 1981 SVIM inventory for both upland and riparian vegetation. Seral stages within the allotment indicate good to excellent condition (toward late-seral stage or Potential Natural Community [PNC]).

The riparian habitats on First Anvil Creek, Sheep Trail Hollow, and Trail Gulch were evaluated at PFC in 1999. East Fork Parachute Creek, Pump House Gulch, Forked Gulch, and Cottonwood Gulch were not evaluated in 1999. In general, riparian areas seemed to be recovering although not yet in proper functioning condition. The riparian areas are infested with bull thistle and houndstongue. Kentucky bluegrass, a non-native pasture grass that behaves as a weed, is also abundant.

JQS Common — A lack of upland water sources has contributed to poor livestock distribution in the past, with livestock grazing concentrated in the riparian habitat along the streams. An AMP completed in

1985 and revised in 1993 changed the grazing rotation system and set utilization and basal coverage objectives for key upland areas of the allotment.

A PFC analysis was conducted in 1994. Riparian objectives were added to the AMP, and numerous measures were implemented to improve livestock management in riparian habitats on the JQS Common Allotment. It appears that these measures have been successful. Riparian monitoring conducted in 1998 indicated that almost all of the riparian areas were improving. The only riparian habitats evaluated as static in 1998 were Middle Trapper Creek, Golden Castle Gulch, and Upper JQS Gulch. No riparian habitats were found to be declining.

The 1999 Land Health Assessment noted that range condition has improved since the 1981 SVIM inventory for both upland and riparian vegetation. The creeks were either at PFC or FAR, with an upward trend indicating improvement in the riparian areas. Seral stages in upland areas within the allotment indicate good to excellent condition. A recent report (Fresques 2002) indicates that riparian conditions may be on a declining trend.

Old Mountain — The allotment was rested in 2001. It contains riparian areas along Forked Gulch and West Forked Gulch, and a 1999 PFC analysis rated both as FAR with an upward trend. Although the Old Mountain Allotment shows a 4-month period of grazing use, rotational grazing is practiced in conjunction with private land, and grazing use occurs for only one month during the period between June 16 and October 15. The one-month period allows ample grazing rest and recovery time for riparian plant species. The upward trend rating is probably indicative of the current grazing management on the allotment. The grazing permit also has a utilization limit stipulation that further protects the riparian area.

Land health assessment and monitoring data indicate that range condition has improved since the 1981 SVIM inventory for both upland and riparian vegetation. Seral stages within the allotment indicate good to excellent condition. Livestock drift has been a concern in the riparian areas; however, better fence maintenance is required on allotment boundary fences and more compliance checks should help alleviate the problem.

Clough-Alber — Monitoring data indicate light utilization levels have occurred in the past on upland sites. Apparent-trend studies indicate static to upward trends throughout the allotment. Grazing distribution and management is a concern on this allotment which is grazed season-long and has no pasture rotation system.

The 1999 land health assessment and other monitoring data indicate that range condition has improved since the 1981 SVIM inventory for both upland and riparian vegetation. Seral stages within the allotment indicate good to excellent condition. Since the most recent monitoring, riparian condition in this allotment was observed to exhibit a declining trend (Fresques 2002).

Cow Creek — An Ecological Site Inventory was conducted and the results indicated that 159 acres (2 percent of the allotment) were at PNC; 1,853 acres (24 percent) were at late-seral stage, 4,756 acres (63 percent) were at mid-seral stage, and 800 acres (11 percent) were at early seral stage. In addition, a land health assessment indicated that 3,439 acres of the allotment were achieving or moving toward meeting the upland vegetation Land Health Standard (#3), and 4,129 acres were not meeting standards (NOT) under current conditions. Riparian areas of Cow Creek and their current status are as follows: PFC – 8.5 acres, FAR – 16.5 acres, and NOT – 4.4 acres.

Gordon Gulch/Naval Oil Shale — Upland areas in the allotment are meeting the standards for upland sites. The Naval Oil Shale pasture has the most productive rangeland sites due to a combination of well-developed soils and higher precipitation. Riparian standards are being met with current management.

Allotments below the Rim

Magpie Gulch — The 2001 Land Health Assessment data indicate that the upland vegetation Land Health Standard (#3) was met at all locations. This indicates the range condition is moving towards a mid- to late-seral stage. No other monitoring data are available.

Hubbard Mesa — An allotment evaluation written in 1996 describes concerns with vegetation resources, particularly browse conditions and utilization levels on sagebrush species. The utilization levels were attributed to both mule deer and sheep. The evaluation also expressed concerns regarding low diversity of grass and forb species. Browse utilization, poor browse recruitment, and understory diversity on public land parcels surrounding private land and portions of Cook Gulch are still a concern in the allotment. The poor browse recruitment and understory diversity may be the results of past livestock practices, heavy use by deer during winter, and the naturally low potential of these sites. In December 1996 a Livestock Use Agreement, which governs sheep use in the allotment, was signed by the BLM and the permittee.

The 2001 permit renewal Environmental Assessment (EA) noted that widespread and increasing vehicle use is a concern in the allotment, especially in Home Ranch and Cook Gulch. The EA also noted that sagebrush stands are decadent and encroachment by Utah juniper and pinyon pine trees is probably due to fire suppression.

The 2001 Rifle Creek Land Health Assessment indicated that this allotment was not meeting Standards 1, 2, or 3. Range condition has remained static or declined since the 1981 SVIM. Livestock grazing was determined to be a significant contributing factor and short-term management actions were implemented in 2002 to prevent further decline in the resource condition. Long-term management actions will be implemented by 2005 with the objective of making substantial progress toward meeting all Land Health Standards.

Rees — This allotment is meeting Land Health Standards. In 1990, the allotment was converted from sheep grazing to cattle grazing during a transfer of grazing privileges. The land health assessment data indicate the range condition is moving towards mid- to late-seral stage. No other monitoring data are available.

Doodlebug — The upland assessment site in the Doodlebug Allotment showed good diversity in the vegetative community. Grasses and forbs looked healthy and productive, but the shrubs were heavily hedged and showed signs of stress from big game use. The upland vegetation Land Health Standard (#3) was met in this allotment. The land health assessment data indicate that range condition is moving toward mid- to late-seral stage. No other monitoring data are available.

Sharrard Park — This allotment has not been grazed since 1990 when the permittee gave up the permit due to the landfill and gas developments. The 1984 GSRA RMP indicates that 23 AUMs are an appropriate stocking level for this allotment due to suitability factors such as forage condition and terrain available for grazing. The 1981 SVIM and 1984 GSRA RMP indicate the allotment is in poor to fair condition (early to mid-seral stage). A land health assessment conducted in 2004 (BLM 2005c) concluded this allotment met, or was moving towards achieving, Land Health Standards. However problem areas were identified in terms of meeting Land Health Standard #3 (Healthy Plant and Animal Communities).

Wheeler Gulch — No livestock grazing has been authorized on this steep, poor condition allotment since 1986 and no monitoring data have been collected since 1985. Utilization studies conducted in 1985 and 1986 indicated that slight to light utilization occurred on key forage plant species. Allotment inspections at the time indicated that the forage condition in the allotment was poor. Prior to 1986, 37 cows and 56 AUMs were allocated for the allotment. However, the 1984 GSRA RMP indicates that eight AUMs are an appropriate stocking level for this allotment due to suitability factors such as forage condition and terrain available for grazing. Earlier monitoring data plus the 1981 SVIM inventory indicate the

allotment is in early to mid-seral stage (poor to fair condition). A land health assessment conducted in 2004 (BLM 2005c) concluded this allotment met, or was moving towards achieving, Land Health Standards with no problem areas.

Cottonwood Gulch — Some sagebrush benches in the allotment contain some perennial grasses but undesirable plants such as cheatgrass and snakeweed are abundant. The allotment shows evidence of poor grazing management in the past, and problems have been noted with cattle trespassing from the adjoining private land. However, in recent years, the grazing management has improved and the vegetation condition appears to be improving as well. A 1995 riparian survey indicates the riparian areas in the allotment are in static to improving condition. A 2004 PFC assessment rated most riparian habitats as PFC. A 0.6 segment of Cottonwood Gulch was rated as FAR with an upward trend. The causal factor for the FAR rating was road encroachment (BLM 2005c). The allotment is grazed from May 11 to June 5, which provides an adequate re-growth period for upland and riparian vegetation. In the sagebrush and salt desert scrub communities, the understory is still dominated by annuals, but perennials are present in the interspaces and appear to be increasing. Utilization levels in 2001 vary from slight to moderate, which is meeting the utilization standard of 50 percent. Earlier available monitoring data indicate that range condition is moving toward good to excellent. A land health assessment conducted in 2004 (BLM 2005c) concluded this allotment met, or was moving towards achieving, Land Health Standards. However problem areas were identified in terms of meeting Land Health Standard #3 (Healthy Plant and Animal Communities).

Webster Park — Utilization data collected in 1996 and 2001 indicate that the 50-percent utilization standard for upland vegetation is being met with the exception of heavy utilization levels occurring near or at a gas well in 2001. A 1992 apparent trend study indicated a static trend at one key area. In addition, 1993 browse studies indicate slight to light utilization on sagebrush with the exception of heavy utilization at one site. The age classes ranged from young to mature to decadent with some recruitment. A 1995 riparian survey indicates an intermittent gulch is in declining condition.

A land health assessment was completed in the Goodrich Park area in 2001. Other available monitoring data indicate that cheatgrass is abundant in the western part of this allotment, and perennial grass cover is poor. Based on seral stages, range condition is good in the eastern part of the allotment (Goodrich Park) but poor to fair in the western part. The better condition in Goodrich Park may reflect the fact that this area is grazed only from March 1 to April 30, so no grazing occurs during the growing season. A land health assessment conducted in 2004 (BLM 2005c) concluded this allotment met, or was moving towards achieving, Land Health Standards. However problem areas were identified in terms of meeting Land Health Standard #3 (Healthy Plant and Animal Communities).

3.5.5 Oil and Gas

3.5.5.1 Oil and Gas Resource

The Planning Area lies within an area of the GSRA in central Garfield County with high natural gas and oil potential and is generally considered to be the southernmost extent of the Piceance Basin. The geology of the Planning Area is described in detail in Section 3.2.1. Within the region, natural gas is currently being produced from the Wasatch Formation and Mesaverde Group.

The Wasatch Formation is a thick sequence of variegated shales and sandstones that represents a mixture of fluvial, alluvial, and piedmont deposits. Depth to the Wasatch in the lower part of the Planning Area is about 3,500 feet. Although early development in Region 4 was from this formation, very little Wasatch development has occurred in the last 10 years.

The Mesaverde Group is divided into the Iles Formation (including Rollins, Corcoran, and Cozzette sandstone members) and the overlying, massively stacked, lenticular, non-marine Williams Fork Formation (including the Cameo Coal Zone). Early Mesaverde gas development within Region 4 was

primarily in the Cozzette and Corcoran sandstones. For the last 10 years or more, virtually all gas production has been from the Williams Fork Formation.

The Williams Fork Formation comprises 1,500 to 4,000 feet of tight sands, shales, and coals. The sands are point-bar deposits stacked into a composite of meander-belt reservoirs, each 20 to 60 feet thick and about 1,500 feet wide, with considerable internal discontinuity. Williams Fork wells vary in depth from around 5,000 feet to 10,000 feet, and the wells currently being drilled in the lower portion of the Planning Area are generally in the middle of that depth range. From the top of the Roan Plateau, depth to the Williams Fork includes another 2,000 to 3,000 feet of overlying sediments.

Over the last 15 years, production from this area has created evidence of substantial reserves in the Planning Area. Recently acquired lands above the rim have the same geologic zones as the immediately adjacent producing areas to the south and it is reasonable to expect that comparable reserves are to be found there. No oil and gas development of the Federal mineral estate has taken place above the rim; however, Barrett Resources drilled and developed seven gas wells on private land in the early 1990s. These were Wasatch wells and production from them has been minimal. No wells have been drilled since then on private property above the rim. Approximately 24 old well pads that DOE used for exploring the oil shale reserves and for hydrological investigations are located on the plateau. These old pads are often mistaken for oil and gas exploration pads.

Although most of the hydrocarbon development discussed in this RMPA/EIS consists of natural gas, some oil is also produced with the gas and would continue to be captured.

3.5.5.2 Drilling and Production

The rate of drilling and production in the region has increased rapidly in recent decades, from fewer than two wells per year from 1957 to 1988, to an average of about nine per year over the next 10 years, to the current rate of approximately 100 wells per year. As of May 2005, 958 had been drilled or were being drilled within the Planning Area. This includes 787 wells drilled and completed, 14 dry holes, 156 wells being drilled, 153 wells permitted but not started, and one well junked and abandoned. A total of 674 wells are producing within the Planning Area (608 Mesaverde, 64 Wasatch, and two other) as of the date of this Proposed Plan/Final EIS. Of the 958 wells, 219 (23 percent) were on the Federal mineral estate lands.

The recent increases in drilling have resulted in a rapid increase in gas production. Cumulative production from wells within the Planning Area between May 1, 1999, and May 1, 2005, increased from 126 BCF of gas and 195 thousand barrels of oil (MBO) to 390 BCF and 553 MBO. Monthly gas production during the same period increased from 1.53 BCF to 6.47 BCF, and monthly oil production increased from 2.68 MBO to 11.99 MBO. On Federal lands only, cumulative production during the same period increased from 26 BCF and 50 MBO to 89 BCF and 161 MBO, and monthly production increased from 270 million cubic feet (MMCF) and 782 MBO to 2,320 MMCF and 6,282 MBO. Based on cumulative production from Federal lands, the Mesaverde contributes about 88 percent of the total production.

This increase in production is due to aggressive development of the lenticular sands that comprise the Williams Fork Formation. A typical well bore may encounter 10 to 25 or more of these lenses. The development approach requires completing wells in multiple zones using sophisticated hydraulic fracturing fluids and procedures. Much of the Williams Fork development has occurred between I-70 and the Roan Cliffs in three gas fields, all of which extend into the southern portion of the Planning Area: Grand Valley, Rulison, and Parachute (Adkins 2003).

Of the existing 219 wells on Federal mineral estate lands, 30 were drilled by DOE in an area referred to in the Transfer Act as the "developed tract of NOSR 3." This drilling was initiated to protect Federal gas resources from drainage by offset operators. Six of the well pads were dual locations (two wells per pad).

DOE also entered into joint ownership/operation or "communitization" agreements with private developers for some 25 to 30 additional wells. The wells drilled by DOE and those in which the U.S. shared an interest are located in the southern portion of the Planning Area. When the developed tract of NOSR 3 was leased in 1999, the facilities on those properties were sold to the lessee.

The largest producer in the region is Williams Production, which is currently developing reserves on Federal and private lands in the southern portion of the Planning Area at an approved downhole spacing of 10 acres. Most of the leases currently being developed for oil and gas in the region are approved for 10-acre spacing. Little gas development has occurred in the WRRA portion of the Planning Area. EnCana Oil and Gas is actively developing the Williams Fork Formation in the White River dome area west of Meeker in Rio Blanco County, Colorado, and Exxon-Mobil is working in the Mesaverde Group of the Piceance Creek Unit. Relatively limited oil and gas development is occurring in the 12 to 18 miles between those activities and the Planning Area.

3.5.5.3 Recoverable Resources

The Planning Area includes 127,007 acres, of which 73,602 acres are Federal mineral estate (including split estate) and 53,405 acres are private mineral estate. Approximately 18,742 acres (25 percent) of the Federal mineral estate is currently leased. The estimated technically recoverable gas resource within the Planning Area is 15,416 BCF (15.4 trillion cubic feet [TCF]), with the Federal mineral estate contributing 8,933 BCF (58 percent) of this total. This represents ultimate gas recovery assuming all land within the Planning Area can be developed. The RFD (Appendix H) estimates actual producible resource at 6,733 BCF and 14,938 MBO within the Planning Area and 3,632 BCF and 8,066 MBO within the Federal mineral estate for the 20-year planning period.

To help put the natural gas resource in the 73,602 acres of Federal mineral estate in the Planning Area into perspective, consider the following: based on the estimated RFD production of 6,733 BCF of gas from the Federal mineral estate during the operational life of the field, an average Colorado household size of 2.5 persons (U.S. Census Bureau 2002), and an average annual consumption of natural gas per consumer in Colorado of 94,000 cubic feet (94 MCF)(DOE 2002), this resource is equivalent to the amount of natural gas needed to serve 3.6 million households for 20 years.

3.5.5.4 Leasing

BLM holds quarterly lease sales of the oil and gas resource in accordance with the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA). An oil and gas lease gives the lessee the right to extract the resource and to occupy as much of the leased surface as needed for extraction. The lessee may conduct any activities necessary to develop and produce natural gas from the lease area, including drilling wells, building roads, and constructing pipelines and related facilities. Although the initial lease term is 10 years, it may be extended indefinitely as long as the lessee demonstrates that the lease is capable of producing oil or gas in paying quantities. Extended leases are considered "held by production." Unleased parcels, or parcels for which the term has expired without development, may be requested by industry for inclusion in a new quarterly lease sale.

Since 1992, few new leases have been offered in Region 4 because most of the Federal mineral estate in that area is already leased. Of the 151,045 acres of BLM mineral estate in the region, almost 95 percent (143,068 acres) had been leased by 1998. With the passage that year of Public Law 105-85, transferring NOSRs 1 and 3 from DOE to BLM, the unleased mineral estate managed by BLM was increased by 55,354 acres. A 1999 lease sale required by Public Law 105-85 resulted in the lease of 8,379 acres of the newly acquired mineral estate. The remaining 46,975 acres has not yet been leased, and this RMPA/EIS will determine whether that area will remain closed or be made available to leasing—and under what stipulations, LNs, or other restrictions. Table 3-31 shows the acreages of leased and unleased Federal

mineral estate in the Planning Area. Most of the existing leases in the Planning Area are held by production and are likely to remain so until the recoverable resource has been extracted.

Table 3-31. Lease Status of Federal Mineral Estate in the Planning Area

Lands	*Total Area*	*Leased*	*Unleased*
Non-NOSR	18,248 ac	10,291 ac	7,957 ac
NOSR 1	36,362 ac	166 ac	36,196 ac
NOSR 3	18,992 ac	8,213 ac	10,779 ac
Total	**73,602 ac**	**18,670 ac**	**54,932 ac**

3.5.5.5 Coalbed Natural Gas

Overall, the Piceance Basin contains significant coal and gas resources in Cretaceous Mesaverde coal seams (CGS 1982). This assessment was based on coal mapping, desorption testing, the presence of gassy mines, and production from test holes that have been drilled. The CGS report estimated that the basin contains up to 77 TCF of gas in high volatile A to semi-anthracite coals. Past estimates place the subsurface coalbed natural gas resource at between 53 TCF (Ameri et al. 1981) and 136 TCF (Tyler et al. 1996).

Many factors affect coalbed natural gas production, and only a small percentage of the resource can be produced economically. The principal factors affecting production are water in the coal seams, the presence of natural fractures, the extent and continuity of the reservoir, economics, and drilling and completion technologies. The primary coal-bearing stratum (the Cameo Coal zone) is at a depth of several thousand feet in the area, making drilling costs a primary component of the economics. However, the evidence is that localized areas of high coalbed natural gas potential are present in the Piceance Basin. These areas may become economic with sufficiently high natural gas prices and/or the application of improvements in drilling and production technologies.

3.5.6 Other Minerals

3.5.6.1 Oil Shale

The Parachute Creek Member of the Green River Formation is the primary oil shale-bearing unit in the Planning Area. It includes a continuous oil shale section that averages 120 feet thick which contains an estimated 25 gallons of shale oil per ton (gpt) of oil shale rock. The upper part contains the thickest and richest oil shale beds and would be of the most economic interest. The 2- to 6-foot-thick Mahogany Bed is a persistent layer of very rich oil shale within the Mahogany Zone, which forms a sheer cliff or ledge of rich oil shale 80 to 100 feet thick in the upper part of the Parachute Creek Member. Some oil shale also occurs in the Garden Gulch Member. Oil shale resources within the Planning Area are several miles south of thicker deposits in Rio Blanco County that range up to 1,000 feet in thickness.

The United States holds over 50 percent of the world's oil shale resources, the equivalent of 2.6 trillion barrels of oil. The oil shale resources in Colorado, Utah, and Wyoming underlie a total area of 16,000 square miles and represent the largest known concentration of hydrocarbons in the world. The Green River Formation contains an estimated 1.5 trillion barrels of oil, 72 percent of which is on public lands administered by the BLM. In Colorado alone, the total resource approaches 1 trillion barrels of oil, and the Federal Government owns approximately 78 percent of the surface acreage and 82 percent of shale oil in place. In 2001, President George W. Bush established the National Energy Policy. In implementing the President's energy policy, BLM established the National Oil Shale Task Force to review, among other

things, access to oil shale resources on public lands. In May 2004, the Task Force issued a report titled *Oil Shale Report for the Implementation of the President's Energy Policy*.

Several energy companies (Unocal, Exxon, Mobil, etc.) investigated oil shale development in the Planning Area in the 1970s and 1980s. This included drilling programs to define the extent, thickness, and richness of the deposits, and demonstration processing (retorting) operations to assess economic feasibility. Under the technology used in the 1970s and 1980s, the cost of producing oil from shale rock was too high in comparison to producing an equivalent volume from petroleum-based crude oil. Consequently, no shale oil has been produced from the Planning Area on a sustained commercial scale.

Over the past few years, Shell has been conducting an experimental oil shale operation in Rio Blanco County, northwest of the Planning Area. This method uses electric heaters lowered into boreholes to raise the rock temperature to 500F to 600F, thereby releasing the shale oil *in situ* (BLM 2002a). Drill-hole spacing density would be about 10 to 40 feet, and the heaters are currently capable of producing oil at depths of up to 2,000 feet. The new process has the potential to produce shale oil economically even if the price of conventional crude oil falls below $30 per barrel. Recently, proposals were submitted by additional energy companies for use of BLM lands to conduct research and development for various *in-situ* recovery methods. None of the research tracts is within the Planning Area or the GSFO area.

3.5.6.2 Coal

Coal-bearing strata of potential economic interest occur primarily in Late Cretaceous rocks that overlie the Mancos Shale, particularly the Cameo Coal Zone of the Mesaverde Group. This zone has produced considerable coal, and supported a mine-mouth power plant farther west in Garfield County, near the downstream end of DeBeque Canyon. Within the Planning Area, the cumulative thickness of coal seams is approximately 50 to 70 feet, overlain by approximately 6,000 feet of overburden at the lowest elevations of the Planning Area along I-70. Given the depth of these deposits, coal recovery within the Planning Area is not economically viable with current technologies or at current prices.

Coalbed natural gas is discussed in Section 3.5.5.6.

3.5.6.3 Other Leasable Minerals

In October 2000, American Soda, LLP, began producing soda ash and sodium bicarbonate from a nacholite (sodium bicarbonate) deposit in Rio Blanco County north of the Planning Area in the Piceance Basin. The company built a solution mine, a 44-mile pipeline, a processing plant, and a railroad spur to produce and ship its sodium products. The plant is located along Parachute Creek and CR 215, north of the town of Parachute. The facility has a designed production capacity of 900,000 tons per year of soda ash and 140,000 tons per year of sodium bicarbonate (USGS 2000).

The potential for any occurrence of recoverable sodium minerals in the Planning Area is considered negligible because the rich sodium resources to the north (i.e., those exploited by American Soda) pinch out approximately 15 miles north of the Planning Area. Nacholite is currently being mined from the Parachute Creek Member of the Green River Formation. Recoverable nacholite is interbedded with oil shale, dawsonite, halite, and other sedimentary deposits between the L5 Zone and the top of the Garden Gulch Member.

3.5.6.4 Locatable Minerals

Metallic and non-metallic hardrock minerals or other minerals regulated under the 1872 Mining Act are not known to occur within the Planning Area.

3.5.6.5 Mineral Materials

Economic deposits of sand and gravel, rip-rap, flagstone, and other types of rock materials are present in the region and may exist on a limited scale within the Planning Area. However, no commercial developments currently occur or have been designated. Any future development of these resources, if they occur, would probably be limited to lower elevations of the Planning Area (i.e., below the rim) due to proximity to markets and accessibility to highway or railroad transport. A possible exception would be if small, localized sources are developed for use in road improvements and other uses within the Planning Area as a result of increased oil and gas development.

3.5.7 Areas of Critical Environmental Concern (ACECs)

3.5.7.1 Introduction

FLPMA directs BLM, as part of the land use planning process, to "give priority to the designation and protection of areas of critical environmental concern" (Sec. 202[c][3]). FLPMA defines areas of critical environmental concern (ACECs) as "areas within public lands where special management attention is required … to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life or safety from natural hazards" (Sec. 103 [a]). Designation as an ACEC recognizes an area as possessing relevant and important values that would be at risk without special management attention. BLM Manual 1613 outlines the procedures for nominating, evaluating, and determining if special management attention is required for potential ACECs.

The ACECs identified in the 1984 GSRA RMP contain typical values for protection under ACEC designation. These include the Blue Hill Archaeological District (4,718 acres); the Glenwood Springs Debris Flow Hazard Zone (6,675 acres); the Bull Gulch (6,714) and Deep Creek (2,470) scenic areas; and the Lower Colorado River Cooperative Management Area, protecting riverine and fisheries values from New Castle to DeBeque.

BLM's process for nominating and evaluating potential ACECs involves compiling a list of areas nominated for designation and then evaluating each nominated area in terms of the ACEC relevance and importance criteria. Nominations may come from BLM staff, other governmental agencies, or members of the public. For the Roan Plateau planning process, BLM staff compiled a list of potential ACECs by reviewing resource inventories for the area, records of the CNHP, CDOW species of concern, and nominations from the Colorado Wilderness Network. The complete evaluation of these areas is provided in the *Roan Plateau RMP Amendment Evaluation of Proposed Areas of Critical Environmental Concern* (BLM 2002d).

Potential ACECs are evaluated in the context of the ACEC relevance and importance criteria. The relevance criteria arise directly from FLPMA. An area meets the relevance criteria if it contains one or more of the following:

- significant historical, cultural, or scenic value
- fish and wildlife resource
- natural process or system
- natural hazards

The value, resource, system, process, or hazard described above must have substantial significance and value in order to satisfy the importance criteria, generally by one or more of the following:

- has more than locally significant qualities, especially when compared to any similar resource

- has qualities that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change
- has been recognized as warranting protection in order to satisfy national priority concerns or to carry our the mandates of FLPMA
- has qualities that warrant highlighting in order to satisfy public or management concerns about safety and public welfare
- poses a significant threat to human life and safety or to property.

Following evaluation of the relevance and importance of the values found in potential ACECs, a determination is made as to whether special management is required to protect those values and, if so, to specify just what management prescriptions would provide that special management.

Ten areas were on the original list of potential Roan Plateau ACECs: Anvil Points, Magpie Gulch, East Fork Parachute Creek, Trapper/Northwater Creek, the Rifle Hogback, Ben Good Creek, Anvil Points Expansion, Parachute Creek, Schoolhouse Point, and Thirty-Two Mile Gulch. Only the first four areas met the relevance and importance criteria and were included in this RMPA/EIS process. The following subsections summarize the evaluation of these four areas. A complete evaluation of all ten areas is included in the *Roan Plateau RMP Amendment Evaluation of Areas of Critical Environmental Concern* (BLM 2002d).

3.5.7.2 Anvil Points ACEC

The proposed Anvil Points ACEC includes 10,226 acres and is located along the southeastern portion of the Roan Plateau north of Rulison (Map 1). The dominant feature in this proposed ACEC is the barren white cliff face along the southern rim of the Roan Plateau. The proposed ACEC also encompasses narrow grasslands and mesic aspen forests above the cliffs and a series of ridges and ravines at the base of the cliffs. The elevation of the proposed ACEC ranges from 5,277 to 9,286 feet. Included within the eastern portion is an area of 5,192 acres classified as having wilderness character. The proposed designation of this area as an ACEC is based on its visual, geologic, wildlife, and botanical values.

Scenic Values

Named for the prominent Anvil Points geological features that dominate the southern cliffs of the Roan Plateau, the area includes steep, dramatic shale cliffs that give way to deep gulches, rugged ridges, and plateaus. The stark contrast of the vertical, barren shale cliffs with the vegetated slopes below gives this feature exceptional scenic quality. This dominant southeast-facing slope of the Roan Plateau is a regionally significant landscape feature and is the scenic backdrop north of the I-70 corridor between the towns of Rifle and Parachute. Its regional significance and vulnerability to adverse change make this feature deserving of special management.

Geologic Values

The southwestern portion of the proposed ACEC contains a regionally significant claystone cave that is reported to be one of the longest known caves of this type in the region. Moreover, an arch formed out of mudstone and sandstone in the Wasatch formation is highly unusual. The composition of the cave and the arch makes them extremely fragile and vulnerable to adverse change. The regional significance and vulnerability to change make these features deserving of the kind of protection an ACEC provides.

Wildlife Values

The Roan Cliffs contain important nesting habitat for peregrine falcons and golden eagles, both of which are protected under the Federal MBTA. In addition, the golden eagle is protected under the Federal Bald and Golden Eagle Protection Act. An active peregrine eyrie and potential nesting habitat are located within the area. Several golden eagle nests are located on the cliffs that are within and adjacent to the

ACEC boundary. The BLM considers this to be an important raptor nesting area and the cliffs are identified as a wildlife security area in the 1999 FSEIS. In addition, the CNHP identified it as a Conservation Area for its plant and raptor habitat values. Townsend's big-eared bat, a BLM sensitive species, is known to occupy the claystone cave (Section 3.3.4).

The area below the rim is important due to the diversity of vegetation types, including oakbrush and mixed mountain shrub, pinyon/juniper, sagebrush benches, and riparian. These various habitat types provide essential food, cover, water, and seclusion for many wildlife species, promoting the area's high biological richness and diversity. Most importantly, the unroaded nature of the area provides security among various habitat types that is important to many wildlife species. This area provides transitional and winter range for big game and is one of the few areas where migration routes exist from the top of the Roan Cliffs to the lower slopes.

The entire area faces south, which is critical to mule deer during severe winters, as these areas are free from snow. The proximity of these open, southern slopes to higher density pinyon/juniper woodland habitats is also critical as a cover component. This mosaic of habitat types and their proximity to each other also provides important nesting areas for a variety of bird species and critical birthing habitats for many other wildlife species.

This area meets the relevance criterion for wildlife resources because it contains crucial habitat for the peregrine falcon, golden eagle, and Townsend's big-eared bat. In addition, the lands below the rim contain some unroaded, unfragmented habitats, which are limited within the Planning Area. The unroaded nature of these lands provides solitude for a variety of wildlife species. This area meets the importance criterion since the wildlife values have more than locally significant qualities. The high-quality nesting habitat provided by the Roan Cliffs is regionally distinct and important for these protected bird species. In addition, the unroaded lands within the proposed ACEC are increasingly rare within the region and highly vulnerable to adverse change.

Botanical/Ecological Values

The combination of the large elevation range and the diverse geologic substrates has led to a wide variety of ecological zones and unique niches within the Anvil Points area. The CNHP has given it a biodiversity rank of B2 for "having very high significance." This proposed ACEC supports the following species and plant communities and provides habitat protection to sustain ecosystem processes on which they depend.

Plant Species

- Parachute penstemon (*Penstemon debilis*)
- DeBeque phacelia (*Phacelia scopulina* var *submutica*)
- Southwest stickleaf (*Mentzelia argillosa*)
- DeBeque milkvetch (*Astragalus debequaeus*)
- Utah fescue (*Argillochloa dasyclada*)

Plant Communities

- Great Basin grassland (beardless bluebunch wheatgrass community)
- Great Basin montane grassland (beardless bluebunch wheatgrass/Sandberg bluegrass community)
- Aspen/Rocky Mountain maple forest
- Sagebrush bottomland shrubland (mountain big sagebrush/Great Basin wildrye)

This area meets the relevance criterion for botanical resources and natural processes because it contains two Federal candidate plant species, two BLM sensitive plant species, and four significant plant

communities. This area meets the importance criterion because it contains four plant species that are globally or regionally rare and four plant communities that are rare or uncommon in the U.S. or Colorado. All of these species are vulnerable to adverse change. The Planning Area supports a significant percentage of the world's population of Parachute penstemon and southwest stickleaf.

3.5.7.3 Magpie Gulch ACEC

The proposed ACEC is situated on the east- and northeast-facing slopes below the Roan Plateau (Map 1). Elevations drop from 9,200 feet at the cliff edge to 6,500 feet in the canyons below. The boundaries of the 5,846-acre unit are virtually the same as those in the area having wilderness character along the Northeast Cliffs portion of the Planning Area: the western boundary follows the eastern cliff edge of the Roan Plateau, and to the north and east is defined by private property and an electric transmission (powerline) ROW. The southern boundary is delineated by the JQS Road and private property. One 40-acre private in-holding is located in the northern portion of the proposed ACEC. Vegetation on north-facing slopes is dominated by mature to old-growth Douglas-fir; south-facing slopes consist of mixed mountain shrub communities at the higher elevations and pinyon/juniper at lower elevations. Benches and terraces along the lower slopes support sagebrush communities.

Scenic Values

Magpie Gulch includes steep, dramatic shale cliffs which give way to deep gulches and rugged ridges at lower elevations on the eastern-most edge of the Roan Plateau. The stark contrast of the vertical barren white cliffs to the heavily vegetated slopes accentuates this unit's rugged character and exceptional scenic qualities. This unique landscape is regionally significant as it provides a scenic backdrop to the communities of Rifle, Silt, and New Castle, and to travelers along I-70 and SH 13. This area warrants special management attention because the eastern-most portion of the Roan Cliffs is not only locally important but also represents a significant visual feature on a regional scale. The qualities and character of this scenic viewshed make it sensitive or vulnerable to adverse change.

Wildlife Values

Magpie Gulch has a wide diversity of vegetation types including stringers of Douglas-fir, aspen, oakbrush, mixed mountain shrub, pinyon/juniper, sagebrush benches, and limited riparian. These various habitat types provide essential food, cover, water, and seclusion for many wildlife species. For this reason, it is one of the few areas where migration routes exist from the top of the Roan Cliffs to the lower slopes. The southern aspects, supporting shrub and pinyon/juniper communities, are critical to mule deer during severe winters as they provide areas free from snow in which mule deer can forage. The proximity of these open, southern slopes to higher density brush and tree habitats is also critical as a cover component. This mosaic of habitat types and their proximity to each other also provide important nesting areas for a variety of bird species including wild turkey, blue grouse, and numerous migratory species, as well as critical production habitats for many other wildlife species.

Because of the diversity in vegetation and elevation, Magpie Gulch is important in maintaining a rich and diverse mix of wildlife habitats. Its unroaded nature provides seclusion among an array of habitat types important to a diverse grouping of species and is irreplaceable and exemplary in nature. This area is vulnerable to adverse changes, including habitat fragmentation and a resultant loss of species diversity.

Botanical/Ecological Values

This proposed ACEC supports several excellent examples of small, unfragmented old-growth Douglas-fir communities, which in turn support small populations of three-toed woodpeckers. The old-growth Douglas-fir communities occur as numerous stringers and large patches (Maps 21 and 22), which together encompass approximately 1,600 acres along the north-facing slopes of the unit. CNHP has ranked it as a B-3 "highly significant" area for its biological diversity. Historic wildfires have helped create a healthy mosaic of dense and open areas important to the diverse wildlife of this area. Three-toed woodpeckers

now thrive in small areas of the conifer forest inflicted with beetle infestations (Crockett and Hansley 1978).

The proposed Magpie Gulch ACEC meets the relevance criterion for natural processes as it contains several small but excellent examples of intact old-growth Douglas-fir communities. The area meets the importance criterion because this resource represents a remnant community type within the region; thus it is an important site for protecting an example of this community type.

3.5.7.4 East Fork Parachute Creek ACEC

This proposed ACEC includes 9,776 acres in the headwaters of East Fork Parachute Creek, a small but biologically significant tributary to the Colorado River drainage. The headwaters for this creek begin at approximately 9,000 feet in elevation with gently rolling hills covered with aspen forests, sagebrush and snowberry shrublands, and native grasslands. East Fork Parachute Creek originates near the eastern rim of the Roan Plateau and flows westward, cutting through the Green River shale to form a deep canyon before plunging 200 feet into a narrow, scenic box canyon. The resource values within the proposed ACEC include this scenic waterfall and box canyon, Colorado River cutthroat trout habitat, a BLM sensitive plant species, a Green River shale endemic plant species, and three significant plant communities (Maps 21 and 22). Most of the proposed ACEC boundary is coterminous with the boundary of the area having wilderness character in the East Fork Parachute Creek basin.

Scenic Values

The scenic area within the proposed East Fork Parachute Creek ACEC starts about midway down East Fork Parachute Creek where a 200-foot waterfall drops into a dramatic box canyon running to the west. The viewshed consists of steep canyon walls with vertical relief of over 2,000 feet from the top of the canyon to the lowest reaches of the creek. Dramatic visual contrast is created by the narrow, incised canyon and the changes in form, line, and color. The diversity and stark contrasts resulting from the steep, barren cliffs falling off to spruce fir forests create a national park-quality scenic attraction. While this scenic portion of the study area is not one-of-a-kind, the region includes few other canyons of this scale and with similar setting. East Fork Canyon was determined to be one of five high-quality (Class A) scenic areas in the 1984 GSRA RMP.

East Fork Parachute Creek meets the ACEC relevance criterion because it contains significant scenic values. It meets the ACEC importance criterion because the scenic values are irreplaceable and deserving of special management.

Fish and Wildlife Values

This area contains year-round habitat for Colorado River cutthroat trout (Section 3.3.4). This subspecies is the only native trout in the Colorado River Basin and is designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, the Colorado River cutthroat trout is classified as a sensitive species by Regions 2 and 4 of the USFS, and by the BLM in Colorado and Utah. Colorado River cutthroat trout were petitioned for Federal listing as threatened or endangered under ESA on December 9, 1999.

East Fork Parachute Creek and JQS Gulch are two of five conservation populations located within the Planning Area (along with Trapper, Northwater, and East Middle Fork Parachute Creeks). A conservation population is defined as a reproducing and recruiting population of native cutthroat trout that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific population and within geographic units (CRCT Task Force 2001).

This area meets the relevance criterion for wildlife resources as it contains a genetically pure population of native, wild, naturally reproducing Colorado River cutthroat trout that has been identified as a conservation population. The area satisfies the importance criterion since these streams are regionally

and nationally important producers of native, genetically pure, and naturally reproducing Colorado River cutthroat trout.

Botanical/Ecological Values

This proposed ACEC supports the following rare plants and significant plant communities and provides the habitat that sustains the ecosystem processes upon which these plants depend:

Plants

- Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*)
- Utah fescue (*Argillochloa dasyclada*)
- Southwest stickleaf (*Nuttallia argillosa* or *Mentzelia argillosa*)

Plant Communities

- Montane riparian forest (Colorado blue spruce/red osier dogwood)
- Boxelder riparian forest (boxelder, narrowleaf cottonwood, and red osier dogwood)
- Western slope grassland (Indian ricegrass shale barrens)

A unique wetland feature found along East Fork Parachute Creek and its tributaries is the "hanging gardens." Hanging gardens occur along seeps limited to the walls of waterfalls or cliffs. These seeps are most abundant on north-facing slopes along East Fork Parachute and Northwater Creeks where the Green River shale beds are exposed within the canyon walls. The hydrologic flows, combined with the Green River shale substrate, create the unique environment which supports the hanging garden sullivantia, a Colorado endemic plant. The plant is narrowly restricted to calcareous seeps and is found in abundance in these hanging gardens. Although it occurs in several locations other than the Roan Plateau, it occurs more often and more extensively in the Roan Plateau than anywhere else (CNHP 1997a). Combined with occurrences in the proposed Trapper/Northwater Creek ACEC, this represents nearly 62 percent of the total known occurrences.

Utah fescue is a perennial grass and an oil shale endemic species found within this proposed ACEC. It is restricted to barren scree slopes or sparsely vegetated Douglas-fir communities in soils derived from oil shales, especially the Green River Formation or Uinta Formation sandstone. It often occurs with other oil shale endemics.

Southwest stickleaf, a BLM sensitive species, is an oil shale endemic that frequently occurs with other such species. Populations of Southwest stickleaf occur on steep talus slopes below the falls on East Fork Parachute Creek.

As East Fork Parachute Creek begins to cut through the Green River shale approximately a mile above the waterfall, the canyon narrows and the riparian vegetation changes from willow-dominated communities to spruce/fir and narrowleaf cottonwoods. The montane riparian forest or Colorado blue spruce/red osier dogwood plant community is found in only a handful of riparian areas in Colorado. Below the waterfall, the riparian vegetation changes to a more low-elevation type of boxelder riparian forest or boxelder, narrowleaf cottonwood, and red osier dogwood community, which is considered rare on a global and State-wide scale.

The western slope grassland or Indian ricegrass shale barrens community occurs on south-facing slopes composed of shale or mudstone soils, often capped with a thin layer of gravel. This grassland community is sparsely vegetated, with often less than 25 percent vegetation cover. Indian ricegrass is the dominant species, with smaller amounts of other grasses, scattered shrubs, and forbs, including several special status plant species. This plant community is extremely limited in distribution. It occurs only in three counties in western Colorado. It is restricted to south-facing slopes with soils derived from shales or

mudstones. Within the Planning Area, this community is found on south-facing slopes of East Fork Parachute Creek, Northwater Creek, Trapper Creek, and Ben Good Creek.

Maps 21 and 22 illustrate the occupied habitat for rare plants and plant communities within the East Fork Parachute Creek watershed.

The proposed East Fork Parachute Creek ACEC meets the relevance criterion for natural processes as it contains a diversity of rare or uncommon riparian plant communities and BLM sensitive plant species. The area also meets the importance criterion since the rare plants and plant communities found in this drainage are of excellent condition and abundance and are vulnerable to adverse change.

3.5.7.5 Trapper/Northwater Creek ACEC

The proposed Trapper/Northwater Creek ACEC comprises 10,296 acres. In this area, Trapper Creek, Northwater Creek, and East Middle Fork Parachute Creek flow roughly parallel to East Fork Parachute Creek. Northwater Creek and Trapper Creek are smaller tributaries with their headwaters at the eastern edge of the Roan Plateau and flow 4 to 5 miles across the plateau before merging to form East Middle Fork Parachute Creek (Figure 1-2). The upper reaches of both Trapper and Northwater Creek have more gentle side slopes than East Fork Parachute Creek, although all three cut the Green River Shale. The canyon walls become steeper and more abrupt just above their confluence. East Middle Fork Parachute Creek continues to cut deeper into the Green River shale before plunging over a waterfall approximately one mile west of the public land boundary. The riparian vegetation in these three drainages is not as diverse as that in the East Fork, although East Middle Fork Parachute Creek and the lower segment of Northwater Creek do support hanging gardens.

Fish and Wildlife Values

Like East Fork Parachute Creek, this area contains year-round habitat for Colorado River cutthroat trout, the only native trout of the Colorado River Basin and designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, the Colorado River cutthroat trout is classified as a sensitive species by Regions 2 and 4 of the USFS, and by BLM in Colorado and Utah. A petition was filed for listing Colorado River cutthroat trout under ESA on December 9, 1999.

Trapper, Northwater, and East Middle Fork Parachute Creeks are three of five conservation populations located within the Planning Area (along with East Fork Parachute Creek and JQS Gulch). Those in Northwater and Trapper Creeks are classified as core conservation populations. A core conservation population is based on a genetic purity of 99 percent or higher. These populations are "managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units (CRCT Task Force 2001).

This area meets the relevance criterion for wildlife resources as it contains a genetically pure population of native, wild, naturally reproducing Colorado River cutthroat trout that have been identified as a core conservation population. The area satisfies the importance criterion since these streams are regionally and nationally important producers of native, genetically pure, and naturally reproducing Colorado River cutthroat trout.

Botanical/Ecological Values

This proposed ACEC supports the following rare plants and significant plant communities and provides the habitat that sustains the ecosystem processes upon which these plants depend:

Plants

- Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*)
- Utah fescue (*Argillochloa dasyclada*)

Plant Communities

- Sagebrush bottomland shrubland (western slope sagebrush shrubland community)
- Western slope grassland (Indian ricegrass shale barrens)

East Middle Fork Parachute Creek and the lower portion of Northwater Creek contain a unique hanging gardens wetland feature. Hanging gardens occur along seeps limited to the walls of waterfalls or cliffs. Seeps are most abundant on north-facing slopes where the Green River Shale beds are exposed within the canyon walls. The hydrologic flows, combined with the Green River Shale substrate, create the unique environment which supports the hanging garden sullivantia, a Colorado endemic plant that is narrowly restricted to calcareous seeps and is found in abundance in these hanging gardens. Although it occurs in several locations other than the Roan Plateau, it occurs more frequently and extensively in the Planning Area than anywhere else (CNHP 1997a), comprising nearly 62 percent of the total known occurrences when combined with those in the proposed East Fork Parachute Creek ACEC.

Utah fescue is a perennial grass and an oil shale endemic species found within this proposed ACEC. It is restricted to barren scree slopes or sparsely vegetated Douglas-fir communities in soils derived from oil shales, especially the Green River Formation or Uinta Formation sandstone. It often occurs with other oil shale endemics.

The sagebrush bottomland shrubland or Western slope sagebrush shrubland community has only been described as occurring on the western slope of Colorado (Johnston 1987), although there is no apparent reason why this type could not be found in Utah and Wyoming as well. On the Roan Plateau, this plant association was located on private land along a Northwater Creek tributary. Thurber fescue, a component of this community, is uncommon on the Roan Cliffs. It is possible that Thurber fescue was once a more common grass on the plateau and that a century of grazing has favored sagebrush and smaller grasses over Thurber fescue.

The Western slope grassland or Indian ricegrass shale barrens community occurs only on south-facing slopes composed of shale or mudstone soils, often capped with a thin layer of gravel. This grassland community is sparsely vegetated, with often less than 25 percent vegetation cover. Indian ricegrass is the dominant species, with smaller amounts of other grasses, scattered shrubs, and forbs, including several special status plant species. This community is extremely limited in distribution, occurring in only three Counties in western Colorado. Within the Planning Area, it is restricted to south-facing slopes of East Fork Parachute, Northwater, Trapper, and Ben Good Creeks.

The Trapper/Northwater Creek ACEC meets the relevance criterion for natural processes or systems because it contains the Colorado endemic hanging garden sullivantia, rare Utah fescue, and two uncommon plant communities: the sagebrush bottomland shrubland association and the rare Western slope grassland community. The area also meets the importance criterion since the Roan Plateau hanging gardens comprise nearly 62 percent of the total known occurrences and are therefore of special consequence and vulnerable to adverse change. The sagebrush/fescue site is also important because it is the only site documented within the Planning Area.

3.5.8 Areas Having Wilderness Character

3.5.8.1 Plan Conformance

The Planning Area includes the NOSR lands, which were not under BLM jurisdiction when FLPMA was enacted and not part of the original wilderness inventory of public lands performed pursuant to Sections 201 and 603 of FLPMA. Instead, as newly acquired lands, they fell under the general inventory and planning authority of Section 201 and 202. These lands were inventoried for wilderness character using

procedures identified in the BLM Wilderness Inventory Handbook, September 27, 1978 and Colorado Wilderness Review Procedures, June 18, 1997.

This process entailed identification of wilderness inventory units, an inventory of roads and wilderness character, and a determination of whether the units possess wilderness characteristics as defined by the Wilderness Act of 1964 (BLM Handbook H-6310-1)(BLM2001e). Units found to possess such characteristics are evaluated during the land-use planning process to address future management. The inventory consisted of a review of roads, wilderness characteristics, and supplemental values in each unit. The following factors were documented:

1. Size – Generally, roadless units must be larger than 5,000 acres.
2. Naturalness – An area is judged to be natural if it "… generally appears to have been affected primarily by the forces of nature, with the imprint of [human activity] substantially unnoticeable." Naturalness is a required component for designation.
3. Solitude or Primitive and Unconfined Recreation – An area must have outstanding opportunities for solitude or primitive and unconfined recreation. At least one of these qualities is required for designation.
4. Supplemental Values – The inventory notes whether the units contain "ecological, geological, or other features of scientific, educational, scenic, or historical value." This is not necessarily required for designation.

3.5.8.2 Roan Plateau Wilderness Inventory

Portions of the transferred lands were inventoried in 1998 and found not to have wilderness character, as documented in the 1999 FSEIS. The remaining transferred lands were inventoried by BLM in 1999 and 2000, including four inventory units: East Fork Parachute Creek, Trapper Creek, Northeast Cliffs, and Southeast Cliffs (Table 3-32). The following subsections describe the wilderness qualities of each of the four inventory units.

Table 3-32. Results of Wilderness Character and Roadless Inventory (acres)

Unit	*Area Inventoried*	*Roadless Area*	*Wilderness Character*	*No Wilderness Character*
East Fork Parachute Creek	14,342	12,403	8,330	4,073
Trapper Creek	11,373	9,073	0	9,073
Northeast Cliffs	5,847	5,845	5,799	46
Southeast Cliffs	5,338	5,336	5,193	145
Total	**36,900**	**32,657**	**19,322**	**13,337**

East Fork Parachute Creek Inventory Unit

This area contains 14,342 acres of Federal land, of which 12,403 acres are roadless. Within the roadless area, 8,330 acres were found to have wilderness character. This includes approximately 7.5 miles of the East Fork Parachute Creek stream corridor and 22.5 miles along eleven small tributaries. Much of the East Fork drainage appears to have been affected primarily by the forces of nature, with little evidence of human activity such as roads and livestock developments.

The main stream has created a deep and scenic canyon. Steep topography and dense vegetation in the middle and lower portions of the drainage provide outstanding opportunities for solitude and for primitive and unconfined recreation such as hiking, horseback riding, photography, wildlife viewing, wildflower study, camping, and sightseeing. The area is also used for hunting and fishing. Eleven separate areas

representing 4,073 acres have noticeable imprints of human activity that detract from naturalness and therefore lack wilderness character. These imprints include roads, ways, fences, stockponds, and spring developments. Although perhaps unnoticeable on their own, the combined effects can be significant.

Several supplemental values were identified in the unit. The unit possesses high scenic values, including a 200-foot waterfall and dramatic box canyon extending to the west. The viewshed consists of steep canyon walls with vertical relief of more than 2,000 feet. Dramatic visual contrast is created by the deep, narrow canyon and changes in form, line, and color. The diversity and stark contrast of the barren cliffs abruptly changing to coniferous forest creates a scenic quality comparable to a national park. The GSRA RMP (1984, revised 1988) listed East Fork Parachute Creek Canyon as one of five high-quality (Class A) scenic areas in the resource area.

In 1996, portions of this unit were classified as a "Very Significant" conservation site by CNHP. This biologically diverse site hosts 21 elements tracked by the CNHP, including nine significant natural plant communities, four rare plant species, one rare butterfly species, one BLM sensitive fish species (the Colorado River cutthroat trout), five rare bird species, and one rare mammal species. The unit also contains cliff seeps that support one of the highest concentrations of populations of hanging garden sullivantia. Other supplemental values include fossil resources in the Green River Formation, cultural resources such as hunting grounds for Native Americans, and ranch structures from the late 1800s.

Trapper Creek Inventory Unit

The Trapper Creek unit includes 11,373 acres of Federal lands, of which 9,073 acres met the definition of roadless. However, areas meeting the definition of "natural" were relatively small and isolated, consisting of 2,700 acres in the western part of Trapper and Northwater Creeks and 1,300 acres in the eastern headwaters of Trapper Creek. These two natural areas are separated by a 2-mile section of Trapper Creek that contains numerous livestock developments, travel routes, fences, and other man-made features that dominate the landscape.

The two natural areas provide outstanding opportunities for solitude, but the remainder of the unit lacks this characteristic due to the collective impacts from numerous human-related developments.

Outstanding opportunities for primitive and unconfined recreation occur throughout much of the unit, especially within the drainages in the western portions of Trapper and Northwater Creeks. As in the East Fork unit, undeveloped recreation could include hiking, horseback riding, photography, wildlife viewing, wildflower study, camping, and sightseeing. The area is also used for hunting and fishing.

Several supplemental values exist in this area, including ten elements deemed "significant" by the CNHP. These include several wetland communities, two species of rare plants, two populations of Colorado River cutthroat trout, and three bird species of concern. Other noted supplemental values included scenic values in the western portions of Trapper and Northwater Creeks, fossil resources, and historic and prehistoric cultural resources.

Areas that were predominantly natural in character were significantly less than 5,000 acres. Therefore, the Trapper Creek Unit did not meet the mandatory wilderness characteristics to warrant further evaluation of wilderness character.

Northeast Cliffs Inventory Unit

This unit contains 5,847 acres of Federal land, of which all but 2 acres related to a road was found to meet roadless criteria. More than 99 percent of the unit (5,799 acres) was found to have wilderness character; the remaining 46 acres was located between an old ditch and its parallel access road in Magpie Gulch.

The Northeast Cliffs unit is long and narrow, about 7 miles by 2 miles. Rugged terrain offers outstanding opportunities for solitude and primitive and unconfined recreation, although access is limited by adjoining private land on the east and steep bluffs on the west. Only the hardiest hikers and hunters are able to enjoy the seclusion offered by the topographic screening and dense vegetation.

An important supplemental value identified in this unit is its scenic quality. Steep, dramatic shale cliffs give way to deep gulches and rugged ridges at lower elevations on the eastern edge of the Roan Plateau. The stark contrast between the vertical white cliffs and the heavily vegetated slopes below accentuates this unit's rugged character. This landscape is regionally significant because it provides a scenic backdrop to the communities of Rifle, Silt, and New Castle and to travelers along I-70 and SH 13.

Other supplemental values found include excellent examples of old-growth Douglas-fir communities, habitat for the uncommon American three-toed woodpecker, and a security area for deer and elk during the hunting season.

Southeast Cliffs Inventory Unit

This unit offers visitors outstanding opportunities for solitude and primitive and unconfined recreation despite its narrow configuration, about 6 miles long and not quite 3 miles at its widest part. The total area within the inventory boundary was 5,338 acres, of which all but 2 acres were found to be roadless. The total area found to have wilderness character was 5,193 acres (97 percent).

Because of the unit's steep and rugged terrain, the area is undeveloped and has few human-related impacts. The few human imprints found were insignificant and do not detract from the area's overall naturalness. The diverse topography of the Southeast Cliffs includes sheer, barren 2,500-foot-high cliffs, separating gently rolling terrain on top of the plateau from the ruggedly dissected ridges below. The varied terrain provides natural screening for those hardy enough to access it.

Access is limited due to private land bounding the unit on the south and southwest, while difficult terrain restricts most visitor use in the western part below the rim. However, once in the area, visitors have excellent opportunities to disperse and enjoy undeveloped types of recreation such as hiking, photography, wildlife viewing, wildflower study, and sightseeing. Horseback riding is possible in some parts as well. The area is currently used for hunting.

An important supplemental value in this unit is its scenic quality. The Southeast Cliffs contain Anvil Points, a prominent rock feature that dominates the cliffs on the southern edge of the Roan Plateau and is a natural landmark along the I-70 corridor. The scenic quality of the cliffs from below is equaled or surpassed by the scenic quality of the cliffs and Colorado River valley from the upper part of the unit.

Other supplemental values include 14 elements along the Anvil Points rim that are tracked by the CNHP. One element, the Parachute penstemon, has been found in only one other location in the world. The unit also includes the Yellow Slide, which some claim to be a meteor impact site. Several oil shale endemic plants, two butterfly species, nest sites for the peregrine falcon, nesting habitat for the Columbia sharp-tailed grouse, deer and elk security areas, aesthetic and scenic qualities, and geological and paleontological values are found there.

3.5.9 Wild and Scenic Rivers

3.5.9.1 Introduction

The WSRA of 1968 established a National Wild and Scenic Rivers System (NWSRS) for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. The act designated 17 river segments for immediate inclusion in the system and prescribed the methods and standards by which other rivers may be added to the system.

As part of the planning process, a BLM interdisciplinary team completed a WSR study under Section 5(d)(1) of the WSRA. BLM's policy is to adhere to the requirements of the WSRA by identifying and evaluating "all rivers on BLM-administered lands to determine if they are appropriate for addition to the NWSRS" (BLM Manual 8351). With the addition of the NOSR lands to BLM's management base, it became necessary to initiate a process that would first evaluate streams and rivers in the recently acquired

lands for their *eligibility* as potential additions to the NWSRS and then to determine the *suitability* of eligible streams—i.e., suitability being a higher standard than eligibility. Inclusion in the NWSRS requires action by Congress.

The examination to determine eligibility was completed by BLM in September 2002 (*Roan Plateau Eligibility Report for the National Wild and Scenic Rivers System*)(BLM 2002e). A suitability study will be conducted sometime after completion of this RMPA/EIS and will undergo a separate NEPA analysis. For this RMPA/EIS, all streams deemed eligible for inclusion in the NWSRS are considered as suitable under some alternatives but not suitable under others to allow analysis of the full spectrum of impact outcomes.

3.5.9.2 Eligibility Process

The WSR eligibility report was prepared by an interdisciplinary BLM team that reviewed all BLM-administered public lands along rivers and streams within the Planning Area. BLM guidance calls for evaluation of stream segments that meet the criteria of "free-flowing" and having "outstandingly remarkable values" (ORVs). The WSRA defines a river as any "flowing body of water or estuary, or a section, portion or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes." The Roan Plateau eligibility team determined that 31 perennial streams totaling 64 miles of stream length within the Planning Area warranted evaluation. Map 16 shows those streams; Table 3-33 lists the stream segments and summarizes the team's findings.

As shown by Table 3-33, a total of 24 miles of stream length were found to be eligible for WSR designation. Of the 31 perennial streams evaluated, 24 were found to be free flowing—i.e., "existing or flowing without impoundment, diversion, straightening, armoring with riprap, or other modification of the waterway."

The second eligibility criterion involves the assessment of ORVs, which are river-related values that are unique, rare, or exemplary features and that are significant on a regional or national scale. The WSRA calls for evaluation of the scenic, recreation, geology, fish, wildlife, cultural, and historic values, and other similar values, when determining if the segment possesses ORVs. In the case of the Planning Area, botanical/ecological and hydrologic values were also assessed. Only one such value need exist to warrant a determination of eligibility. ORVs in the Planning Area were compared with those in the Utah High Plateau and the Southern Rocky Mountain ecoregions to evaluate regional significance.

The boundaries of any river proposed for addition to the NWSRS are usually limited to that area within 0.25 mile of the ordinary high water mark on each side of the river. Within the Planning Area, analysis was limited to this width on all river segments, except on the western portions of East Fork Parachute Creek, where the boundary was increased to encompass areas of outstanding scenic value. Once a river segment has been determined to be eligible, BLM's policy is to protect and, where possible, enhance any identified ORV pending a subsequent suitability determination and/or designation by Congress (BLM Manual 8351). In the interim, management and authorized uses are not allowed to affect either the eligibility or tentative classification of the segment.

3.5.9.3 Eligibility Findings

Of the original list of 31 streams evaluated, eight were found to have ORVs: Trapper Creek, Northwater Creek, East Middle Fork Parachute Creek, East Fork Parachute Creek, First Anvil Creek, Second Anvil Creek, Golden Castle Gulch, and JQS Gulch (Table 3-33). ORVs fell into three categories: scenic, fisheries, and botanical/ecological.

Table 3-33. Summary of Findings of WSR Eligibility Determination [1]

Name of Stream	*Free Flowing*	*Outstandingly Remarkable Values [2]*	*Eligible*	*Eligible miles*
Ben Good Creek	yes	--	no	--
Bull Gulch	yes	--	no	--
Corral Gulch	yes	--	no	--
Cottonwood Creek	yes	--	no	--
East Fork Parachute Creek	yes	B, F, S	yes	7.5
East Middle Fork Parachute Creek	yes	F	yes	1.1
First Anvil Branch	no	--	no	--
First Anvil Creek	yes	B, F	yes	--
Forked Gulch	no	--	no	--
Golden Castle Creek	yes	B, F	yes	--
Goodrich Creek	yes	--	no	--
Government Creek	no	--	no	--
JQS Branch	yes	--	no	--
JQS Gulch	yes	B, F	yes	1.1
JV Gulch	yes	--	no	--
Northwater Creek	yes	B, F	yes	--
Northwater Branches	yes	--	no	--
Raspberry Creek	yes	--	no	--
Second Anvil Creek	yes	B	yes	1.8
Second Water Creek	yes	--	no	--
Sheep Trail Hollow Creek	no	--	no	--
Third Water Creek	yes	--	no	--
Thirty Two Mile Creek	no	--	no	--
Tichner Creek	yes	--	no	--
Timber Gulch	yes	--	no	--
Trapper Creek	yes	F	yes	6.1
West Forked Creek	yes	--	no	--
Yellow Jacket	yes	--	no	--
TOTAL				**24.0**

[1] *Source: BLM/GSFO Roan Plateau Preliminary Findings Wild and Scenic Eligibility Review (May 2002)*

[2] *B = Botanical/Ecological, F = Fisheries (Colorado River cutthroat trout), S = Scenic*

Scenic Values

Of the 64 miles of streams and creeks analyzed within the Planning Area, only one segment, East Fork Parachute Creek west of the falls and box canyon was found to contain scenic ORVs. This segment includes approximately 1.5 miles of East Fork Parachute Creek, starting at a waterfall and dropping into a dramatic box canyon extending to the west. The waterfall, one of the highest in Colorado, dominates the viewshed within the eastern reach of the canyon. While this scenic segment is not one of a kind, it is unusually rare and distinctive. Few canyons in the region contain a scenic feature of this scale or quality.

Fisheries Values

The value of a stream for fish may be judged on the relative merits of the fish populations, habitat, or a combination. Several streams are nationally or regionally important for sustaining native, genetically pure, and naturally reproducing populations of Colorado River cutthroat trout (Section 3.3.4).

The Colorado River cutthroat trout is the only native trout of the Colorado River Basin and has been designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, it is classified as a sensitive species by Regions 2 and 4 of the USFS and by BLM in Colorado and Utah.

Once common in most of the larger rivers of the region, including the White, Yampa, Colorado, Gunnison, and the San Juan and its tributaries, the species is now mostly limited to small headwater streams and isolated natural lakes within their historic range. Disappearance of Colorado River cutthroat trout in other areas has resulted from overfishing, interbreeding with other subspecies of cutthroat trout due to stocking by State fish and wildlife agencies, and competition from more aggressive non-native trout species, including the rainbow, brown, and brook trout. Fortunately for the cutthroat, the Planning Area historically received so little used by anglers (due to its isolation and remoteness) that no pressure was placed on CDOW to stock gamefish. Until recently, this would have meant the introduction of non-native trouts, including non-native subspecies of the cutthroat trout. Just as important, the extreme physical barriers between larger streams stocked by CDOW and the isolated streams atop the Roan Plateau prevented upstream dispersal of non-native species and subspecies. As described in Section 3.3.4, the Planning Area contains five conservation populations of Colorado River cutthroat trout, defined as reproducing and recruiting populations at least 90-percent pure (i.e., with less than 10-percent genes of other species or subspecies). These populations are located in JQS Gulch, East Fork Parachute Creek, East Middle Fork Parachute Creek, Northwater Creek, and Trapper Creek. These five creeks contain 15.5 miles of habitat for the Colorado River cutthroat trout. Also, 4 miles of stream length in Trapper and Northwater Creeks contain core conservation populations, defined as having at least 99-percent genetic purity. Therefore, the Roan Plateau populations of Colorado River cutthroat trout are considered nationally and regionally significant (CRCT Task Force 2001).

Botanical/Ecological Values

Seven of the 31 streams evaluated as WSRs in the Planning Area support rare plants or significant plant communities. East Fork Parachute Creek supports several species and plant communities considered rare or imperiled in Colorado, including the Southwest stickleaf, a BLM sensitive plant. East Fork Parachute Creek and its tributaries JQS Gulch, Golden Castle Creek, First Anvil Creek, and Second Anvil Creek, as well as East Middle Fork Parachute Creek and lower Northwater Creek, contain hanging garden environments that support the narrowly endemic hanging garden sullivantia (Section 3.2.4). Nearly two-thirds (62 percent) of the known populations of this species occur in the Planning Area (Section 3.3.3). The occurrences of rare or imperiled plant communities and hanging garden associations in these drainages are outstandingly remarkable or nationally/regionally significant when compared with other areas in the ecoregion.

3.5.9.4 Stream Classification

The process of determining eligibility for designation as a WSR also includes a preliminary classification into one of three categories: wild rivers, scenic rivers, or recreational rivers. This classification is based on the type and degree of human development on adjacent lands at the time of the evaluation. See the WSR eligibility report (BLM 2002e) for a complete description.

Wild Rivers

These are defined as streams that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. They represent vestiges of primitive America. All or portions of seven of the eight eligible streams within the Planning Area were

found to be wild in character: East Fork Parachute Creek, First Anvil Creek, Second Anvil Creek, Golden Castle Gulch, Trapper Creek, Northwater Creek, and East Middle Fork Parachute Creek.

Scenic Rivers

These streams are free of impoundments, with banks and watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. "Scenic" does not necessarily mean the river corridor has scenery as an outstandingly remarkable value, simply that it may contain more development than a wild segment and less development than a recreational segment. All or portions of five of the eight eligible creeks have a preliminary classification of scenic: East Fork Parachute Creek, First Anvil Creek**,** Second Anvil Creek, JQS Gulch, and Trapper Creek

Recreational Rivers

This classification includes streams that qualify for WSR designation but are less "pristine." Streams eligible for this classification may be readily accessible by road or railroad, may have some development along their banks, and may have undergone some impoundment or diversion in the past. Existing small dams and diversions may be allowed, as may the presence of parallel roads or railroads. Recreational rivers are not necessarily managed for recreational use. Portions of Second Anvil Creek and Trapper Creek were preliminarily classified as recreational rivers.

3.5.10 Forest Products

3.5.10.1 Management Plans and Documents

The forest management objective in the 1984 GSRA RMP, which included the Planning Area, is to "manage all suitable commercial forest land and woodland to meet sawtimber and fuelwood demand and maintain stand productivity."

The forest management objectives in the 1997 WRRA RMP are to "(1) determine the sustainable, annual allowable timberland harvest level on suitable commercial and non-commercial timberlands; (2) manage all timberlands to maintain productivity, extent, [and] forest structure, and for the enhancement of other resources; and (3) provide special management consideration for special or unique forest/woodland areas."

The woodlands objectives in the WRRA RMP are to "(1) determine annual allowable woodland harvest level on suitable/commercial woodlands; (2) determine allowable use levels on non-commercial woodlands; and (3) manage all woodlands to maintain productivity, extent, [and] forest structure and for the enhancement of other resources."

The forest management objective outlined in the DOE operational management plan for NOSRs 1 and 3 (DOE 1988) is as follows: "NOSR timber resources shall be managed to prevent deterioration of the soils and vegetation and the visual resources of the NOSRs and shall be consistent with good fire pre-suppression techniques."

3.5.10.2 Current Management

The Priorities of Implementation section of the 1984 GSRA RMP indicates that forest management plans were to be prepared on the two remaining forest management units (Castle Peak and the NOSRs). Measures were taken in the mid-1980s to draft a forest management plan for the NOSRs. Discussions between BLM and DOE during the 1980s and early 1990s were focused on funding to manage the forest on the NOSRs actively. Despite various meetings and requests for funding, monies were never allocated for forest management. DOE funding was focused on fire protection and livestock grazing management. A timber sale prospectus was developed in 1990 for the potential harvest of various stands of aspen, although lack of funds to carry manpower costs of a sale precluded this action.

Historical files in the GSFO detail tree-planting efforts in Golden Castle Gulch, with the objective of establishing ponderosa pine, white fir, and Douglas-fir during the late 1960s. Discussions with former BLM employees indicate that a contract was issued and planting occurred. Field review of the site in 2000 found no evidence of introduced planting stock or tree establishment.

In summary, few records are available that indicated active or even passive forest management in the Planning Area. A USFS forest management plan written in the mid-1960s recommended an intensive tree-planting program with the objective of establishing ponderosa pine. A sale of Douglas-fir saw logs (45 million board-feet [MBF]) was made to Ray Lyons in 1983 with access from a private road off Piceance Creek (Section 28, T4S, R94W). A public area for cutting of juniper fuelwood has been open for permit since the early 1990s on 32 Mile Mesa off SH 13, about 6 miles north of Rifle. No records of forest product sales or projects from the WRRA area are available.

3.5.10.3 Resource Condition and Capabilities Evaluation

The aspen resource of the Planning Area can be found in varying stages of growth, with many stands in overall decline as evidenced by signs of rot and breakdown. Consequently, merchantability of many stands is questionable. Most of the aspen stands in the Planning Area appear to be self-sustaining, although gradual succession to coniferous forest is indicated by the presence of conifer seedlings in the understory of some sites. Conifer forests of the Planning Area are generally multi-aged and self-sustaining.

In general, the forest resource on the Planning Area is in over-mature condition with expanding signs of decay and mortality. Fir aphids have been recognized as a pest problem since the late 1970s. Decline of subalpine fir and aspen, and mortality from Douglas-fir beetle, were identified in USFS aerial monitoring of the plateau in 1996 (BLM 2002a). Pockets of fir and aspen decline were identified in the headwaters of Northwater and Trapper Creeks. Douglas-fir mortality was noted on the steep slopes along the eastern rim and Ben Good Creek. No reference to these occurrences was made in *Forest Insect and Disease Conditions in the Rocky Mountain Region* (Harris et al 2002). This document included results of the USFS 2001 aerial monitoring.

Timber harvest potential exists within the Planning Area, although optimum yield most likely passed 15 to 30 years ago. The better aspen sites where conifer establishment is occurring in the understory would be "choice" stands for management if maintenance of aspen were a management objective. Most conifer sites, being multi-aged in structure, possess marginal yield capacity and high percentages of low-valued subalpine fir. Very few spruce trees are found on the plateau and, to preserve species diversity, should not be targeted for harvest. The highest and best use for most forested stands is riparian protection, wildlife cover/habitat, and soil protection/stabilization. Pinyon/juniper woodland in dissected lands below the rim offers limited potential for fuelwood harvest, primarily because of rough topography and lack of public access.

3.5.11 Fire

3.5.11.1 Management Plans and Documents

The fire management objectives outlined in the operational management plan for NOSRs 1 and 3 (DOE 1988) have been replaced by updated Fire Management Plans (FMPs) for the GSFO and WRFO. The FMPs were completed to comply with the 1995 Federal Wildland Fire Management Policy and the 2001 Review and Update of the 1995 Federal Wildland Fire Management Policy (BLM 2002f). The policy directs BLM field offices to have an approved FMP for every area with burnable vegetation. FMZs define differing strategies for managing and prioritizing wildland fires and prescribing vegetation treatments for fuel hazard reduction and resource benefit. Table 3-34 is an overview of FMZs.

The 1984 GSRA RMP was amended in September 2002 by incorporating an FMP from EA No. CO-140-2001-0051, which analyzed implementation of wildland fire management in the resource area. A future site-specific document that complies with NEPA is prepared for each prescribed vegetation treatment. The EA and FMP document the goals, values, fire management direction, suppression direction, and guidance for prescribed fires for the GSRA, including the Planning Area.

The WRFO completed an FMP (EA No. CO-017-WR-99-99-EA) in 1999. That FMP identified the appropriate management response on all natural and unplanned ignitions within the WRRA. The fire management objective for the WRFO portion of the Planning Area, as described in the 1997 WRRA RMP, is to "manage (using appropriate management response) naturally ignited fires throughout the unit to promote a vegetation mosaic [and to] conduct prescribed burns or other vegetation treatments on mountain shrub and sagebrush types to achieve age and structural diversity."

Table 3-34. Fire Management Overview

FMZ	Description	*Wildfire Management*		*Vegetation Treatments*		
		Suppression Priority	*Suppression Strategy*	*Wildland Fire Use* [1]	*Prescribed Fire Use*	*Mechanical, Biological, Chemical, Manual Use*
A	Fire not desired	High	Aggressive	No	No, except for burning piles of mechanically removed vegetation.	Yes, fuel hazard reduction to mitigate risks a priority.
B	Unplanned wildland fire not desired	High	Aggressive	No	Yes, fuel hazard reduction to mitigate risks a priority.	Yes, fuel hazard reduction to mitigate risks a priority.
C	Wildland fire desired but must consider significant constraints	Moderate	Appropriate responses	No	Yes, fuel hazard reduction lower priority than "A" or "B." Used to attain desirable conditions.	Yes, fuel hazard reduction lower priority than "A" or "B." Used to attain desirable conditions.
D	Wildland fire desired, with few constraints	Low	Appropriate responses	Yes, under prescribed conditions	Yes, used to attain desirable resource conditions. Fuel hazard reduction is lower priority than "C."	Yes, used to attain desirable resource conditions. Fuel hazard reduction is lower priority than "C."

[1] *Use of wildland fires to accomplish specific, stated resource management goals in predefined geographic areas.*

3.5.11.2 Evaluation of Resource Condition and Capabilities

Natural historical ("pre-settlement") conditions exist in few areas today. The influences of human activities and land uses such as livestock grazing, water development, road construction, recreation, the intentional or inadvertent introduction of exotic plant species, and more than a century of fire suppression have altered the composition of the plant communities and their response to fire.

In many areas, prolonged fire suppression has created conditions of high fuel loading at the ground surface. Fires in these areas may be hotter and more destructive than under more normal conditions. In extreme cases, these fires can "sterilize" the soil by destroying the soil seed bank, surficial organic matter,

and soil organisms. These hotter fires can also kill trees that would survive a lower intensity fire. The development of "ladder fuels" in the form of dense shrubs or small trees in the understory can also lead to the destruction of a forest by spreading the fire from the ground, where it is less threatening, to the tree crowns. These crown fires can then spread rapidly and violently through the forest canopy. Returning these areas to a cycle of periodic, low-intensity fires may require prescriptive vegetation treatments to reduce shrub and tree density. The Planning Area includes areas of invasive non-native species such as cheatgrass, musk and other thistles, houndstongue, and tamarisk that are adapted to shorter fire intervals than the native species. Since these species have both higher survival and more rapid reestablishment (by resprouting or by germination from seeds) following fire, they often increase in dominance compared to the native component. Consequently, reestablishment of a beneficial and self-sustaining plant community in areas that have burned is important to the ecological and visual quality post-fire habitats. Fire rehabilitation will be conducted using appropriate seed mixes and erosion control methods in accordance with BLM procedures. Where practicable, fire rehabilitation will be consistent with overall vegetation and range management goals of the Proposed Plan, including use of performance-based standards and adaptive management to ensure long-term recovery of the damaged area.

3.5.11.3 Current Fire Management

Public lands are managed under four fire management zone classifications for the purposes of wildland fire and prescribed vegetation management. The fire management zone classes (A through D)(Table 3-34) are based on BLM Instruction Memorandum No. 2002-034 (BLM 2001f) and Clarification of Fire Management Categories and RMP-Level Decisions in BLM Handbook H-1601-1 (BLM 2001a).

Atop the Plateau

The top of the plateau is currently managed as FMZ D (Map 29). If predetermined criteria are met, fires may be managed under a Wildland Fire Use (WFU) strategy to achieve desired objectives such as improving vegetation, wildlife habitat, or watershed conditions. Wildland fires under a suppression strategy are managed using the appropriate management response commensurate with predetermined constraints (negative effects to values and zone goals). Wildland fires under a suppression strategy are contained within natural or man-made barriers/firebreaks. Areas in FMZ D have the lowest priority for suppression in a multiple fire situation.

Within the GSRA, no more than 50 percent of the FMZ D area atop the plateau should burn over a 10-year period. Wildland fire suppression guidelines apply for Colorado River cutthroat trout, northern leopard frog, and Parachute penstemon along the Anvil Points rim. Wildland fire suppression restrictions also apply to areas with commercial wood product designation.

Northeast Cliffs and Southeast Cliffs

The cliffs along the northeastern and southeastern margins of the plateau are currently managed as FMZ C (Map 29). The FMP for the GSFO acknowledges that fire is a desirable component of the ecosystem. However, constraints must be considered, including private lands and homes, topography, archaeological and historical sites, visual aesthetics, wilderness characteristics, rare plants, the old-growth Douglas-fir community, big game security areas, and habitat for a variety of other sensitive species. Wildland fires are managed using the appropriate management response commensurate with predetermined constraints. Management strategies are intended to ensure that wildland fire is contained within natural or man-made barriers/firebreaks. FMZ C areas have a lower suppression priority in multiple wildland fire situations than FMZs A or B. No more than 50 percent of the FMZ C areas should burn over a 10-year period. Wildland fire suppression guidelines apply for northern leopard frogs, and suppression restrictions apply to commercial wood product areas.

Lower Elevations along the I-70 Corridor

The lower elevation terrain below the rim is currently managed as FMZ B (Map 29). The GSFO FMP recognizes that fire plays a natural role in the function of the ecosystem. However, an unplanned ignition in these lands could have negative effects unless or until some form of mitigation takes place. All wildland fires in FMZ B, regardless of ignition source, are a high priority and receive prompt suppression action commensurate with human safety in all instances. Fire suppression is usually aggressive to minimize wildland fire size. Wildland fire suppression guidelines apply for bald eagle winter range, Federally listed Colorado River fishes, Great Basin spadefoot toads, and northern leopard frogs. Wildland fire suppression restrictions for commercial wood product areas and ACECs also apply. Managers emphasize prevention/mitigation programs that reduce unplanned ignitions and threats to life, property, and natural and cultural resources.

3.5.12 Hazardous Materials

3.5.12.1 Wastes from Oil and Gas Exploration and Production

Wastes associated with oil and gas exploration and production are exempt from regulation under Subtitle C (hazardous materials) of the Resource Conservation and Recovery Act (RCRA) of 1976 but are regulated under RCRA Subtitle D (solid waste) and State regulations. The RCRA Subtitle C exemption applies, among other things, to produced water, constituents removed from produced water prior to injection or disposal of the spent water, drilling fluids, drill cuttings, rig wash, pit sludges, tank bottoms (sludge) from storage facilities, gas plant dehydration wastes, workover wastes, produced sand, packing fluids, stimulating fluids, and hydrocarbon-bearing soil. This exemption does not apply to listed waste solvents, painting wastes, unused fracturing fluids or acids, used lubricating oils, waste compressor oil and filters, pigging wastes from gathering lines, caustic or acid cleaners, sanitary wastes, pesticide wastes, and radioactive tracer wastes. Additionally, any hazardous substances as listed or defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 that are contained within one of the exempted wastes and released into the environment are regulated under CERCLA. For example, produced water is exempt under RCRA Subtitle C, but any CERCLA hazardous substances within the water are regulated under CERCLA if they are released to the environment.

Oil and gas wells are drilled primarily with rotary drilling rigs. In the rotary method, drilling mud is used as a lubricant for the drillbit and to lift well cuttings to the surface. At the surface, the drilling mud is diverted to tanks or pits for cleaning and treatment. Water requirements for drilling a well in the Wasatch or Mesaverde formations range from 5,000 to 15,000 gallons per day. This water is delivered to the site by truck. Operators in the region typically reuse water from the drilling mud to reduce transportation costs. Drilling mud typically contains several additives to enhance the properties of the fluid, including:

- Weighting materials, primarily barium sulfate, to increase the density of the mud
- Corrosion inhibitors, to protect metal components from corrosion
- Dispersants, to break up solid clusters of clay particles
- Flocculants, to cause suspended particles to group together so they can be removed by settling
- Surfactants, such as fatty acids and soaps, to defoam and emulsify the mud
- Biocides, to kill bacteria that may inhabit the mud and clog the formation
- Fluid loss reducers, including starch and polymers, to limit the loss of drilling fluid to subsurface formations

Typical drilling mud reported by Williams Production as being used in the Planning Area includes additives such as barite, sawdust, caustic soda, soda ash, bentonite, lignite, aluminum stearate,

bicarbonate of soda, cottonseed hulls, lime, potassium chloride, sodium polyacrylate, an organic thinner, and a liquid polymer (EZ-Mud). These materials fall within the broad category of well completion, treatment, and stimulation fluids that are exempt under RCRA Subtitle C.

Drill cuttings, consisting of rock debris mixed with some residual drilling mud, are typically not removed from the site. Approximately 100 cubic yards of cuttings are typically generated for each well drilled in the Planning Area. The cuttings are buried in pits 8 to 10 feet deep within the drill pad area, backfilled with soil and subsoil stripped and stockpiled during excavation, and revegetated. The pits are generally unlined.

3.5.12.2 Produced Water

Williams Production, the largest oil and gas developer in the Planning Area, had 740 gas wells in the Roan Plateau region as of January 2003. Each generally yields four barrels of produced water per day, for a total of approximately 3,000 barrels per day. About 60 percent of this water is used for finishing wells, where the water is filtered, chlorinated, and injected to fracture the formation or for other purposes. The remaining water is evaporated in evaporation pond facilities (Cesark, personal communication 2003). Williams does not use onsite pits for evaporation but instead trucks the produced water offsite.

The produced water contains about 10 percent natural gas condensate, a light hydrocarbon that is sold to produce gasoline and reported as "oil" to the COGCC. Produced water ranges in salinity from about 7,000 to 26,000 parts per million (ppm) of total dissolved solids (TDS), with an average salinity of about 20,000 ppm. Most of this salinity consists of sodium and chloride ions (i.e., NaCl, common table salt]).

Information on the chemistry of the produced water was obtained from data reported to CDPHE from the Black Mountain brine disposal facility in DeBeque, Colorado. This facility receives fracturing waters and drilling fluids in addition to produced waters. The water in Pond 1, the first evaporation pond at the Black Mountain facility, was analyzed periodically from 1990 through 2002. Comparisons of average concentrations of pond water reported by Black Mountain with CDPHE water quality standards are provided in Table 3-35. The water quality standards shown include secondary (non-health-based) and primary (health-based) drinking water standards (maximum contaminant levels [MCLs]), agricultural (livestock watering/irrigation) stream standards, and aquatic life (coldwater [trout]) standards. Coldwater fisheries standards in the table are the most stringent value applicable to any of various segments in the East Fork Parachute Creek watershed. Calculated standards used a hardness of 25.

All of the analyte concentrations presented in the table are conservative (i.e., more likely to be overestimates than underestimates) in relation to actual produced waters at the well sites because of concentration associated with evaporation. Also, the chemistry of water at the Black Mountain facility is likely to differ somewhat from the chemistry of produced waters from the Planning Area, since the facility also receives other types of fluids. However, most of their throughput is from regional wells. Note that exceedances (average concentrations that exceed a standard) include the secondary (non-health-based) drinking water standards for calcium, iron, bicarbonate, and chloride; agricultural stream standards for copper and zinc; and aquatic life (coldwater fisheries) standards for cadmium, iron, manganese, and chloride. The most important exceedance is for chloride, reflecting the high salinity of the produced waters. The other exceedances are relatively slight and could be the result of evapoconcentration in the disposal pond. This underscores the importance of keeping produced water from reaching area streams in significant quantities, especially for the small streams atop the plateau in which seasonal flows can be very low and insufficient to achieve the nearly 50-fold dilution required to bring the chloride concentration to within the aquatic life standard.

Table 3-35. Chemistry (mg/L) of Produced/Disposed Waters at the Black Mountain Disposal Site Evaporation Pond, DeBeque, Garfield County, Colorado [1]

Analyte	*Average Value of Analytes in Pond Waters 1990 – 2002*	*MCLs [2]*	*Stream Standards for Agriculture [3]*	*Aquatic Life Standards [4]*	*Groundwater Standards for Agriculture [5]*
Arsenic	<0.001	0.05	0.1	0.05	0.1
Barium	0.28	2.0	--	--	--
Cadmium	0.02	0.005	0.0008	0.01	0.01
Copper	0.4	1.0	0.0027	0.2	0.2
Iron	7.5	0.3	1.0	1.0	5.0
Lead	0.003	0.05	0.014	0.1	0.1
Manganese	0.96	0.05	1.04	0.2	0.2
Mercury	<0.0002	0.002	0.00001	.00077	0.01
Zinc	0.07	5.0	0.036	2.0	2.0
Sodium	6,941	250	--	0.2	--
Calcium	564.8	500	--	--	--
Chloride	11,816	250	--	250	--
Bicarbonate	1,470	250	--	--	--
Carbonate	<0.5	250	--	--	--
Sulfate	63.6	250	--	--	--
Total Alkalinity	1,129.2	500	--	--	--
Total Dissolved Solids	23,000	500	--	--	variable
pH	7.20	--	6.5-9.0	6.5-9.0	6.5-8.5

[1] *Specific water quality standards vary depending on designated water use and location.*

[2] *MCLs = maximum contaminant levels. Colorado and/or EPA secondary (non-health-based) drinking water standards (the 500 ppm standard is for total hardness). Primary (health-based) standards are in italics.*

[3] *Stream standards are Colorado agricultural water standards. Values were calculated using a hardness of 25.*

[4] *Coldwater aquatic life standards are lowest value for various designated stream segments of East Fork Parachute Creek watershed.*

[5] *Colorado State groundwater standards for agricultural uses.*

3.5.12.3 Spills and Releases

BLM has stipulated procedures to be followed in the event of a spill or release from an oil and gas production facility on BLM land (BLM 1999b). These procedures require that BLM be notified in the event of "all spills or leakages of oil, gas, produced water, toxic liquids or waste materials, blowouts, fires, personal injuries, and fatalities." The operator is to report any such releases to the BLM and the Surface Managing Agency (BLM 1999b) immediately for all "Class 1" events (more than 100 barrels of fluid or 500 MCF of gas). Therefore, if more than 100 barrels of produced water were released into the environment, the operator would be required to notify BLM and initiate corrective actions.

BLM will use its delegated authority under CERCLA to respond to uncontrolled releases of hazardous substances on Federal lands, or on private lands with oil and gas produced from a Federal mineral estate. Response actions will be in accordance with the procedures and requirements of the National Contingency Plan (NCP) found in 40 CFR 300. Exemptions to CERCLA hazardous substances can be found in section 101(4) of the Act. The only exceptions to CERCLA are crude oil, natural gas liquids,

liquefied natural gas, or synthetic gas. Thus, all other substances listed as a hazardous substance that are released to the environment are subject to CERCLA, including those from oil and gas operations.

The Colorado Oil and Public Safety Division regulates oil and gasoline in the State and requires that responsible parties report any release of more than 25 gallons of a regulated substance within 24 hours. State regulations, contained at Colorado Code of Regulations (CCR) 8-20.5 section 101 (Oil and Public Safety), define crude oil and natural gas condensates as regulated substances subject to these reporting requirements, but tanks associated with oil and gas production facilities are exempted. Relevant excerpts from CCR 8-20.5 section 101 include the following:

> (13) "Regulated substance" means: (a) Any substance defined in section 101 (14) of CERCLA but not including any substance regulated as a hazardous waste under Subtitle (C) of RCRA; or (b) Petroleum, including crude oil, and any fraction thereof that is liquid at standard conditions of temperature and pressure (60F and 14.7 pounds per square inch absolute).
>
> (14) "Release" means any spilling, leaking, emitting, discharging, escaping, leaching, or disposing of a regulated substance from an underground storage tank into groundwater, surface water, or subsurface soils.
>
> (15) "Reportable quantities" means quantities of a released regulated substance which equal or exceed the reportable quantity under CERCLA, and petroleum products in quantities of 25 gallons or more.
>
> (b) "Above-ground storage tank" does not include:
>
> (I) A wastewater treatment tank system that is part of a wastewater treatment facility.
>
> (II) Equipment or machinery that contains regulated substances for operational purposes.
>
> (III) Farm and residential tanks.
>
> (IV) Above-ground storage tanks located at natural gas pipeline facilities that are regulated under State or Federal natural gas pipeline acts.
>
> (V) Above-ground storage tanks associated with natural gas liquids separation, gathering, and production.
>
> (VI) Above-ground storage tanks associated with crude oil production, storage, and gathering.
>
> (VII) Above-ground storage tanks at transportation-related facilities regulated by the Federal Department of Transportation.
>
> (VIII) Above-ground storage tanks used to store heating oil for consumptive use on the premises where stored.
>
> (IX) Above-ground storage tanks used to store flammable and combustible liquids at mining facilities and construction and earthmoving projects, including gravel pits, quarries, and borrow pits where, in the opinion of the director of the division of oil and public safety, tight control by the owner or contractor and isolation from other structures make it unnecessary to meet the requirements of this article.
>
> (X) Any other above-ground tank excluded by regulation.

Potential regulated releases could be from tanker trucks, onsite tanks, or evaporation ponds. The average condensate tanks at the wellheads are typically 300 barrels per wellhead, and produced water tanks are generally between 200 and 300 barrels per wellhead. Transport trucks range in capacity from 60 to 120 barrels. Produced water typically contains about 10 percent condensate. Therefore, tankers and ponds

can contain more than 25 gallons of natural gas condensate at any given time. As stated above, BLM requires reporting of brine releases that exceed 100 barrels.

3.5.12.4 Existing Environmental Records

A search of several pertinent environmental agency records was conducted for the properties within one mile of the study area. The study area has historically been the focus of extensive resource exploration projects; undocumented sources of environmental contamination that pre-date modern environmental regulations are likely.

Anvil Points Spent Oil Shale Pile

A spent oil shale pile is located on the slopes below the Anvil Points research facility. The pile is in a narrow ravine adjacent to West Sharrard Creek, a tributary that flows to the Colorado River in less than 2 miles. The pile was developed through 40 years of deposition from oil shale mining and processing activities. The pile consists of approximately 300,000 cubic yards of material and is roughly 1,000 feet long and 350 feet high. BLM and CDPHE have conducted analyses of the site and concluded that the pile is the source of arsenic and other heavy metals contamination leaching into both surface and groundwater. Chemical constituents in the pile have also been determined to be hazardous through direct physical contact. In addition, the physical stability of the pile may be questionable due to its steep slope, lack of vegetation, and proximity to West Sharrard Creek.

BLM, in consultation with CDPHE, has completed an engineering design for removal of the pile and associated facilities. The removal action is expected to be initiated in 2007 and completed by the end of 2009. This removal action would be conducted consistent with the land-use restrictions, BMPs, and reclamation standards under this RMPA/EIS where practicable.

CERCLA/Superfund Sites

A search of EPA's CERCLA Information System (CERCLIS) database, dated January 2003, indicated no CERCLA sites within 1 mile of the Planning Area.

RCRA/Hazardous Waste Notifiers

The RCRA Notifiers List is an inventory of transporters; burner/blenders; and large-, small-, and very small-quantity generators of hazardous wastes. None occur on Federal lands in the Planning Area. Large-quantity generators (LQGs) generate more than 1,000 kilograms (2,205 pounds) of hazardous waste per month. Small-quantity generators (SQGs) generate between 100 and 1,000 kilograms (2,205 pounds) per month; conditionally exempt small-quantity generators (CESQGs) generate less than 100 kilograms (220 pounds) per month. No LQGs were found in the RCRA Information System (RCRIS) database within 0.5 mile, and no other facilities were located within 0.25 mile. Table 3-36 lists the SQGs and CESQGs within one mile of the Planning Area. Note that the Unocal shale oil facility is also listed as a treatment, storage, and disposal (TSD) facility.

Table 3-36. RCRA/Hazardous Waste Notifiers Within One Mile of the Planning Area

Facility	*Address/Location*	*Status*	*ID*
American Soda LLP	2717 CR 215, Parachute	Not Classified	COR000016014
Anvil Points Oil Shale Facility	8 miles W of Rifle on I-70	Not Classified	CO9890031876
CDOT – Rifle	SH 13 at milepost 2	CESQG	COD983771791
Development Eng. Inc	1354 CR 246, Rifle	CESQG	CO0890090129
Exxon Co USA	16 miles N of Parachute, CR 215	CESQG	COD000651539

Table 3-36. RCRA/Hazardous Waste Notifiers Within One Mile of the Planning Area

Facility	*Address/Location*	*Status*	*ID*
JQS Trail, Rifle	NW¼, SE¼, Sec. 2, T5S, R93W	Not Classified	COR000005249
KN Energy Inc	1879 CR 264, Rifle	SQG	COR00007179
Occidental Oil Shale Inc	20011 CR 5	Not Classified	COD000716530
Rifle Clough Compressor	Sec. 13, T6S, R93W	CESQG	COD981550064
Rifle Gas Plant	620 CR 264	CESQG	COR000000125
Rulison Compressor	Sec. 21, T6S, R93W	CESQG	COD981550080
Unocal Shale Oil Facility	10735 CR 215, Parachute	CESQG, TSD, CAS	COD980718902

Environmental Covenants

No environmental covenants restrict Public lands within the Planning Area. Landowners and CDPHE have been given the authority to impose environmental covenants that limit access or use of a property due to ongoing contamination and/or remediation projects. One such property is located within the Planning Area vicinity but entirely on private property: the Old Rifle Mill site located in portions of Sections 15 and 18, Township 6 South, Range 93 West. Use restrictions are as follows:

- No habitable structure may be constructed on the property without properly designed radon mitigation as approved by DOE.
- Wells completed in the alluvial aquifer or the Entrada Formation may not be used for domestic or potable water supplies.
- No tilling, excavation, grading, construction, or any other activity that disturbs the ground surface is permitted on the property, without the express written consent of DOE.
- No activities that will in any way damage any monitoring or remedial wells installed by DOE or interfere with the maintenance, operation, or monitoring of the wells are allowed without the express written consent of USDI and DOE.

3.5.13 Renewable Energy

In February 2003, BLM and the National Renewable Energy Laboratory (NREL) issued a report identifying public lands most suitable for increased development of renewable energy (DOE and BLM 2003). The report examined Federal areas, including those administered by BLM in eleven Western States, for the highest energy potential from four renewable sources: wind, solar, geothermal, and biomass. The assessment was undertaken in response to the National Energy Plan. BLM and DOE worked with industry experts to develop screening criteria for each type of energy. Factors considered included geography, infrastructure requirements, access to roads and power transmission lines, and proximity to towns and cities. Findings of the assessment indicated that the region including the Planning Area was not among the 25 highest rated areas for any of these potential energy sources.